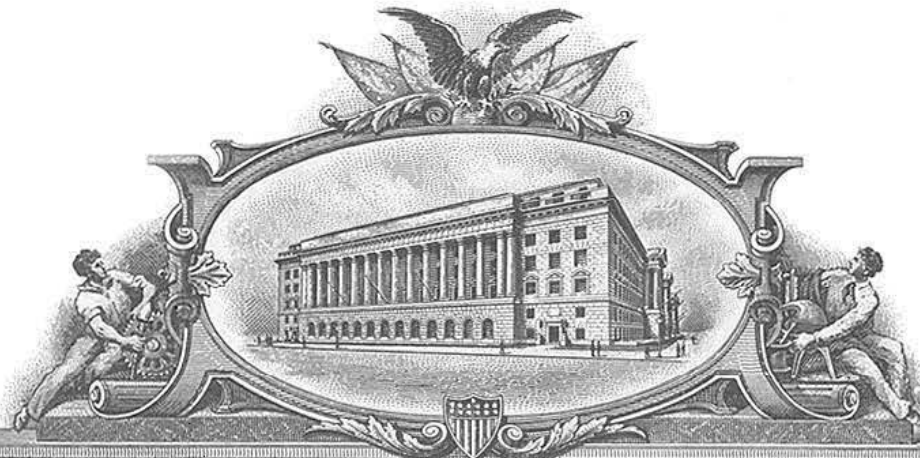


8327376



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*December 20, 2022*

**THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE  
RECORDS OF THIS OFFICE OF THE FILE WRAPPER AND CONTENTS  
OF:**

**APPLICATION NUMBER:** *11/909,002*  
**FILING DATE:** *September 18, 2007*  
**PATENT NUMBER:** *7515981*  
**ISSUE DATE:** *April 07, 2009*



Certified by

*Kathi*

Performing the Functions and Duties of the  
Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

Amazon Ex. 1002.0001

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371</b>		ATTORNEY'S DOCKET NUMBER <b>RYZ01 P-100B</b>
U.S. APPLICATION NO. (If known, see 37 CFR 1.5)		
INTERNATIONAL APPLICATION NO. <b>PCT/US2006/039215</b>	INTERNATIONAL FILING DATE <b>October 6, 2006</b>	PRIORITY DATE CLAIMED <b>October 7, 2005</b>
TITLE OF INVENTION <b>LIGHT GUIDED ASSEMBLY SYSTEM</b>		
APPLICANT(S) FOR DO/EO/US <b>Paul Ryznar and James Ryznar</b>		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</li> <li>4. <input checked="" type="checkbox"/> The US has been elected (Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))               <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input checked="" type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).               <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto.</li> <li>b. <input checked="" type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))               <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol> <p><b>Items 11 to 20 below concern document(s) or information included:</b></p> <ol style="list-style-type: none"> <li>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>13. <input checked="" type="checkbox"/> A preliminary amendment.</li> <li>14. <input checked="" type="checkbox"/> An Application Data Sheet under 37 CFR 1.76.</li> <li>15. <input type="checkbox"/> A substitute specification.</li> <li>16. <input checked="" type="checkbox"/> A power of attorney and/or change of address letter.</li> <li>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821- 1.825.</li> <li>18. <input type="checkbox"/> A second copy of the published International Application under 35 U.S.C. 154(d)(4).</li> <li>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> </ol>		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering information, preparing, and submitting the completed form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)		INTERNATIONAL APPLICATION NO. PCT/US2005/036992		ATTORNEY'S DOCKET NUMBER RYZ01 P-100B	
20. Other items or information:					
The following fees have been submitted				CALCULATIONS	PTO USE ONLY
21.	<input checked="" type="checkbox"/>	Basic national fee (37 CFR 1.492(a))..... \$300		\$ 300.00	
22.	<input checked="" type="checkbox"/>	Examination fee (37 CFR 1.492(c))		\$ 0.00	
If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0					
All other situations..... \$200					
23.	<input checked="" type="checkbox"/>	Search fee (37 CFR 1.492(b))		\$ 0.00	
If the written opinion of the ISA/US or the International preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0					
Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority..... \$100					
International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... \$400					
All other situations..... \$500					
<b>TOTAL OF 21, 22 and 23 =</b>				300.00	
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). The fee is \$250 for each additional 50 sheets of paper or fraction thereof.					
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)		RATE	
- 100 =	/50 =			x \$250	\$
Surcharge of \$130.00 for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	25 - 20 =	5	x \$ 50	\$ 250.00	
Independent claims	3 - 3 =	0	x \$200	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$360	\$	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 550.00	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.				275.00	
<b>SUBTOTAL =</b>				\$ 275.00	
Processing fee of \$130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).				+	\$
<b>TOTAL NATIONAL FEE =</b>				\$ 275.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$
<b>TOTAL FEES ENCLOSED =</b>				\$ 275.00	
				Amount to be refunded:	\$
				Amount to be charged	\$ 275.00

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.


- a. ☐ A check in the amount of \$ \_\_\_\_\_ to cover the above fees is enclosed.
- b. ☒ Please charge my Deposit Account No. 220190 in the amount of \$ 275.00 to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 22 0190. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

**ADVISORY:** If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended paying fees online by using the electronic payment method.

**NOTE:** Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

SEND ALL CORRESPONDENCE TO:

Karl T. Ondersma  
Van Dyke, Gardner, Linn & Burkhart, LLP  
2851 Charlevoix Drive, SE  
P.O. Box 888695  
Grand Rapids, Michigan 49508-8695  
Telephone: 616-975-5500  
Facsimile: 616-975-5505

  
\_\_\_\_\_  
SIGNATURE  
Karl T. Ondersma  
\_\_\_\_\_  
NAME  
55 894  
\_\_\_\_\_  
REGISTRATION NUMBER

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	RYZ01 P-100B
		Application Number	
Title of Invention	LIGHT GUIDED ASSEMBLY SYSTEM		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

**Secrecy Order 37 CFR 5.2**

- ☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

**Applicant Information:**

<b>Applicant 1</b>					
<b>Applicant Authority</b>		<input checked="" type="radio"/> Inventor		<input type="radio"/> Legal Representative under 35 U.S.C. 117	
				<input type="radio"/> Party of Interest under 35 U.S.C. 118	
<b>Prefix</b>	<b>Given Name</b>	<b>Middle Name</b>	<b>Family Name</b>	<b>Suffix</b>	
	Paul		Ryznar		
<b>Residence Information (Select One)</b> <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
<b>City</b>	Northville	<b>State/Province</b>	MI	<b>Country of Residence i</b>	US
<b>Citizenship under 37 CFR 1.41(b) i</b>		US			
<b>Mailing Address of Applicant:</b>					
<b>Address 1</b>		49601 Deer Run Drive			
<b>Address 2</b>					
<b>City</b>	Northville	<b>State/Province</b>	MI		
<b>Postal Code</b>	48167	<b>Country i</b>	US		
<b>Applicant 2</b>					
<b>Applicant Authority</b>		<input checked="" type="radio"/> Inventor		<input type="radio"/> Legal Representative under 35 U.S.C. 117	
				<input type="radio"/> Party of Interest under 35 U.S.C. 118	
<b>Prefix</b>	<b>Given Name</b>	<b>Middle Name</b>	<b>Family Name</b>	<b>Suffix</b>	
	James		Ryznar		
<b>Residence Information (Select One)</b> <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
<b>City</b>	Belleville	<b>State/Province</b>	MI	<b>Country of Residence i</b>	US
<b>Citizenship under 37 CFR 1.41(b) i</b>		US			
<b>Mailing Address of Applicant:</b>					
<b>Address 1</b>		11535 Ryznar Drive			
<b>Address 2</b>					
<b>City</b>	Belleville	<b>State/Province</b>	MI		
<b>Postal Code</b>	48111	<b>Country i</b>	US		
<p>All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <b>Add</b> button.</p> <div style="text-align: right;"><input type="button" value="Add"/></div>					

**Correspondence Information:**

Enter either Customer Number or complete the Correspondence Information section below.  
For further information see 37 CFR 1.33(a).

- ☐ An Address is being provided for the correspondence Information of this application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	RYZ01 P-100B	
		Application Number		
Title of Invention	LIGHT GUIDED ASSEMBLY SYSTEM			
Customer Number	28101			
Email Address	ondersma@vgib.com	<a href="#">Add Email</a>		<a href="#">Remove Email</a>

**Application Information:**

Title of the Invention	LIGHT GUIDED ASSEMBLY SYSTEM			
Attorney Docket Number	RYZ01 P-100B	Small Entity Status Claimed <input checked="" type="checkbox"/>		
Application Type	Nonprovisional			
Subject Matter	Utility			
Suggested Class (if any)		Sub Class (if any)		
Suggested Technology Center (if any)				
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	1	
<b>Publication Information:</b>				
<input type="checkbox"/> Request Early Publication (Fee required at time of Request 37 CFR 1.219)				
<input type="checkbox"/> Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not been and will not be the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.				

**Representative Information:**

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.			
Please Select One:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> US Representative (37 CFR 11.9)
Customer Number	28101		

**Domestic Priority Information:**

This section allows for the applicant to claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c). Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.			
Prior Application Status	Pending	<a href="#">Remove</a>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	a 371 of international	PCT/US2006/39215	2006-10-06
Prior Application Status	Expired	<a href="#">Remove</a>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/US2006/39215	non provisional of	60724858	2005-10-07

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	RYZ01 P-100B	
		Application Number		
Title of Invention	LIGHT GUIDED ASSEMBLY SYSTEM			
Prior Application Status	Expired	<input type="button" value="Remove"/>		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	
PCT/US2006/39215	non provisional of	60818058	2006-06-30	
Additional Domestic Priority Data may be generated within this form by selecting the <b>Add</b> button.				

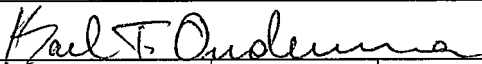
**Foreign Priority Information:**

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).			
<input type="button" value="Remove"/>			
Application Number	Country <sup>i</sup>	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			<input type="radio"/> Yes <input checked="" type="radio"/> No
Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button.			

**Assignee Information:**

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.			
<b>Assignee 1</b>			
If the Assignee is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	Ops Solutions LLP		
<b>Mailing Address Information:</b>			
Address 1	49601 Deer Run Drive		
Address 2			
City	Northville	State/Province	MI
Country <sup>i</sup>	US	Postal Code	48167
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the <b>Add</b> button.			

**Signature:**

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature			Date (YYYY-MM-DD)	2007-09-18	
First Name	Karl T.	Last Name	Ondersma	Registration Number	55894

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>Application Data Sheet 37 CFR 1.76</b>		Attorney Docket Number	RYZ01 P-100B
		Application Number	
Title of Invention	LIGHT GUIDED ASSEMBLY SYSTEM		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Paul Ryznar and James Ryznar  
For : **LIGHT GUIDED ASSEMBLY SYSTEM**  
Atty Docket : RYZ01 P-100B  
Customer No. : 28 101

Mail Stop PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir or Madam:

PRELIMINARY AMENDMENT

Prior to the examination of this application, Applicants request amendment of the application as follows:

**Amendments to the Specification** are on page 2 of this paper.

**Amendments to the Claims** are reflected in the listing of claims which begins on page 3 of this paper.

**Remarks** are on page 8 of this paper.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 2

**Amendments to the Specification:**

Please amend paragraph [0001] on page 1 as follows:

[0001] The present application is a 371 national phase application of PCT Application No. PCT/US2006/39215, filed October 6, 2006, which claims benefit of U.S. provisional application, Ser. No. 60/724,858, filed October 7, 2005, and of U.S. provisional application Ser. No. 60/818,058, filed June 30, 2006, which are all hereby incorporated herein by reference in their entireties.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 3

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the present application:

1. (original) An operational guide system adapted to provide visual indicators to an individual to guide sequential actions, said operational guide system comprising:
  - at least one sensor apparatus, said at least one sensor apparatus operable to detect operation information and generate an output indicative of said operation information;
  - a controller, said controller receiving at least a first input signal indicative of said operation information and selectively providing at least one command signal in response to said first input signal; and
  - at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller.
2. (original) The operational guide system of claim 1, wherein said at least one indicating light is provided to an operator performing an assembly action at a work station.
3. (original) The assembly guide system of claim 2, wherein said at least one indicating light is projected at a component location, said component location retaining a part required for assembly at said work station.
4. (original) The assembly guide system of claim 2, wherein said operation information comprises identification of a presence of a work piece at said work station.
5. (original) The assembly guide system of claim 4, wherein said operation information comprises identification of a type of the work piece at said work station, and wherein said at least one command signal is selectively provided depending on the type of the work piece identified.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 4

6. (original) The assembly guide system of claim 2, wherein said at least one indicating light is projected at a work piece to indicate an operation step location.

7. (currently amended) The assembly guide system of claims 1-~~or~~2, wherein said controller is adapted to receive at least one confirmation signal indicative of a completion of an assembly action, said at least one confirmation signal comprising at least one signal selected from the group consisting of a manually input signal and an automated input signal.

8. (currently amended) The assembly guide system of claims 1-~~or~~2, wherein said at least one indicating light is produced by at least one high intensity light emitting device selected from the group consisting of a laser projector, a digital light projector, and a liquid-crystal display.

9. (currently amended) The assembly guide system of claims 1-~~or~~2, further including a display device, and wherein said controller is programmable via at least one program screen displayable on said display device, said at least one program screen configured to include at least one input field for entering and/or selecting indicia regarding sequential actions;

said controller being further configured to display at least one display screen on said display device during operation of said operational guide system, said display screen being adapted to display indicia regarding sequential actions to be performed.

10. (original) The assembly guide system of claim 9, wherein said at least one input field comprises at least one selected from the group consisting of a description field, a graphic field, and a location field, and wherein said description field is configured to enable programming of descriptive text associated with sequential actions, said graphic selection field is configured to enable programming of an image formed by said at least one indicating light, and said location field is configured to enable programming of the location at which said at least one directional light device projects said at least one indicating light.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 5

11. (currently amended) The assembly guide system of claims 1-~~or~~2, wherein said controller is configured to monitor operational information associated with sequential actions.

12. (original) The assembly guide system of claim 11, said operational information including at least one selected from the group consisting of a cycle time, an incorrectly performed action, a time between sequential actions, and an operator identification.

13. (currently amended) The assembly guide system of claim 1-~~or~~2, further including a display device, said display device being operable to display information regarding sequential actions.

14. (original) A method for guiding assembly actions by providing visual indicators, said method comprising:

- identifying a characteristic of a work piece requiring assembly actions;
- communicating identification information to a controller in response to the identifying of a characteristic of the work piece;
- communicating a first command signal to at least one directional light device in response to the identifying of a characteristic;
- selectively projecting at least one indicating light via the directional light device in response to the first command signal; and
- communicating a confirmation signal to the controller upon completion of a first operation step.

15. (original) The method of claim 14, wherein identifying a characteristic of a work piece comprises identifying the presence of a work piece with a sensor apparatus.

16. (original) The method of claim 15, including identifying the type of work piece requiring assembly actions.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 6

17. (original) The method of claim 14, wherein projecting at least one indicating light comprises projecting at least one indicating light toward at least one of a component location and an operation step location.

18. (original) The method of claim 14, wherein projecting at least one indicating light comprises projecting at least one indicating light in a selectively configurable pattern.

19. (original) The method of claim 14, wherein communicating a confirmation signal comprises communicating a confirmation signal from at least one selected from the group consisting of a manual input signal and an automated input signal.

20. (original) The method of claim 14, including:

- communicating a second command signal from the controller to the at least one directional light device in response to the confirmation signal;
- projecting at least one indicating light from the directional light device in response to the second command signal; and
- communicating a confirmation signal to the controller upon completion of a second operation step.

21. (original) The method of claim 20, including:

- repeating said communicating a command signal;
- projecting at least one indicating light in response to said command signal; and
- communicating a confirmation signal until assembly actions for the work piece have been completed.

22. (original) The method of claim 14, including:

- programming the controller via at least one program screen displayable on the display device, the at least one program screen configured to include at least one input field for entering and/or selecting indicia regarding sequential actions; and

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 7

displaying indicia regarding sequential actions to be performed on at least one display screen displayable on the display device.

23. (original) The method of claim 14, including:

monitoring operational information associated with sequential actions via the controller.

24. (new) The assembly guide system of claim 2, further including a display device, and wherein said controller is programmable via at least one program screen displayable on said display device, said at least one program screen configured to include at least one input field for entering and/or selecting indicia regarding sequential actions;

said controller being further configured to display at least one display screen on said display device during operation of said operational guide system, said display screen being adapted to display indicia regarding sequential actions to be performed.

25. (new) The assembly guide system of claim 2, further including a display device, said display device being operable to display information regarding sequential actions.

Applicants : Paul Ryznar and James Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Page : 8

**Remarks:**

Claims 1-25 are pending in the application. Claims 7, 8, 9, 11 and 13 have been amended to remove their multiple dependent format. Claims 7, 8, 9, 11 and 13 originally depended from "claims 1 or 2" and have been amended to only depend from claim 1.

New claims 24 and 25, both of which depend from claim 2, have been added and are the equivalent of the removed multiple dependency of claims 9 and 13. The specification has been amended to update the Cross Reference to Related Applications section to refer to the PCT application.

Also enclosed herewith is the International Search Report and Written Opinion of the International Searching Authority.

The amendments and new claims are fully supported in the application as originally filed. No new matter has been added.

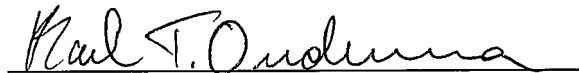
Examination on the basis of claims 1-25 and an early and favorable action on the merits is respectfully requested.

Respectfully submitted,

PAUL RYZNAR ET AL.

By: Van Dyke, Gardner, Linn & Burkhart, LLP

Date: September 18, 2007



Karl T. Ondersma  
Registration No. 55 894  
2851 Charlevoix Drive, S.E.  
P.O. Box 888695  
Grand Rapids, Michigan 49588-8695  
(616) 975-5500

KTO/wen  
RYZ01 P-100B

**DECLARATION AND POWER OF ATTORNEY**

As a below named inventor, I hereby declare:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **LIGHT GUIDED ASSEMBLY SYSTEM**, the specification of which is attached hereto, and for which an international application was filed on October 6, 2006 and assigned PCT International Application Ser. No. PCT/US06/39215.

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office (the Office), all information which is known by me to be material to patentability as defined in Title 37, Code of Federal Regulations (C.F.R.), Section 1.56.

**CLAIM OF PRIORITY**

I hereby claim foreign benefits under Title 35, United States Code (U.S.C.), Section 119(e), of any provisional application(s) for patent listed below:

U.S. Provisional Application Ser. No. 60/724,858, filed on October 7, 2005.

U.S. Provisional Application Ser. No. 60/818,058, filed on June 30, 2006.

**POWER OF ATTORNEY**

I hereby appoint the patent law firm of Van Dyke, Gardner, Linn & Burkhardt, LLP, P.O. Box 888695, Grand Rapids, Michigan 49588-8695, telephone number 616/975-5500, facsimile number 616/975-5505, and the individual patent attorneys and patent agents at such patent law firm, namely, Daniel Van Dyke, Reg. No. 25 046; Donald S. Gardner, Reg. No. 25 975; Terence J. Linn, Reg. No. 30 283; Frederick S. Burkhardt, Reg. No. 29 288; Catherine S. Collins, Reg. No. 37 599; Timothy A. Flory, Reg. No. 42 540; Karl T. Ondersma, Reg. No. 55 894, Deidre D. Link, Reg. No. 57,184; Matthew D. Kendall, Reg. No. 60 815; and Matthew L. Goska, Reg. No. 42 594 my attorney(s) or agent(s) with full power of substitution and revocation, to prosecute this application and to transact all business in and to receive all correspondence from the Patent and Trademark Office connected therewith.

All statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further, these statements are made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

First joint inventor:

  
Paul Ryznar

Date:

8/31/07

Second joint inventor:

  
James Ryznar

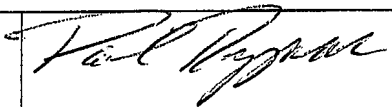

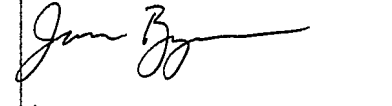
Date:

9-3-07

Citizenship: : United States of America  
Resident Address : 49601 Deer Run Drive  
Northville, Michigan 48167  
Post Office address : Same as above

Citizenship : United States of America  
Resident Address : 11535 Ryznar Drive  
Belleville, Michigan 48111  
Post Office address: Same as above

## PCT POWER OF ATTORNEY

0-1	PCT Power of Attorney (for an International application filed under the Patent Cooperation Treaty) (PCT Rule 90.4)	
0-1-1	Prepared Using	PCT-SAFE [EASY mode] Version 3.51.009.184 MT/FOP 20060701/0.20.5
1	The undersigned applicant(s)	Ops Solutions LLC; RYZNAR, Paul; RYZNAR, James
1-1-1	hereby appoints (appoint) the following person	Van Dyke, Gardner, Linn and Burkhardt, LLP and its individual attorneys, primarily Karl T. Ondersma 2851 Charlevoix Drive S.E., Suite 207 P.O. Box 888695 Grand Rapids, Michigan 49588-8695 United States of America
1-2	as	agent
1-3	to represent the undersigned before	all the competent International Authorities
1-4	in connection with the international application identified below:	
1-4-1	Title of invention	LIGHT GUIDED ASSEMBLY SYSTEM
1-4-2	Applicant's or agent's file reference	RYZ01FP100PC
1-4-3	International application number (if already available)	
1-4-4	filed with the following Office as receiving Office	United States Patent and Trademark Office (USPTO) (RO/US)
1-5	and to make or receive payments on behalf of the undersigned	
2-1	Signature of applicant, agent or common representative	
2-1-1	Name	Ops Solutions LLC
2-1-2	Name of signatory	Paul Ryznar
2-1-3	Capacity	President
2-2	Signature of applicant, agent or common representative	
2-2-1	Name (LAST, First)	RYZNAR, Paul
2-2-2	Name of signatory	Paul Ryznar
2-2-3	Capacity	President
2-3	Signature of applicant, agent or common representative	
2-3-1	Name (LAST, First)	RYZNAR, James
2-3-2	Name of signatory	James Ryznar
2-3-3	Capacity	Dir. of Sales
3	Date	04 October 2006 (04.10.2006)

<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371</b>		ATTORNEY'S DOCKET NUMBER <b>RYZ01 P-100B</b> U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
INTERNATIONAL APPLICATION NO. <b>PCT/US2006/039215</b>	INTERNATIONAL FILING DATE <b>October 6, 2006</b>	PRIORITY DATE CLAIMED <b>October 7, 2005</b>
TITLE OF INVENTION <b>LIGHT GUIDED ASSEMBLY SYSTEM</b>		
APPLICANT(S) FOR DO/EO/US <b>Paul Ryznar and James Ryznar</b>		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a submission under 35 U.S.C. 371.</li> <li>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</li> <li>4. <input checked="" type="checkbox"/> The US has been elected (Article 31).</li> <li>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))           <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> has been communicated by the International Bureau.</li> <li>c. <input checked="" type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li>6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).           <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> is attached hereto.</li> <li>b. <input checked="" type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))           <ol style="list-style-type: none"> <li>a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li>b. <input type="checkbox"/> have been communicated by the International Bureau.</li> <li>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li>d. <input type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</li> <li>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li> <li>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol> <p><b>Items 11 to 20 below concern document(s) or information included:</b></p> <ol style="list-style-type: none"> <li>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li>13. <input checked="" type="checkbox"/> A preliminary amendment.</li> <li>14. <input checked="" type="checkbox"/> An Application Data Sheet under 37 CFR 1.76.</li> <li>15. <input type="checkbox"/> A substitute specification.</li> <li>16. <input checked="" type="checkbox"/> A power of attorney and/or change of address letter.</li> <li>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 37 CFR 1.821- 1.825.</li> <li>18. <input type="checkbox"/> A second copy of the published International Application under 35 U.S.C. 154(d)(4).</li> <li>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> </ol>		

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering information, preparing, and submitting the completed form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)		INTERNATIONAL APPLICATION NO. PCT/US2005/036992		ATTORNEY'S DOCKET NUMBER RYZ01 P-100B	
20. Other items or information:					
The following fees have been submitted				CALCULATIONS	PTO USE ONLY
21.	<input checked="" type="checkbox"/>	Basic national fee (37 CFR 1.492(a))..... \$300		\$ 300.00	
22.	<input checked="" type="checkbox"/>	Examination fee (37 CFR 1.492(c))		\$ 0.00	
If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0					
All other situations..... \$200					
23.	<input checked="" type="checkbox"/>	Search fee (37 CFR 1.492(b))		\$ 0.00	
If the written opinion of the ISA/US or the International preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... \$0					
Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority..... \$100					
International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... \$400					
All other situations..... \$500					
<b>TOTAL OF 21, 22 and 23 =</b>				300.00	
<input type="checkbox"/> Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). The fee is \$250 for each additional 50 sheets of paper or fraction thereof.					
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round up to a whole number)		RATE	
- 100 =	/50 =			x \$250	\$
Surcharge of \$130.00 for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	25 - 20 =	5	x \$ 50	\$ 250.00	
Independent claims	3 - 3 =	0	x \$200	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$360	\$	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 550.00	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. Fees above are reduced by 1/2.				275.00	
<b>SUBTOTAL =</b>				\$ 275.00	
Processing fee of \$130.00 for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)).				+	\$
<b>TOTAL NATIONAL FEE =</b>				\$ 275.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$
<b>TOTAL FEES ENCLOSED =</b>				\$ 275.00	
				Amount to be refunded:	\$
				Amount to be charged	\$ 275.00

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

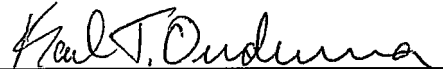
- a. ☐ A check in the amount of \$ \_\_\_\_\_ to cover the above fees is enclosed.
- b. ☒ Please charge my Deposit Account No. 220190 in the amount of \$ 275.00 to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 22 0190. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

**ADVISORY:** If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended paying fees online by using the electronic payment method.

**NOTE:** Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

SEND ALL CORRESPONDENCE TO:

Karl T. Ondersma  
Van Dyke, Gardner, Linn & Burkhart, LLP  
2851 Charlevoix Drive, SE  
P.O. Box 888695  
Grand Rapids, Michigan 49508-8695  
Telephone: 616-975-5500  
Facsimile: 616-975-5505



SIGNATURE

Karl T. Ondersma

NAME

55 894

REGISTRATION NUMBER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Paul Ryznar and James Ryznar  
For : **LIGHT GUIDED ASSEMBLY SYSTEM**  
Atty Docket : RYZ01 P-100B  
Customer No. : 28 101

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**INFORMATION DISCLOSURE STATEMENT**

In accordance with 37 CFR 1.51, 1.56, 1.97 and 1.98, Applicants submit herewith patents and publications listed on attached form PTO/SB/08A for consideration by the Examiner in connection with examination of the present application.

This Information Disclosure Statement is not intended to constitute an admission that any patent, publication or other information referred to herein is "prior art" for this invention unless specifically designated as such.

Under 37 CFR 1.97(h), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR 1.56(a) exists.

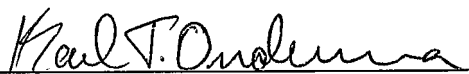
An early and favorable action on the merits is respectfully requested.

Respectfully submitted,

PAUL RYZNAR and JAMES RYZNAR

By: Van Dyke, Gardner, Linn & Burkhardt, LLP

Dated: September 18, 2007.

  
Karl T. Ondersma (Reg. No. 55 894)  
Van Dyke, Gardner, Linn & Burkhardt, LLP  
2851 Charlevoix Drive, S.E., Suite 207  
P.O. Box 888695  
Grand Rapids, Michigan 49588-8695  
(616) 975-5500

KTO:wen

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Paul Ryznar	
Art Unit		
Examiner Name		
Attorney Docket Number	RYZ01 P-100B	

**U.S.PATENTS**

Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	6658218	B2	2007-08-15	Krolczyk et al.	
	2	6224385	B1	2001-05-01	Nitta et al.	
	3	5910894		1999-06-08	Pryor	
	4	5801946		1998-09-01	Nissen et al.	
	5	5506641		1996-04-09	Dorsey-Palmateer	
	6	5430662		1995-07-04	Ahonen	
	7	5119536		1992-06-09	Leitz et al.	
	8	4469553		1984-09-04	Whitehead	

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Paul Ryznar	
Art Unit		
Examiner Name		
Attorney Docket Number	RYZ01 P-100B	

	9	4318222		1982-03-09	Frohlich	
	10	4222036		1980-09-09	Troukens	
	11	41633309		1979-08-07	Stuckler	
	12	4102568		1978-07-25	Miyagi	
	13	3667104		1972-06-06	Chamillard et al.	
	14	3623066		1971-11-23	Norris	
	15	3600785		1971-08-24	Cook	
	16	2682117		1954-06-29	Wales	

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20030073541	A1	2003-04-17	Carlson	

If you wish to add additional U.S. Published Application citation information please click the Add button.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Paul Ryznar	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	RYZ01 P-100B	

FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2i</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							<input type="checkbox"/>

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	International Search Report and Written Opinion of the International Searching Authority for International Application No. PCT/US2006/39215.	<input type="checkbox"/>

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/39215

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: G01M 19/00( 2006.01);B23P 17/04( 2006.01),19/00( 2006.01),21/00( 2006.01);G06F 17/00( 2006.01)  
G06F 19/00( 2006.01)

USPC: 29/407.1,407.04,592,700,703;700/95,115

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 29/407.1,407.04,592,700,703;700/95,115

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
IEEE/Xplore

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
USPAT; US-PGPUB; USOCR; EPO, JPO, DERWENT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,910,894 A (PRYOR) 8 June 1999 (08.06.1999), entire document.	1-23
A	US 5,119,536 A (LEITZ et al.) 9 June 1992 (09.06.1992), entire document.	1-23
A	US 5,430,662 A (AHONEN) 4 July 1995 (04.07.1995), entire document.	1-23
A	US 5,506,641 A (DORSEY-PALMATEER) 9 April 1996 (09.04.1996), entire document.	1-23
A	US 4,469,553 A (WHITEHEAD) 4 September 1984 (04.09.1984), entire document.	1-23
A	US 4,222,036 A (TROUKENS) 9 September 1980 (09.09.1980), entire document.	1-23
A	US 4,102,568 A (MIYAGI) 25 July 1978 (25.07.1978), entire document.	1-23

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search  
15 May 2007 (15.05.2007)

Date of mailing of the international search report  
01 JUN 2007

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (571) 273-3201

Authorized officer  
David N. Spector  
Telephone No. (571) 272-2338

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
VAN DYKE, GARDNER, LINN AND BURKHART, LLP AND  
ITS  
2851 CHARLEVOIX DRIVE S.E., SUITE 207  
P.O. BOX 888695  
GRAND RAPIDS, MI 49588-8695

*dyi*

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference RYZ01FP100PC		Date of mailing (day/month/year) <b>01 JUN 2007</b> <b>FOR FURTHER ACTION</b> See paragraph 2 below
International application No. PCT/US06/39215	International filing date (day/month/year) 06 October 2006 (06.10.2006)	Priority date (day/month/year) 07 October 2005 (07.10.2005)
International Patent Classification (IPC) or both national classification and IPC IPC: Please See Continuation Sheet USPC: 29/407.1,407.04,592,700,703;700/95,115		
Applicant OPS SOLUTIONS LLC		

Reply Due September 1, 2007

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Date of completion of this opinion 15 May 2007 (15.05.2007)	Authorized officer David N. Spector <i>[Signature]</i> Telephone No. (571) 272-2338
---	--	---

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US06/39215

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in electronic form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US06/39215

Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO
Inventive step (IS)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO
Industrial applicability (IA)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and explanations:

Claims 1-23 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest an operational guide system or assembly guide system adapted to provide visual indicators to an individual to guide sequential actions at a work location; comprising at least one sensor apparatus operable to detect operation information and generate an output indicative of the operation information, a controller receiving at least a first input signal indicative of the operation information and selectively providing at least one command signal in response to the first input signal, and at least one directional light device selectively operable to project and target at least one indicating light in response to the at least one command signal from the control module.

Claims 1-23 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry to facilitate product assembly and other operational tasks requiring the execution of a series of sequential steps.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US06/39215

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of IPC:

G01M 19/00( 2006.01);B23P 17/04( 2006.01),19/00( 2006.01),21/00( 2006.01);G06F 17/00G01M 19/00;B23P 17/04( 2006.01),19/00( 2006.01),21/00( 2006.01);G06F 17/00  
( 2006.01)  
G06F 19/00  
( 2006.01)

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>				
<b>Filing Date:</b>				
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM			
First Named Inventor/Applicant Name:	Paul Ryznar			
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance			
<b>Attorney Docket Number:</b>	RYZ01 P-100B			
Filed as Small Entity				
<b>U.S. National Stage under 35 USC 371 Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
Basic National Stage Fee	2631	1	150	150
National Stage Exam Fee - U.S. was IPEA	2643	1	0	0
<b>Pages:</b>				
<b>Claims:</b>				
Claims in excess of 20	2615	5	25	125
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				275

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	2208972
<b>Application Number:</b>	11909002
<b>International Application Number:</b>	PCT/US06/39215
<b>Confirmation Number:</b>	9951
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar
<b>Customer Number:</b>	28101
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance
<b>Filer Authorized By:</b>	Karl T. Ondersma
<b>Attorney Docket Number:</b>	RYZ01 P-100B
<b>Receipt Date:</b>	18-SEP-2007
<b>Filing Date:</b>	
<b>Time Stamp:</b>	14:23:00
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	\$275
RAM confirmation Number	7180
Deposit Account	220190
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 and 1.17	

### File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	AppTransmittalLetter.pdf	153703	no	3
			a1e1a672e16e5b9d1a45ae3769832aee003032ae		
Warnings:					
Information:					
2	Application Data Sheet	AppBiblioDataSheet.pdf	255896	no	5
			c580f6939dd7c233896a8472cf40c9db951d7148		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3	Preliminary Amendment	AppPreliminaryAmendment.pdf	279807	no	8
			f3f0d50dc3f6eaf73518585bodb3ac394189a0d		
Warnings:					
Information:					
4	Oath or Declaration filed	AppDeclarationAndPOA.pdf	67045	no	1
			686b0910bb9ccc5814863405c6fd0fed28478e0e		
Warnings:					
Information:					
5	Oath or Declaration filed	AppPCTPowerOfAttorney.pdf	45733	no	1
			427b8e319d0380ed228fec6845e1dd24e9f14c3d		
Warnings:					
Information:					
6	Information Disclosure Statement (IDS) Filed	AppInformationDisclosureStatement.pdf	137616	no	4
			3fc9bfad4ccda13a32ebbafe68c657d5486ed09c0		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
7	NPL Documents	AppIntlSearchReport.pdf	185511	no	5
			1f0911255006ac7f8419a0cf2c01e2959b040ae6		
Warnings:					
Information:					
8	Fee Worksheet (PTO-06)	fee-info.pdf	8406	no	2
			530c6be14e7b7b917498e901438647a7b0ec6f13		
Warnings:					
Information:					

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 April 2007 (19.04.2007)

PCT

(10) International Publication Number  
**WO 2007/044558 A2**

(51) International Patent Classification:

G02B 26/08 (2006.01)

(21) International Application Number:

PCT/US2006/039215

(22) International Filing Date: 6 October 2006 (06.10.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/724,858 7 October 2005 (07.10.2005) US

60/818,058 30 June 2006 (30.06.2006) US

(71) Applicant (for all designated States except US): OPS  
SOLUTIONS LLC [US/US]; 49601 Deer Run Drive,  
Northville, Michigan 48167 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): RYZNAR, Paul  
[US/US]; 49601 Deer Run Drive, Northville, Michigan  
48167 (US). RYZNAR, James [US/US]; 11535 Ryznar  
Drive, Belleville, Michigan 48111 (US).

(74) Agent: Van Dyke, Gardner, Linn and Burkhart, LLP  
and its individual attorneys, primarily Karl T. Onder-  
sma; 2851 Charlevoix Drive S.E., Suite 207, P.o. Box  
888695, Grand Rapids, Michigan 49588-8695 (US).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP,  
KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT,  
LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ,  
NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU,  
SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

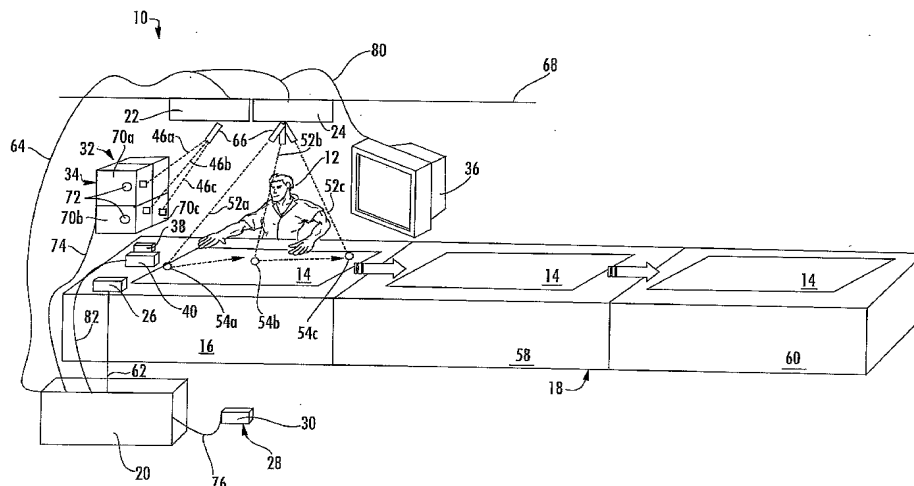
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT,  
RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a  
patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the  
earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: LIGHT GUIDED ASSEMBLY SYSTEM



(57) Abstract: An operational guide system adapted to provide visual indicators to an individual to guide sequential actions includes at least one sensor apparatus, a controller, and at least one directional light device. The sensor apparatus is operable to detect operation information and generate an output indicative of the sensed operation information. The controller receives at least a first input signal indicative of the operation information and selectively provides at least one command signal in response to the first input signal. The at least one directional light device being selectively operable to project and target at least one indicating light in response to the at least one command signal from the controller.

WO 2007/044558 A2



**Published:**

— without international search report and to be republished  
upon receipt of that report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

LIGHT GUIDED ASSEMBLY SYSTEM  
CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims benefit of U.S. provisional application Ser. No. 60/724,858, filed October 7, 2005, and of U.S. provisional application Ser. No. 60/818,058, filed June 30, 2006, which are all hereby incorporated herein by reference in their entireties.

BACKGROUND OF THE INVENTION

[0002] The present invention is directed to a system for guiding an individual in the performance of operational steps, and in particular a system that provides visual indicators to the individual.

[0003] Numerous activities involve the performance of pre-designated operational steps to properly complete a particular task, with some such activities needing to be completed within a specified or standard time allowance. For example, in a manufacturing environment the selection and assembly of components to a work piece must be properly completed to satisfy the specified design criteria of the work piece. Numerous problems arise when such activities are improperly performed either from a workmanship standpoint and/or outside the standard time allowance. In the case of workmanship, if the problem is not discovered prior to shipment of the work piece, a failure in the field may occur that can result in significant warranty costs to the manufacturer. If the problem is discovered prior to shipment, the work piece may have to be scrapped or require re-work operations, both of which add significant and undesirable cost and complexity to the manufacturing operations. In the case of failure to meet a standard time allowance, the entire assembly process may become unbalanced resulting in costly bottlenecks, excess inventory, and additional workmanship risk.

[0004] Several methods of preventing the improper assembly of a work piece exist. One such method is the use of automated machine vision systems that utilize cameras to compare a work piece to the preprogrammed specification of a properly assembled work piece. Automated machine vision systems, however, are expensive and are highly customized such that they are only able to handle a limited assortment of work pieces. Other types of systems may involve human inspection of work piece products. Such systems inherently involve human error such that a higher degree of nonconforming parts may go undetected. Furthermore, when human inspection systems are constructed as

separate “inspection stations” apart from the value added work operations, manufacturing costs are increased by allowing nonconforming work pieces to leave work stations.

[0005] In addition to manufacturing assembly operations, numerous other activities involve human performance of particular tasks that are desired to be performed without omitting any steps. Such activities include, by way of example only, the testing or measuring of various components, packaging products, preparation and production of food and chemical goods, air flight checklist activities, the proper performance of critical safety routines, and multi-person choreographed physical activities,

[0006] Therefore, a cost effective and flexible method of providing guidance to individuals performing tasks is desired whereby the occurrence of missed or improperly performed steps is reduced.

#### SUMMARY OF THE INVENTION

[0007] The present invention provides an operational guide system or assembly guide system adapted to provide visual indicators to an individual to guide sequential actions at a work location. According to one aspect of the present invention, an operational guide system comprises at least one sensor apparatus operable to detect operation information and generate an output indicative of the operation information, a controller receiving at least a first input signal indicative of the operation information and selectively providing at least one command signal in response to the first input signal, and at least one directional light device selectively operable to project and target at least one indicating light in response to the at least one command signal from the control module.

[0008] The at least one indicating light may be provided to an operator performing an assembly action on a work piece at a work station. The at least one indicating light may be projected at the work piece to indicate an operation step location. The operation step location may indicate where a component is to be assembled to the work piece or where an operation step is to be performed by an operator. The operation step may comprise a fastening step, a testing step, or a tool selection step.

[0009] The controller may be adapted to receive at least one confirmation signal indicative of a completion of an assembly action, the at least one confirmation signal being either a manually input signal and an automated input signal. A manual input signal may be transmitted by an operator in response to completion of an assembly action by the operator selectively actuating a foot pedal and a push button. An automated input signal may be transmitted by a machine vision system, a light curtain, or a confirmation sensor.

- [0010] The at least one indicating light may be selectively configurable to form at least one selected from the group consisting of a number, a word, a letter, a shape, a figure, a picture, an animation, or a video.
- [0011] According to another aspect of the present invention, an operational guide system adapted to provide visual indicators to an individual to guide sequential actions comprises, a controller, at least one directional light device, and a controller. The controller adapted to selectively providing at least one command signal in response with the at least one directional light device being selectively operable to project and target at least one indicating light in response to the at least one command signal from the controller. The controller being programmable via at least one program screen displayable on a display device, the at least one program screen including at least one input field for entering and/or selecting indicia regarding sequential actions. The controller being further adapted to display at least one display screen on the display device during operation of the operational guide system, with the display screen being adapted to display indicia regarding sequential actions to be performed.
- [0012] According to another aspect of the present invention, an operational guide system adapted to provide visual indicators to an individual to guide sequential actions comprises, a controller, at least one display device, at least one directional light device, and a controller. The controller adapted to selectively providing at least one command signal in response to the first input signal with the at least one directional light device being selectively operable to project and target at least one indicating light in response to the at least one command signal from the controller. The at least one display device being operable to display information regarding the sequential actions. The information displayed by the display device may include, for example, descriptive text regarding the sequential actions, a listing of sequential actions, animation and/or videos, part drawings. The display device may be configured as a touch screen to enable an operator to interact with the operational guide system via the touch screen.
- [0013] According to another aspect of the present invention, a method for guiding assembly actions by providing visual indicators includes identifying a characteristic of a work piece requiring assembly actions and communicating identification information to a controller in response to the identification of the presence of the work piece. The method further includes communicating a first command signal to at least one directional light device in response to the identification information and selectively projecting at least one indicating light via the directional light device in response to the first command signal.

The method also includes communicating a confirmation signal to the control module upon completion of a first operation step.

[0014] The method for guiding assembly actions may also include displaying at least one display screen on a display device with the display screen being adapted to display indicia regarding sequential actions to be performed.

[0015] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been fully completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part present at a work station provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station. The control module may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable in environments involving, for example, significant employee turnover and/or language and literacy barriers.

[0016] These and other objects, advantages, purposes, and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a perspective view of an operational guide system constructed as an assembly guide system at a work station of an assembly line in accordance with the present invention;

[0018] FIGS. 1A-1L illustrate exemplary images that may be projected by the light sources of the assembly guide system of FIG. 1;

[0019] FIG. 2 is a schematic illustration of the operation of the assembly guide system of FIG. 1;

[0020] FIG. 3 is an illustration of a program screen generated on a display device used to program operational guide system software in accordance with the present invention;

[0021] FIG. 4 is an illustration of an operator display screen generated on a display device of the operational guide system in accordance with the present invention; and

[0022] FIG. 5 is an illustration of the operator display screen of FIG. 4 shown with an additional display image in accordance with the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] The present invention will now be described with reference to the accompanying figures, wherein the numbered elements in the following written description correspond to like-numbered elements in the figures. An operational guide system or assembly guide system 10 is illustrated in FIG. 1 in connection with the providing of visual indicators to an operator 12 performing one or more assembly actions on a work piece 14 at a work station 16 of an assembly line 18. The illustrated assembly guide system 10 includes a controller or a control module 20, two directional light devices 22, 24, a sensor apparatus 26, and a confirmation module or device or element 28, shown as a foot pedal 30. Assembly guide system 10 includes a component location 32, which is illustrated as a parts bin 34, a display device 36, and a tool 38 and tool holder 40.

[0024] Assembly guide system 10 is operable, in response to an operation information or characteristic or identification information associated with work piece 14 detected by sensor apparatus 26, to selectively provide indicating lights 46, 52 to guide an operator in the selection and/or assembly of parts to work piece 14, with the indicating lights 46, 52 being directed and/or provided based on, at least in part, the operation information detected by sensor apparatus 26. The system 10 is also or alternatively operable in response to one or more confirmation signals, such as confirmation signals 48, 56, and/or 84 of FIG.2 that are described below, which may be manually or automatically supplied to control module 20 to verify completion of a particular operation or task. The system 10 is further operable via display device 36 to provide and relay information to operator 12 such as, for example, a listing of steps needing completion, work instructions, images of a work piece, videos, and/or warnings regarding a missed or improperly performed assembly step.

[0025] Referring to FIGS. 1 and 2, when work piece 14 initially enters work station 16, the sensor apparatus 26 detects an operation information or characteristic or identification information associated with the work piece 14, such as, for example, the presence of and/or the type of work piece 14 present at the work station 16. In response to the detection by sensor apparatus 26, a first input signal 42 is communicated or transmitted to the control module 20 and, based on the detected or identified work piece 14 that the operator 12 is or will be working on, the control module 20 communicates or transmits a

command signal 44 (FIG. 2) to directional light device 22 to project an indicating light 46 at a location on parts bin 34 to guide the operator 12 to a part required for a particular step in the assembly action. After the proper part has been selected, a confirmation signal 48 (FIG. 2) is sent to the control module 20, the control module 20 then transmits a command signal 50 (FIG. 2) to directional light device 24 to project indicating light 52 to indicate the operational step location 54 on the work piece 14 where the selected component is to be installed. Upon completion of a particular operation step, the operator 12 actuates the foot pedal 30 to transmit a confirmation signal 56 (FIG. 2) to the control module 20 verifying that the operation step has been completed. The control module 20 may then send another command signal 49, 50 to one of the directional light devices 22, 24 to indicate the next operation step, or may release the work piece 14 to a subsequent work station 58, 60 for further operations if all required pick and assembly steps have been properly completed.

[0026] Assembly guide system 10 is able to provide visual indicators to operator 12 that are specific to a particular work piece 14 such that, for example, multiple different styles or types of work pieces requiring different components or parts may be processed at work station 16 with a significant reduction in the risk of the occurrence of assembly errors. The assembly guide system 10 thus provides a cost effective and accurate method of guiding an operator 12 through a series of tasks and provides confirmation that the tasks have been fully accomplished and completed in the proper order. Furthermore, the ability of the assembly guide system 10 to identify/recognize the presence and/or type of work piece 14 present at the work station 16 provides a flexible system that enables different types or models of work pieces to be processed at a particular work station 16, as well as provide notification to an operator 12 of the presence of the work piece 14 at the work station 16 and thereby improves throughput of the assembly line 18. The control module 20 may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station 16 for system productivity reporting, or the like.

[0027] Assembly guide system 10 is shown in FIG. 1 in connection with work station 16, where work station 16 is part of an assembly line 18 that includes additional work stations 58, 60 for performing subsequent operations. Although not shown, it should be appreciated that additional assembly guide systems could be included at the other work stations of assembly line, or that a single assembly guide system could be used to aid operations at more than one work station. Assembly line 18 may be constructed to

transport work pieces 14 in an automatic fashion, such as by known chain, belt, or roller conveyors, or may require work pieces 14 to be manually moved by sliding rails, rollers, or the like. In addition, depending on the type of work piece and assembly line involved, the work pieces may be supported on a frame, tray, pallet, or the like, or may be supported directly on the assembly line.

[0028] As noted, sensor apparatus 26 functions to detect an operation information or characteristic or identification information associated with work piece 14, such as the presence and/or type of work piece 14 located at the work station 16, and may be constructed as one or more of a number of known sensors such as, for example, a proximity switch, light curtain, photo eye, radio frequency identifier device, bar code reader, or the like. When constructed as a radio frequency identifier device or bar code reader, a readable tag or bar code may be placed on either the work piece or the structure upon which the work piece is supported while traveling on the assembly line. The tag or bar code may contain information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. A scanner or reader may be mounted to the assembly line, such as to framework of the assembly line, with the scanner being able to read the information from the tag or bar code when the work piece enters the work station. Alternatively, a sensor apparatus may comprise a vision system configured to detect an identifiable characteristic or identification information associated with a work piece. It should be appreciated, however, that operational guide system 10 may be activated or sequentially stepped to subsequent operations by non-automated signals. For example, an operator may manually enter a part type into the system, depress a palm button, press a touch screen, or simply commence operations or pre-operations on a part.

[0029] It should be appreciated, however, that the type of part present at a particular work station need not be determined using a bar code or radio frequency system. For example, and as is known in the art, standard binary type sensors may be used to detect geometrically distinguishing features of a work piece or the structure upon which it is located to "identify" the work piece. Alternatively, the sensor apparatus could include multiple components whereby one component would detect the presence of a work piece and another could detect the type of work piece. Still further, an assembly guide system could be constructed in accordance with the present invention where an operator uses a hand held scanner to scan a bar code label affixed to the work piece or the structure supporting the work piece as opposed to the scanner being mounted directly to the

assembly line. The sensor apparatus may also be used to detect the relative orientation of a work piece with respect to the work station, with the control module adapted to receive the positional information and provide accordingly adjusted command signals to the directional light devices such that the projected indicating lights accurately impinge on the desired operational step locations. Still further, the presence of a part at a workstation may be supplied to the operational guide system by a manual operator activated input signal, such as by a touch screen, a palm button, or the like.

[0030] Control module 20, in the illustrated embodiment, is a computer controller device and as indicated is adapted to receive and send various signals to monitor and guide the assembly actions at work station 16. Control module 20 may be constructed as a desktop or laptop style PC, a PLC, or the like, or may be a networked computer system that may be used to control and monitor other aspects of the assembly line and work stations. It should be understood, however, that the control module may alternatively comprise a combination of interacting computer devices and still function as intended within the scope of the present invention. For example, a local computer device present at a particular work station may be adapted to receive and provide communication information with a network computer system associated with an assembly line, or other linked computer system.

[0031] As previously indicated, control module 20 is adapted to receive a first input signal 42 regarding identification information of the work piece present at the work station. In the illustrated embodiment of FIG. 1, the first input signal 42 is transmitted to the control module 20 directly from the sensor apparatus 26 along communication link 62, where link 62 is a computer cable, fiber optic line, or the like. Alternatively, however, a first input signal may be transmitted to a network computer system and, in response to the first input signal, the network system may provide the control module with the identification information regarding the work piece present at the work station. The identification information, as previously indicated, may simply indicate the presence of a part at the work station and/or may include information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. Optionally, a sensor apparatus and control module may be alternatively constructed to wirelessly transmit and receive identification information such as the type, location, dimensions, or the like, of the work piece present at the work station without a link 62, such as via RF, IR, etc. communication.

[0032] In response to the first input signal 42 received, the control module 20 outputs command signals 44, 50 to directional light devices 22, 24 along link 64 to provide visual indicators to the operator, as described in more detail below, with the command signals 44, 50 being communicated based on, at least in part, the first input signal 42. In the illustrated embodiment, two substantially similar directional light devices 22, 24 are provided at work station 16 and are responsive to the command signals 44, 50 of the control module 20. Directional light device 22 is used to project indicating lights 46 at the component location 32, while the other directional light device 24 is used to project indicating lights 52 at operational step locations 54 on work piece 14. Each directional light device 22, 24 includes a light source 66 for projecting indicating lights 46, 52, with the directional light devices 22, 24 constructed such that the indicating lights 46, 52 may be selectively and movably positionable to direct the indicating light 46, 52 at pre-targeted locations. The light sources 66 may also be constructed to provide an indicating light beam of selectively adjustable brightness to compensate for ambient surroundings and/or the distance from the light source to the selected impingement point. Although light sources 66 are illustrated in FIG. 1 as projecting a single indicating light beam, it should also be appreciated that light sources 66 may be constructed to simultaneously project two or more beams such that, for example, multiple parts may be indicated for selection from location 32 by the operator 12 or multiple assembly locations may be indicated. For example, a single light device may include a light source configured to simultaneously project two or more indicating lights, which indicating lights, for example, may be for part selection and assembly guidance for different operation stations, or may be for part selection and assembly animation at a single operation station.

[0033] In the illustrated embodiment, light sources 66 are constructed as laser light sources that are able to project a focused, coherent beam of light at a desired location. Laser light sources may preferably be class 3 or lower lasers for employment within a visual setting for operators. A directional light device utilizing such a laser light source capable of producing variously configured and targeted indicating lights is available, for example, from Laser Compliance in Utah, while Phoenix Contact GmbH & Co. KG of Blomberg, Germany, for example, may be the supplier of all interface Input/Output Control between the shop floor and an operational guide system. Alternatively, light sources other than lasers may be used and still function as intended without affecting the scope of the present invention, such as incandescent lights, light emitting diodes (LEDs), or the like. Alternatively, a light source may be constructed as a Digital Light Processing

(DLP ®) projector, such as an industrial grade DLP ® projector able to project signals of sufficiently high-lumens to be visible by an operator. Still further, a light source may be constructed as a liquid-crystal display (LCD) projector or an LED projector, or other form of high intensity light emitting device. It should also be understood that in embodiments incorporating more than one light source alternative types of light sources, such as laser, DLP ®, and/or LCD, may be simultaneously and/or alternatively employed together.

[0034] In the illustrated embodiment, directional light devices 22, 24 are mounted to a mounting structure 68 to retain the directional light devices 22, 24 in a pre-determined and positively located orientation relative to the work station 16. The mounting structure 68 may comprise framework of the work station 16 or assembly line 18, or may be a structural element of the building, such as the roof or a wall, or may even be a separate stand, post, or pole.

[0035] Directional light devices 22, 24 may use controllable servo motors for movably positioning light sources 66 to selectively direct the indicating light 46, 52 in response to the command signal 44, 50 transmitted by the control module 20. Alternatively, directional light devices 22, 24 may include optical manipulation devices, such as adjustable mirrors, that function to selectively and movably position the projected indicating lights 46, 52 at the desired locations. Still further, alternative directional light devices may employ robotics to selectively position the light sources, with the robotics comprising robotic gantry or XYZ type arms, or the like. Alternatively, light devices may themselves be mounted to a robotic gantry or arm, or the like, for movably positioning the projected indicating lights.

[0036] Light sources 66 may be constructed such that they produce light of differing color from each other to provide further visual cues to the operator 12 while working at work station 16. For example, as illustrated in FIG. 1 the indicating light 46 produced by light source 66 of directional light device 22 may be used to project light at component location 32 and may be of a first color, and the indicating light 52 produced by light source 66 of directional light device 24 may be used to project light at operational step locations 54 on work piece 14 and be of a second color. In such an embodiment, the differing colors serve as a further visual indicator or cue to the operator 12 with one color representing part selection and the other color representing the location where the selected part is to be assembled. It should also be appreciated, however, that each light source 66 may project multiple different colors, such as green, red, yellow, and/or blue. Furthermore, light sources may be adapted to project animated images or videos onto a surface, such as a

surface of the work piece 14, assembly line 18, or a work station 16, 58, 60. The projected animated images or videos may be, for example, a training video, and may be in a .mpeg, .wmv, or other such file format provided by or stored in, for example, a control module of an operational guide system.

[0037] Referring to FIGS. 1A-1L, the directional light devices 22, 24 may also include known optical effect devices for fanning or adapting or configuring the projected indicating lights 46, 52 produced by the light sources 66 into a desired shape, pattern, or form at the point or location at which the indicating light 46, 52 impinges the component location 32 or operational step location 54. For example, the indicating light may initially be projected as a geometric shape (FIGS. 1J-1L), such as a circle, about a particular location to quickly attract the operator's attention, and then focus to a point or circle of smaller diameter at the specific location. The indicating light may also be projected to produce alpha numeric characters, such as shown in FIGS. 1A-1I, blink, and/or produce rotating images. For example, sequential numbers may be projected where each number indicates a step in the assembly action being preformed by the operator at the work station, or part numbers or textual information may be projected to provide written guidance to the operator. The indicating lights may also be projected at an initially higher intensity level to attract the attention of an operator, with the intensity level being subsequently reduced after a brief period. Indicating lights projected by light sources, as described in more detail below, may further be configured to display videos or pictures or animation on the surface upon which the indicating light impinges.

[0038] As previously noted, indicating lights 46, 52 may be projected at component location 32 or at operation step locations 54 associated with work piece 14. Component location 32 is exemplified as a parts bin 34 having multiple storage locations 70 for holding various parts required in the assembly of work pieces 14. As shown, directional light device 22 is functional to selectively project an indicating light 46 at discrete storage locations 70 of parts bin 34 in response to command signal 44 to prompt the operator 12 regarding part selection. Although not shown, storage locations 70 of parts bin 34 may include luminescent tape, paint, reflectors, Radio Frequency Identification tags (RFID) ,or the like, onto which an indicating signal is directed for providing further contrasts or visual prompts to an operator.

[0039] RFID tags, or the like, may also be used to supply information to the control module 20. For example, an RFID tag located on a parts bin 34 may be used in connection with assembly guide system 10 for monitoring the presence and/or proper

location of the parts bin 34. In the event assembly guide system 10 detected, such as by control module 20, the absence of parts bin 34 an error message could be, for example, displayed by display device 36, or projected by a light device 22, 24, or an audible warning message may be broadcast.

[0040] In the illustrated embodiment of FIG. 1, storage locations 70 of parts bin 34 include detection devices 72 that are intended to detect or sense when a component has been withdrawn from a particular storage location 70. Detection devices 72 may be of known construction and are selected based on a particular application, taking into consideration the types or models of work pieces 14 and parts to be assembled. Detection devices 72, for example, may comprise light curtains, proximity sensors, electronic mats, such as pressure sensitive mats, machine vision systems, or the like.

[0041] The detection devices 72 are operable to transmit a confirmation signal 48 to the control module 20 along link 74 upon selection by the operator 12 of a part from a particular storage location 70, with control module 20 being functional to determine whether or not the operator 12 has selected the correct part as prompted. In response to the confirmation signal 48, if the operator 12 selected the proper part as directed by the indicating light 46, control module 20 may terminate the indicating light 46 projecting from directional light device 22 at the storage location 70 and transmit a subsequent command signal 50 to directional light device 24 to project an indicating light 52 to the operational step location 54 on the work piece 14 where the just selected part is to be assembled. However, if control module 20 determines that an incorrect part has been selected as compared to what should have been selected as prompted by the indicating light 46, control module 20 will not provide the subsequent command signal 50. In addition, control module 20 may be constructed to provide a visual or audible signal to the operator 12 when an improper part has been selected from a storage location 70. For example, although not illustrated, control module may prompt a visible alert, such as a red warning light mounted in the vicinity of the operator, to activate or illuminate, or may cause an audible alert, such as a warning alarm or buzzer to sound. Still further, an error message may be displayed by display device 36 or projected by a light device 22, 24. For example, the word "error" may be projected by a light device 22, 24 onto a surface of assembly line 18, or a work station 16, 58, 60.

[0042] Although not illustrated, the parts bin may additionally employ a known pick-to-light system whereby each storage location includes an illumination device, such as an LED light or the like, that lights up to prompt the operator as to the proper storage location

from where a part is to be selected. When the assembly guide system of the present invention includes such a pick-to-light system, the directional light device 24 used to project an indicating light 46 at a component location 32 may optionally be excluded.

[0043] As noted above, assembly guide system 10 includes confirmation module 28, which in the illustrated embodiment is a foot pedal 30. Confirmation module 28 is constructed to transmit a confirmation signal 56 along link 76 to control module 20 to signal that the operational step indicated by directional light device 22 or 24 has been completed. To transmit the confirmation signal 56, operator 12 simply depresses foot pedal 30 upon completion of the directed activity. The confirmation signal 56 transmitted by foot pedal 30 then triggers control module 20 to selectively transmit another command signal 44, 50 to provide guidance to the operator 12 regarding the subsequent operational step that must be taken by the operator 12 at the work station 16 in accordance with work piece 14. For example, the assembly guide system 10 may cause an indicating light 46 to be projected at a storage location 70 for the next required part. Alternatively, the control module 20 may provide a command signal that releases the work piece to the next work station 58 if all of the operational steps at the current work station 16 have been completed.

[0044] Although illustrated as a foot pedal 30, it should be understood that numerous alternative confirmation modules 28 may be utilized and still function as intended within the scope of the present invention. For example, confirmation module 28 may be constructed as a pressure sensitive mat, push button, toggle switch, palm button, light curtain, touch screen, touch pad, or the like, which is constructed to be depressed, switched, or otherwise activated by a manual action of the operator 12. A sound activated signal may alternatively be employed, such as a voice command, to provide a confirmation signal. Confirmation module 28 may also be constructed as a wireless transmitter, such as a transmitter that an operator may carry by affixing to his or her belt, or the like, thereby eliminating the need for a physical link. Further, operational guide system may be adapted to receive and/or respond to other confirmation signals and/or sources as additional technologies become available such as, for example, the potential future computer technology of reading an operator's mind.

[0045] Still further, a confirmation module or device or element may be constructed to automatically detect when an operator has completed an assembly step. For example, a confirmation module may be constructed as a vision system that is able to detect the presence or absence of a component at a location, such as by processing an image captured

by a pixilated imaging device, as is known in the art. Alternatively, for example, the confirmation module may be constructed as a proximity sensor, photo eye, light curtain, or the like, constructed to automatically detect the presence or absence of a part upon assembly to the work piece. Still further, a confirmation signal may be transmitted by an automated tool or measuring device, such as a weight scale or other type of measuring device, as described in more detail below. In which case, the automated tool or measuring device may function as a confirmation module. An indicating light projected by a light source of an operational guide system may also be used to provide a confirmation signal where, for example, a sensor is employed at the light source or elsewhere on the operational guide system to detect the reflection of an indicating light from a part or component that requires verification. Still further, the indicating lights projected by the light sources of an operational guide system may be used in connection with a light detecting sensor to detect, for example, a part height or other part feature. The light sources may also be used as a "light curtain" by being projected at a particular location or parts bin, or the like, with a sensor adapted to detect that an operator has properly selected from that location.

[0046] It should also be appreciated that an operation information could be transmitted to the controller 20 from a remote signal. For example, in the case of a part kitting operation, an order request may be transmitted to a work station from a central processing location, such as a computer system or the like, and transmit a signal to the work station regarding, for example, what parts to gather and/or assemble. In which case, the work piece of the operation may comprise a collection of parts assembled into a parts holder. A work piece may also comprise a food or drug item to which ingredients, components, or portions are added. Similarly, the transmission of an order request may also generate an assembly operation, such as in the case of, for example, custom assembled goods, such as a personal computer or laptop computer.

[0047] Although not illustrated, an assembly guide system may also incorporate known ultrasonic technology used to confirm, for example, that a tool is placed onto the proper bolt or nut at an assembly operation. Such ultrasonic technology is configured to send and receive ultrasonic frequencies with the spatial location of a sent or received signal being monitored to confirm that an operation is performed at a proper location. Thus, an assembly guide system may be configured to utilize both light sources and ultrasonic projection technology to guide and confirm assembly.

[0048] Assembly guide system 10 also includes a display device 36 that is able to receive display signals 78 (FIG. 2) along link 80 (FIG. 1) from control module 20 and to relay information to the operator 12. Display device 36 may be constructed as a television, LCD, LED device, or other type of viewable display mechanism. Display device 36 may be used to present information to the operator 12 such as, for example, the sequential steps needing to be performed, work instructions associated with the work station 16, images of a work piece 14 properly affixed with the part that is to be assembled, information regarding a missed or improperly performed assembly step, or the like. In the case of sequential steps, display device 36 may be configured to highlight the current step under consideration and/or provide an indication that previous steps have been completed. The display device 36 may be constructed as a touch screen device adapted to be depressed by an operator to provide a confirmation signal regarding completion of a particular step. The inclusion of such a touch screen device may also provide the ability to prompt or guide an operator through certain operational or assembly steps that do not require guidance via indicating light signals. The display device may also be used to show or provide instructional videos, display running cycle times, desired cycle times, and/or alerts, or the like. In the case of a touch screen, the touching by an operator of a particular location or tab area of the screen may display of a video or an image on the display screen, or another display screen, or may initiate the projection of an indicating light or video. It should be understood, however, that an assembly guide system may be constructed without a display device and still function as intended within the scope of the present invention.

[0049] Although not shown, one or more additional display devices may also be included with an operational guide system of the present invention. For example, a first display device may be used to display sequential operational steps, such as steps completed, the current step needing to be performed, and subsequent yet to be performed steps with the second display device used to display work instructions and/or a blueprint of the assembly. In such an embodiment, the displayed blueprint may be sequentially highlighted to indicate the particular component or feature associated with the sequential operational steps.

[0050] Optionally, assembly guide system 10 may be used in connection with a tool 38 and a tool holder 40. Tool 38 may comprise, for example, a manual tool such as a wrench, torque wrench, pliers, screwdriver, or the like, or may be an automated tool such as an electric screwdriver, air gun, electric torque wrench, or the like. Tool 38 may otherwise be

a manual or automated measuring device such as calipers, a gauge block, feeler gauges, air gauge device, or the like. Tool holder 40 is intended to provide a storage location for tool 38 when tool 38 is not in use. Directional light devices 22, 24 may project an indicating light onto tool 38 and/or tool holder 40 in response to a command signal when tool 38 is required to complete a pending operational step, such as in a similar manner as described above with respect to storage locations 70 of parts bin 34 and operation step locations 54 on work piece 14. Tool holder 40 may include a sensor and thereby be integrated with the assembly guide system 10 to detect when tool 38 is positioned within or removed from tool holder 40, where the sensor may be a photo eye, proximity switch, light curtain, or the like. In such an embodiment, as illustrated, tool holder 40 may be in communication with control module through link 82 (FIG. 1) such that a confirmation signal 84 (FIG. 2) may be transmitted from tool holder 40 to control module 20 to indicate that operator 12 has properly selected the tool 38 as prompted.

[0051] Although not illustrated, the assembly guide system may utilize an automated gauge or tool that is electrically linked to control module such that control module is able to monitor both the use of the tool as well as an operational parameter associated with the tool, without affecting the scope of the present invention. For example, if a tool is constructed as a torque wrench, the control module may be constructed to monitor the fastening torque obtained by the torque wrench and to compare the value to a preprogrammed or predetermined or threshold value prior to transmitting a subsequent command signal. The control thus may function to transmit the subsequent command signal only after the desired or appropriate torque has been applied by the torque wrench. Similarly, if the tool is constructed as a measuring device, such as digital calipers, control module may be constructed to receive a measurement value, and may compare the measurement value to a threshold measurement value, and may communicate or transmit the subsequent command signal when the measurement value is at or near the threshold measurement value.

[0052] It should also be appreciated that a tool holder may be alternatively constructed as a holding device adapted to receive a marking device or a container of adhesive, lubricant, cleaner, or other holder of other suitable or useful elements or devices or materials, or the like that may be used in the process steps at a work station.

[0053] Control module 20 is illustrated as transmitting command signal 44a to directional light device 22, which in response to command signal 44a, projects indicating light 46a on storage location 70a of parts bin 34. Upon receiving confirmation signal 48a from

detection device 72 signifying that the proper part was selected, control module 20 then terminates projection of indicating light 46a and transmits command signal 50a to directional light device 24 such that indicating light 52a is projected on operational step location 54a on work piece 14 to direct operator 12 as to the proper assembly point for the selected part. Operator 12 then activates foot pedal 30 (or other confirmation device), which transmits confirmation signal 56a to control module 20 and the above process is repeated for indicating lights 46b, 52b, 46c, 52c, storage locations 70b, 70c, and operational step locations 54b, 54c.

[0054] As described in more detail below, the control module 20 and directional light devices 22, 24 of the assembly guide system 10 are programmed as to the proper spatial positioning to where an indicating light 46, 52 is to be projected. This teaching of the assembly guide system 10 may be accomplished in various ways. For example, one teaching method involves the use of known pendant device technology, where the pendant device is used to position the projected beam of the light source 66 to a proper location, such as a storage location 70, record the coordinates, and then move to the next location, such as onto the work piece 14. Control module may also be adapted to employ voice activated programming. Alternatively, a wireless transmitter may be used that may be positioned at a desired impingement point of the projected indicating light 46, 52 and functional to transmit the spatial positioning information to the control module. Similarly, various locations, such as part bins, may be provided with wireless transmitters, such as RFID tags, with the control module being adapted to detect the signal and direct the indicating lights accordingly, in which case the operational guide system is able to compensate for movement or shifting of the desired impingement points of the indicating lights. Still further, control module 20 may be directly programmed and, for example, may utilize a touch screen having an image of the work station with the control module 20 being programmable using the touch screen. An operational guide system may also alternatively be programmed via a computer, such as desktop or laptop or networked computer, without the above noted peripheral equipment. The operational guide system may also employ an alignment test pattern that may be used to “calibrate” the system, such as at the beginning of a shift, to insure that the various indicating light signals are properly aimed.

[0055] The operational programming and use of an operational guide system will now be described with reference to FIGS. 3-5. FIG. 3 illustrates a program screen 100 that may be displayed or generated on a display device by a control module, such as display device 36

and control module 20. Program screen 100 includes various fields 102, 104, 106, 108 for entering descriptive text regarding an operational step, for selecting a type of display graphic or visual display feature ("VDF") and characteristics for the VDF to be exhibited by an indicating light, such as indicating light 46 or 52, and for programming the location at which an indicating light VDF will be directed via the control module.

[0056] The VDF description field 102 enables the operational guide system to be sequentially programmed with progressive operational steps, each of which may include certain selectively input descriptive text. For example, an operational step number may be selected from the scroll down number sub-field 110 with descriptive text being assigned to that operational step number by being entered or typed in VDF description sub-field 112, such as by a keyboard (not shown). VDF description field 102 further includes various commands 114, such as "Insert", "Copy", "Paste", "Promote", and "Demote" for accepting a particular operational step number and corresponding text, and for propagating or copying additional operational steps.

[0057] The VDF graphic selection field 104 enables various sub-steps or layers and graphics to be selected and programmed corresponding to a single operational step detailed in the VDF description field 102 noted above. For example, a single operational step detailed in the VDF description field may be specified as "Mount manifold." In order to accomplish this step, an operator may be required to perform various sequential sub-steps or layers, such as, for example, selecting a bolt, inserting the bolt through a hole in the manifold, selecting a washer, mounting the washer to the bolt, selecting a nut, and mounting and tightening the nut to the bolt. These various sub-steps may be selected and programmed in the VDF graphic selection field 104.

[0058] The VDF graphic selection field 104 includes a VDF layer sub-field 116 and a VDF graphic selection sub-field 118. In the illustrated embodiment, the VDF layer sub-field comprises a drop down menu enabling up to fifteen layers or sub-steps to be associated with a single operational step. Descriptive text regarding the sub-step, such as "Select Bolt," may be input within the VDF layer sub-field 116. The VDF graphic selection sub-field 118 enables a pre-programmed image, video, blueprint, or the like, to be selectively associated with the sub-step entered in the VDF layer sub-field 116. In the illustrated embodiment, VDF graphic selection sub-field 118 is a drop down menu enabling selection of pre-programmed images such as, for example, arrows, various geometric shapes, such as circles, triangles, squares, and the like.

[0059] The VDF location field 106 is used to program the location at which the graphic associated with a particular operational step and/or sub-step is to be projected by a light device, such as directional light devices 22 or 24. In the illustrated embodiment, the VDF location field 106 includes an initial or rough location sub-field 120 and a secondary or fine tune location sub-field 122. While in the programming mode, the graphic may be constantly displayed to enable the graphic to be appropriately positioned. The initial location sub-field 120 enables the position of the projected graphic to be positioned via a cursor 124 moveable by a mouse device (not shown). Clicking on the cursor 124 and dragging the cursor within the display field 126 correspondingly causes the directional light device to move and position the graphic. A touch screen device may alternatively allow a cursor to be moved via a user's finger. Upon obtaining a location for the projected graphic using the initial location sub-field 120, the secondary location sub-field 122 may be used to further locate the graphic if required. The secondary location sub-field 122 includes first and second axis slider bars 128, 130 for moving the graphic in first and second axis. The secondary location sub-field 122 further includes slider bars 132, 133 for altering the scale of the first and second axis, which act as a multiplier or reducer to the movement of the graphic by a light device via the first and second axis slider bars 128, 130. The secondary location sub-field 122 also includes a third axis rotation slider bar 134 that is used to rotate the displayed graphic, such as a directional arrow or written text, such that the graphic is displayed in an appropriate manner, such as pointing at a particular part or feature or displayed such that it is readable from left-to-right.

[0060] The VDF feature field 108 is used to provide further customization to the displayed graphic. A drop down color menu 136 is provided to alter the displayed color of the graphic and a brightness slider bar 138 is provided for adjusting the intensity of the displayed image. Various further selectable feature display options 140 may also be provided such as, for example, a blinking display option used to cause the graphic to flash, and rotational display options to cause the graphic to rotate in either a clockwise or counter-clockwise fashion. It should be appreciated that various additional selectable graphic customization options may be provided within the scope of the present invention.

[0061] Referring now to FIGS. 4 and 5, operator display screens 142 generated on a display device, such as display device 36, are illustrated that may be displayed while operating the operational guide system in a "run" mode. Display screen 142 discloses a header field 144 listing the particular operational step that is to be or is being performed. Display screen 142 also includes an operational step listing field 146 that may provide a

list of the various operational steps that are to be performed at, for example, a particular assembly station. In use, the first operational step to be performed is displayed within the header field 144 and the operator is then guided through the various sub-steps associated with that operational step. Confirmation signals are provided upon completion of each sub-step either manually by the operator or automatically via other means described above. Upon completion of all sub-steps associated with an operational step, the next operational step to be performed is displayed in the header field.

[0062] It should be appreciated that alternatively configured programming interfaces provided by, for example, a programming software for an operational guide system may be employed to enter and propagate commands into the system. For example, although description field 102, graphic selection field 104, location field 106, and feature field 108 are all simultaneously disclosed on program screen 100, it should be appreciated that an alternative software, for example, may incorporate separate programming screens for each of a description field, graphic selection field, location field, and a feature field. Further, the various attributes or elements of such fields, such as the above noted sub-fields, sub-steps, and/or slider bars, may also be incorporated on separate screens or pop-up screens. Furthermore, fields or screens may be provided for browsing or scrolling to link or associate an image, blueprint, video, or the like, with a particular step. Still further, such a programming interface may be provided in the form of a “programming wizard” configured to sequentially guide a programmer through the entering and propagating of commands into the system.

[0063] Display screen also includes cycle time monitoring display fields 148a and 148b which may be used to display to an operator the running time associated with performance of an operational step, previous running times, average running times, and/or target times for completion of the operational steps. For example, cycle time monitoring display field 148a may show the cycle time to perform one or more previous or completed operational steps, while cycle time monitoring display field 148b may show the cycle time of the preceding and current operational step. A cycle time measurement may, for example, be initiated upon receipt of a first input signal 42 from sensor apparatus 26, and completed upon detection of a confirmation signal 48, 56, 84. Display screen 142 also includes a manual confirmation button 150 that may be used to provide a confirmation signal to a control module. Display screen may be constructed as a conventional touch screen to enable the operator to physically touch the confirmation button, as with a finger, and/or may be “clicked” via a mouse, in which case display screen may alternatively be a

conventional monitor. Display screen may also include a back button 152 to enable an operator to repeat or check steps associated with prior operational steps.

[0064] FIG. 5 illustrates display screen 142 with an additional display window 154 that may be displayed to provide additional guidance or direction to an operator for a particular operational step. In the illustrated embodiment, window 154 is displaying work instructions pertaining to the operational step being performed. Although not shown, window 154 may also color code or provide animation to the display. Display window 154 may be caused to automatically appear on display screen 142 upon reaching the associated operational step or may be selectively displayed by an operator as needed.

[0065] As previously noted, control module 20 may also be used to monitor and record various parameters useful for improving productivity. For example, control module 20 may record cycle times of the individual operational steps at a work station 16 and/or the combined cycle time of operations at a work station 16. Such information is beneficial for balancing cycle times on the assembly line 18 to provide even work flow and for monitoring operator performance. The control module 20 may also be used to monitor and record the duration of time between a work piece 14 exiting a work station 16 and the next work piece entering the work station 16, which is useful for calculating the downtime of a given work station to focus efforts on upstream operations. In addition, the control module 20 may be used to monitor and record the duration of time a work piece is not able to exit a work station upon completion of all assembly actions at a particular work station due to a blocked or slower downstream operation. Further, an operator may be required to sign-on and sign-off at the start and end of his or her shift such that performance tracking to individual operators may be obtained. Correspondingly, control module 20, or another such computational device, may record and provide charts or reports regarding recorded error data, such as on mis-performed steps, and/or cycle times. In addition, such data may be linked or otherwise networked, or even monitored via the internet, such that the variously above noted cycle times or performance parameters may be monitored from a remote computer, with such data being viewable in a live format or archived. The above noted information being a useful tool to supervisors, process engineers, and/or operational managers in identifying and continuously improving production operations.

[0066] Although not shown, it should also be appreciated that the operational guide system may be adapted to additionally provide audio guidance and/or instruction, such as voice or sound type instruction. For example, an operational guide system may be adapted to enable the entering or programming of verbal instructions that are output by the

operational guide system, such as to a speaker or headphones worn by an operator. Such audio guidance may be programmed to the control module, for example, as part of the layered programming discussed above in regard to the VDF graphic selection field 104, where audio output commands may be supplied or programmed to the system via a microphone, or the like, or may alternatively include selectable preprogrammed audible commands that may be associated with a sub-step.

[0067] It should be appreciated that numerous alternative structures and methods are contemplated within the scope of the operational guide system of the present invention. For example, an operational guide system need only utilize a single directional light device for projecting indicating lights at both a component location as well as operational step locations on a work piece. An operational guide system also need not employ a component location, but rather may employ one or more tools with directional light devices functioning to project indicating lights at the various tools. Furthermore, it should also be appreciated that the assembly guide system 10 of FIGS. 1 and 2 may be alternatively constructed whereby the various links are not formed by computer cables or the like, but are rather formed as wireless connections between the various devices. Still further, each assembly step need not involve both the selection of a part and the assembly of the part to a work piece.

[0068] Operational guide systems may also be incorporated into assembly line systems with the guide systems simultaneously moving along with the item or device being assembled or constructed on the assembly line. For example, an operational guide system may be affixed to a moving assembly line or a fixture used in association with such an assembly line, such as an automotive vehicle assembly line. In such case, the operational guide system may be employed to prompt or aid the progression of numerous operational assembly or qualification steps.

[0069] It should also be appreciated that the operational guide system of the present invention may be configured for use with a stand alone work station as opposed to a work station integrated into an assembly line as shown in FIG. 1. For example, an operational guide system may be constructed as a stand alone testing or gauging station using multiple tools formed as testing devices, such as air leak testers or the like, or gauges that are used to evaluate one or more characteristics, parameters, or dimensions of a work piece. A stand alone operational guide system may also be used as a training station, such as for new employees or to aid in the introduction of a new part or assembly step. An operational guide system training station may also be used for physical rehabilitation or

job training programs. Still further, an operational guide system may be constructed as a standalone station or cart that may be docked or aligned with a particular operational step, such as on an assembly line, for use at only limited times in conjunction with the operational step. In such an embodiment, for example, the operational guide system may include sensors, or the like, for identifying or detecting the particular station to which the guide system is adjacently positioned. The operational guide system may, thus, be mobile such that it may be moved and/or re-positioned for use with other assembly operations, components, and/or at other locations.

[0070] Although the operational guide system of the present invention is discussed above in regard to assembly operations and testing operations, it should also be appreciated that numerous alternative uses and/or configurations of the operational guide system of the present invention exist. For example, an operational guide system may be used to pick and package products into a shipping container, such as a bag or box, for fulfilling an order, such as part kitting at order fulfillment centers, supermarkets, part bin loading, or the like. In such an embodiment, the shipping container may be associated with a bar code order number that would provide information to the control module as to the particular products needed for filling the order. Alternatively, a signal may be supplied, such as from a remote order input or collection computer, to a control module for directing assembly of a component or parts. In such an embodiment, the order input or collection computer may comprise a sensor apparatus and the assemblage of parts or components may comprise a work piece, even if initially no components are assembled or collected to define or form a work piece. The operational guide system may also be used in a food production or preparation process in which, for example, the indicating lights may be projected onto sequentially required ingredients and may be timed depending upon when a particular ingredient is to be added. In like manner to a food production or preparation process, the operational guide system may also be configured for use in the production of non-edible chemical compositions such as welding fluxes, salves, creams, ointments, soaps, shampoos, drugs, and the like. It is envisioned that the guide system of the present invention may be suitable for other applications involving a step-by-step process by a human operator. The operational guide system may also be used in alternative environments, such as underwater for training astronauts, Navy Seals, underwater fabricators, and the like, or may even be used in outer space as a guided instructional tool inside or outside a space shuttle and/or space station.

[0071] Still further, the operational guide system of the present invention may be used in connection with the cockpit of an airplane as a pilot checklist, with the control module adapted to receive, for example, information regarding the type of plane, duration of flight, and/or weather conditions. The operational guide system of the present invention may also be used in connection with multi-person choreographed activities, such as football plays, automobile racing pit stops, marching band numbers, and dance routines. Regarding football plays, for example, the control module may be programmed to direct multiple plays and adapted to receive information regarding a particular defense. Regarding automobile racing pit stops, for example, the control module may be adapted to receive information regarding the amount of fuel remaining in the race car, the number of laps left in the race, and/or the number of laps run using a particular set of tires. The operational guide system of the present invention may also be incorporated with a global positioning satellite (GPS) system adapted to provide positioning information to the control module whereby command signals may be output such that the directional light devices provide geographical location direction guidance. Such a GPS incorporated operational guide system may be beneficial, for example, in guiding military operations. Still further, the operational guide system may include ultrasonic positioning technology, or other such positioning technology, to enable directional guidance and/or position monitoring capabilities.

[0072] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part or item or article present at a work station and to adapt or modify a command output based on the type or position of the part provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station and thereby improves throughput of the assembly line. The control module may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable

in environments involving, for example, significant employee turnover and/or language and literacy barriers.

[0073] Changes and modifications in the specifically described embodiments can be carried out without departing from the principles of the present invention which is intended to be limited only by the scope of the appended claims, as interpreted according to the principles of patent law including the doctrine of equivalents.

## CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An operational guide system adapted to provide visual indicators to an individual to guide sequential actions, said operational guide system comprising:
  - at least one sensor apparatus, said at least one sensor apparatus operable to detect operation information and generate an output indicative of said operation information;
  - a controller, said controller receiving at least a first input signal indicative of said operation information and selectively providing at least one command signal in response to said first input signal; and
  - at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller.
2. The operational guide system of claim 1, wherein said at least one indicating light is provided to an operator performing an assembly action at a work station.
3. The assembly guide system of claim 2, wherein said at least one indicating light is projected at a component location, said component location retaining a part required for assembly at said work station.
4. The assembly guide system of claim 2, wherein said operation information comprises identification of a presence of a work piece at said work station.
5. The assembly guide system of claim 4, wherein said operation information comprises identification of a type of the work piece at said work station, and wherein said at least one command signal is selectively provided depending on the type of the work piece identified.
6. The assembly guide system of claim 2, wherein said at least one indicating light is projected at a work piece to indicate an operation step location.

7. The assembly guide system of claims 1 or 2, wherein said controller is adapted to receive at least one confirmation signal indicative of a completion of an assembly action, said at least one confirmation signal comprising at least one signal selected from the group consisting of a manually input signal and an automated input signal.
8. The assembly guide system of claims 1 or 2, wherein said at least one indicating light is produced by at least one high intensity light emitting device selected from the group consisting of a laser projector, a digital light projector, and a liquid-crystal display.
9. The assembly guide system of claims 1 or 2, further including a display device, and wherein said controller is programmable via at least one program screen displayable on said display device, said at least one program screen configured to include at least one input field for entering and/or selecting indicia regarding sequential actions;  
said controller being further configured to display at least one display screen on said display device during operation of said operational guide system, said display screen being adapted to display indicia regarding sequential actions to be performed.
10. The assembly guide system of claim 9, wherein said at least one input field comprises at least one selected from the group consisting of a description field, a graphic field, and a location field, and wherein said description field is configured to enable programming of descriptive text associated with sequential actions, said graphic selection field is configured to enable programming of an image formed by said at least one indicating light, and said location field is configured to enable programming of the location at which said at least one directional light device projects said at least one indicating light.
11. The assembly guide system of claims 1 or 2, wherein said controller is configured to monitor operational information associated with sequential actions.
12. The assembly guide system of claim 11, said operational information including at least one selected from the group consisting of a cycle time, an incorrectly performed action, a time between sequential actions, and an operator identification.
13. The assembly guide system of claim 1 or 2, further including a display device, said display device being operable to display information regarding sequential actions.

14. A method for guiding assembly actions by providing visual indicators, said method comprising:

- identifying a characteristic of a work piece requiring assembly actions;
- communicating identification information to a controller in response to the identifying of a characteristic of the work piece;
- communicating a first command signal to at least one directional light device in response to the identifying of a characteristic;
- selectively projecting at least one indicating light via the directional light device in response to the first command signal; and
- communicating a confirmation signal to the controller upon completion of a first operation step.

15. The method of claim 14, wherein identifying a characteristic of a work piece comprises identifying the presence of a work piece with a sensor apparatus.

16. The method of claim 15, including identifying the type of work piece requiring assembly actions.

17. The method of claim 14, wherein projecting at least one indicating light comprises projecting at least one indicating light toward at least one of a component location and an operation step location.

18. The method of claim 14, wherein projecting at least one indicating light comprises projecting at least one indicating light in a selectively configurable pattern.

19. The method of claim 14, wherein communicating a confirmation signal comprises communicating a confirmation signal from at least one selected from the group consisting of a manual input signal and an automated input signal.

20. The method of claim 14, including:

- communicating a second command signal from the controller to the at least one directional light device in response to the confirmation signal;

projecting at least one indicating light from the directional light device in response to the second command signal; and

communicating a confirmation signal to the controller upon completion of a second operation step.

21. The method of claim 20, including:

repeating said communicating a command signal;

projecting at least one indicating light in response to said command signal; and

communicating a confirmation signal until assembly actions for the work piece have been completed.

22. The method of claim 14, including:

programming the controller via at least one program screen displayable on the display device, the at least one program screen configured to include at least one input field for entering and/or selecting indicia regarding sequential actions; and

displaying indicia regarding sequential actions to be performed on at least one display screen displayable on the display device.

23. The method of claim 14, including:

monitoring operational information associated with sequential actions via the controller.

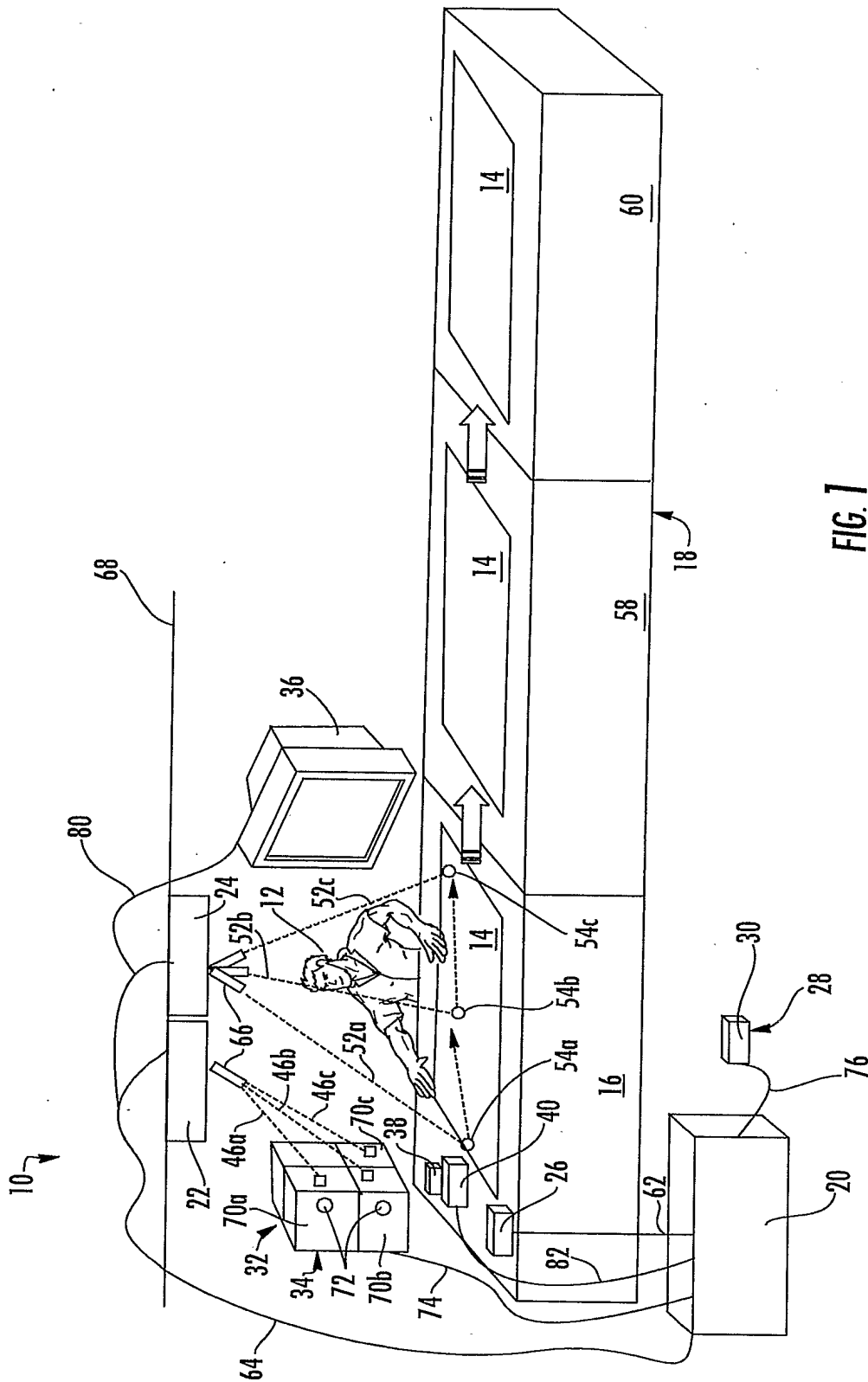


FIG. 1

Pre-assemble



FIG. 1A



Left

FIG. 1H

Select

FIG. 1B



Right

FIG. 1I

Insert

FIG. 1C

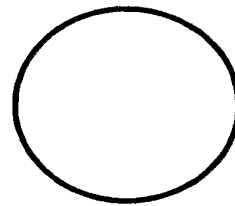


FIG. 1J

Assemble

FIG. 1D

Pick

FIG. 1E



FIG. 1K

Gauge

FIG. 1F

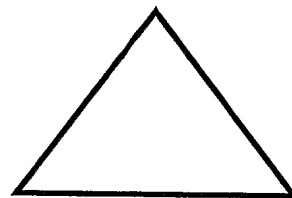


FIG. 1L

Torque

FIG. 1G

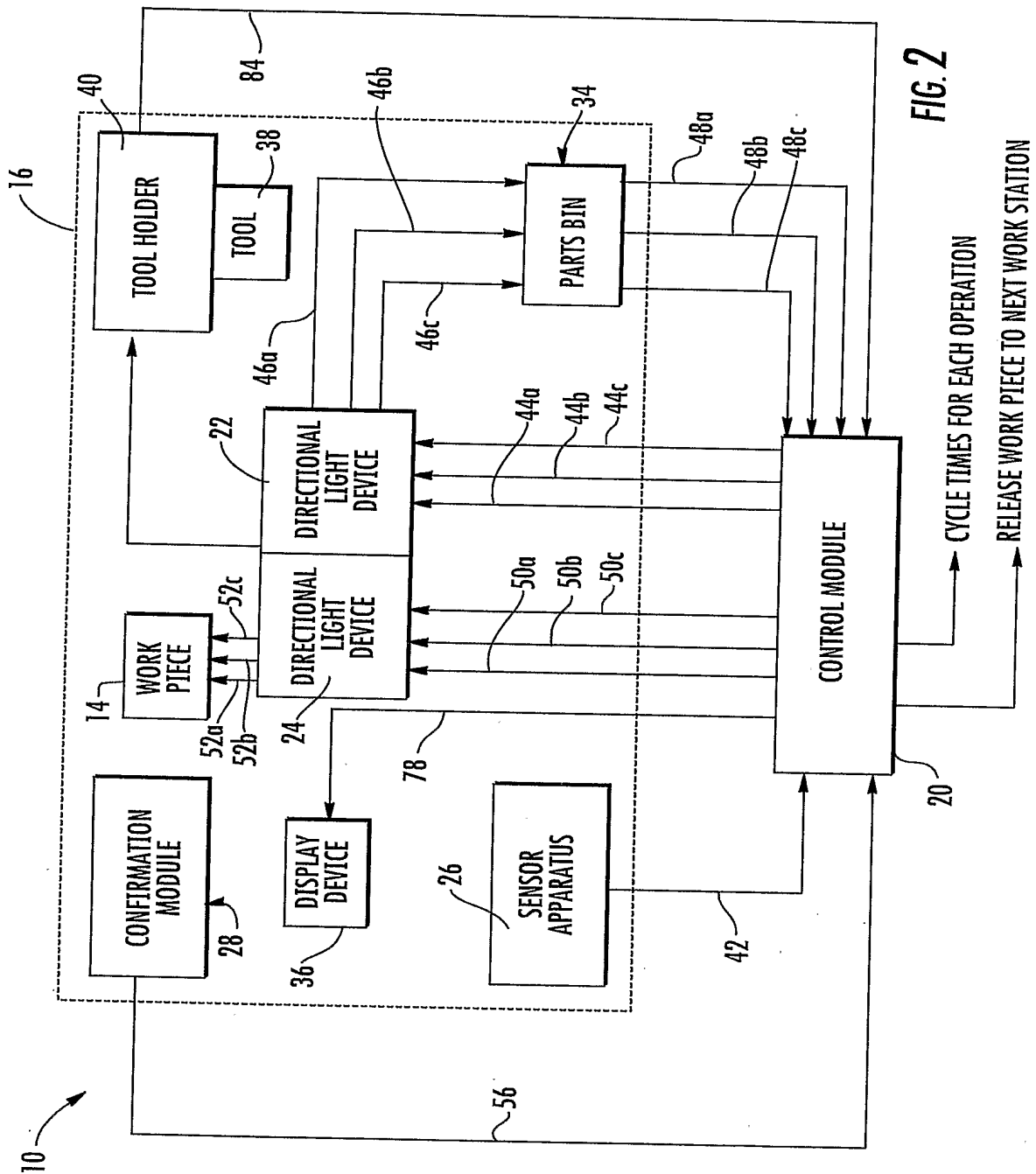
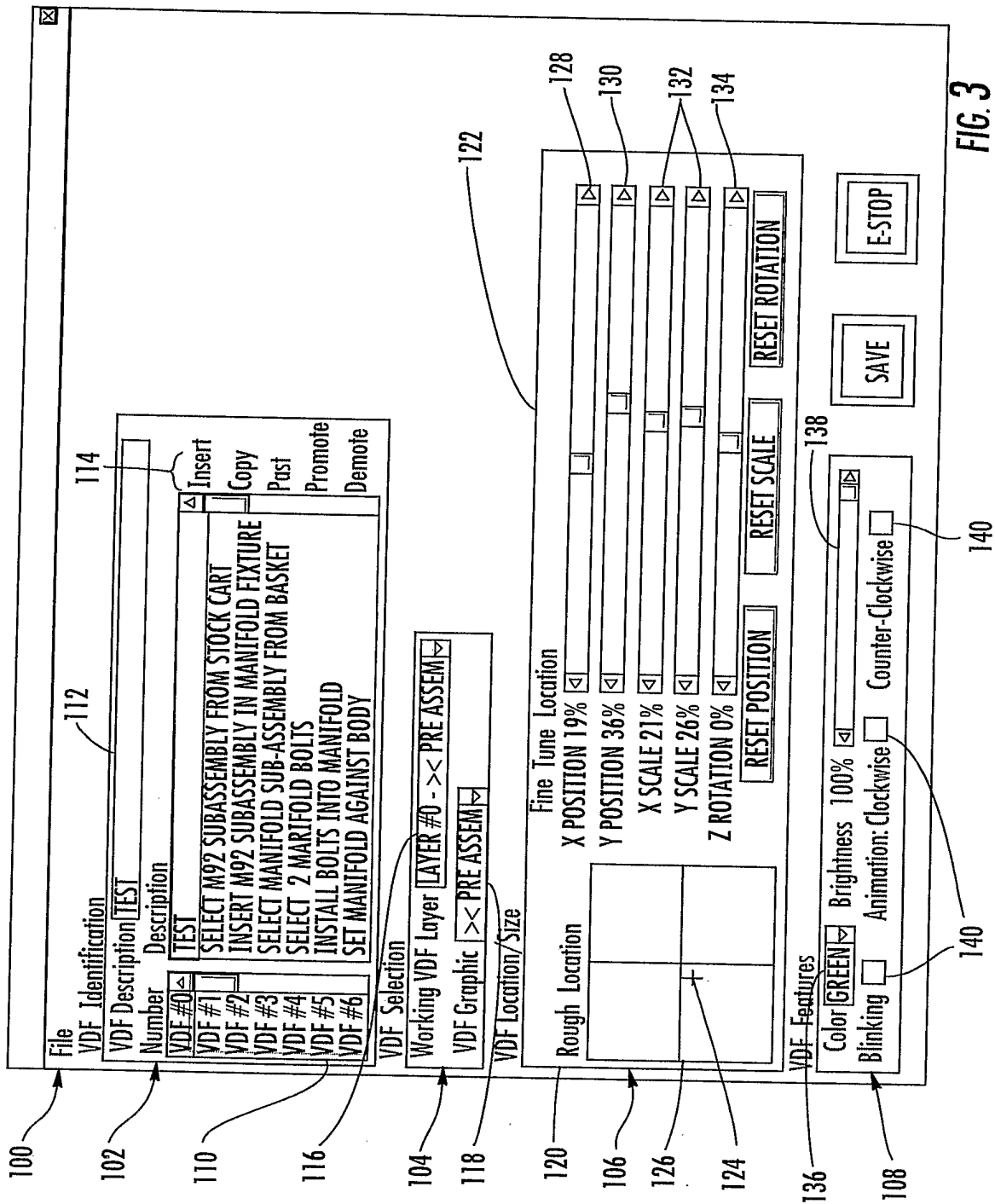


FIG. 2



OP 150- M92 EUI NUTSTACK STATION 148a 6:27:26 PM

13- ASSEMBLE CHECK VALVE AND CAGE TO SPACER - !!! ALERT !!!

STEP DESCRIPTION	TIME (SEC)	STEP DESCRIPTION	TIME (SEC)
1- SELECT M92 SUB-ASSEMBLY FROM STOCK CART	2	16- ASSEMBLE TO CHECK VALVE CAGE	0
2- INSERT M92 SUB-ASSEMBLY IN MANIFOLD FIXTURE	2	17- SELECT VALVE NUT FROM BASKET	0
3- SELECT MANIFOLD SUB-ASSEMBLY FROM BASKET	1	18- TORQUE VALVE NUT ONTO NUT THREAD	0
4- SELECT 2 MANIFOLD BOLTS	2	19- CHECK CONCENTRICITY OF INJECTOR IN CONCENTRICITY GAUGE	0
5- INSTALL BOLTS INTO MANIFOLD	3	20- PLACE INJECTOR IN CART FOR CALIBRATION	0
6- SET MANIFOLD AGAINST BODY	3		0
7- HAND THREAD BOLTS INTO BODY	2		0
8- FINAL TORQUE BOLTS USING TORQUE GUN	2		0
9- SELECT SPACER FROM BASKET	0		0
10- INSTALL SPACER ONTO NUT FACE	2		0
11- SELECT CHECK VALVE AND CHECK VALVE CAGE	3		0
12- ASSEMBLE CHECK VALVE AND CHECK VALVE CAGE	3		0
13- ASSEMBLE CHECK VALVE AND CAGE TO SPACER - !!! ALERT !!!	0		0
14- SELECT SPRING CAGE/SEAT/SPRING/SPRAY TIP	0		0
15- ASSEMBLE SPRING CAGE/SEAT/SPRING/SPRAY TIP	0		0

142 144 146 152

PREVIOUS STEP

CURRENT CYCLE TIME 36 SEC

LAST CYCLE TIME 96 SEC

MANUAL CONFIRMATION 150

148b

FIG. 4

142

OP 150- M92 EUI NUTS

144

13- ASSEMBLE CHECK VALVE

146

STEP DESCRIPTION

1- SELECT M92 SUB-ASSEMBLY FROM STOCK CART	2
2- INSERT M92 SUB-ASSEMBLY IN MANIFOLD FIXTURE	2
3- SELECT MANIFOLD SUB-ASSEMBLY FROM BASKET	1
4- SELECT 2 MANIFOLD BOLTS	2
5- INSTALL BOLTS INTO MANIFOLD	3
6- SET MANIFOLD AGAINST BODY	2
7- HAND THREAD BOLTS INTO BODY	2
8- FINAL TORQUE BOLTS USING TORQUE GUN	2
9- SELECT SPACER FROM BASKET	0
10- INSTALL SPACER ONTO NUT FACE	2
11- SELECT CHECK VALVE AND CHECK VALVE CAGE	3
12- ASSEMBLE CHECK VALVE AND CHECK VALVE CAGE	3
13- ASSEMBLE CHECK VALVE AND CAGE TO SPACER - !!! ALERT !!!	0
14- SELECT SPRING CAGE/SEAT/SPRING/SPRAY TIP	0
15- ASSEMBLE SPRING CAGE/SEAT/SPRING/SPRAY TIP	0

152

PREVIOUS STEP

148

CURRENT CYCLE TIME 69 SEC

LAST CYCLE TIME 96 SEC

150

MANUAL CONFIRMATION

154

Process Control Documentation (Graphics/Text Sheet)

UNCONTROLLED COPY

OP 150 METRIC

Part 140 Name 118

SINGLE SPRING CAGE NUT STACK #1

DO NOT PINCH CHECK VALVE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

150

FIG. 5

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 April 2007 (19.04.2007)

PCT

(10) International Publication Number  
**WO 2007/044558 A3**

(51) International Patent Classification:

*G01M 19/00* (2006.01)      *B23P 21/00* (2006.01)  
*B23P 17/04* (2006.01)      *G06F 17/00* (2006.01)  
*B23P 19/00* (2006.01)      *G06F 19/00* (2006.01)

(21) International Application Number:

PCT/US2006/039215

(22) International Filing Date: 6 October 2006 (06.10.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/724,858      7 October 2005 (07.10.2005)      US  
60/818,058      30 June 2006 (30.06.2006)      US

(71) Applicant (for all designated States except US): **OPS SOLUTIONS LLC** [US/US]; 49601 Deer Run Drive, Northville, Michigan 48167 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **RYZNAR, Paul** [US/US]; 49601 Deer Run Drive, Northville, Michigan 48167 (US). **RYZNAR, James** [US/US]; 11535 Ryznar Drive, Belleville, Michigan 48111 (US).

(74) Agent: **Van Dyke, Gardner, Linn and Burkhardt, LLP** and its individual attorneys, primarily **Karl T. Onderma**; 2851 Charlevoix Drive S.E., Suite 207, P.O. Box 888695, Grand Rapids, Michigan 49588-8695 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

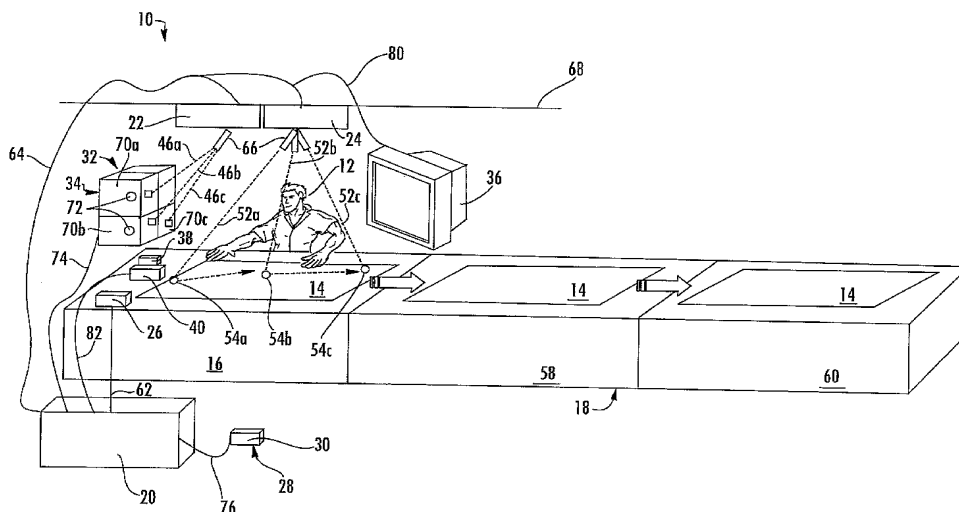
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: LIGHT GUIDED ASSEMBLY SYSTEM



(57) Abstract: NEW ABSTRACT: An operational guide system (10) adapted to provide visual indicators to an individual to guide sequential actions includes at least one sensor apparatus (26), a controller (20), and at least one directional light device (22, 24). The sensor apparatus (26) is operable to detect operation information and generate an output indicative of the sensed operation information. The controller (20) receives at least a first input signal indicative of the operation information and selectively provides at least one command signal in response to the first input signal. The at least one directional light device (22, 24) being selectively operable to project and target at least one indicating light in response to the at least one command signal from the controller (20).

WO 2007/044558 A3



- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *of inventorship (Rule 4.17(iv))*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**

26 July 2007

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/39215

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: **G01M 19/00**( 2006.01);**B23P 17/04**( 2006.01),**19/00**( 2006.01),**21/00**( 2006.01);**G06F 17/00**( 2006.01)  
**G06F 19/00**( 2006.01)

USPC: 29/407.1,407.04,592,700,703;700/95,115

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 29/407.1,407.04,592,700,703;700/95,115

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
IEEE/XploreElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
USPAT; US-PGPUB; USOCR; EPO, JPO, DERWENT

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,910,894 A (PRYOR) 8 June 1999 (08.06.1999), entire document.	1-23
A	US 5,119,536 A (LEITZ et al.) 9 June 1992 (09.06.1992), entire document.	1-23
A	US 5,430,662 A (AHONEN) 4 July 1995 (04.07.1995), entire document.	1-23
A	US 5,506,641 A (DORSEY-PALMATEER) 9 April 1996 (09.04.1996), entire document.	1-23
A	US 4,469,553 A (WHITEHEAD) 4 September 1984 (04.09.1984), entire document.	1-23
A	US 4,222,036 A (TROUKENS) 9 September 1980 (09.09.1980), entire document.	1-23
A	US 4,102,568 A (MIYAGI) 25 July 1978 (25.07.1978), entire document.	1-23

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
15 May 2007 (15.05.2007)

Date of mailing of the international search report

01 JUN 2007

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
Facsimile No. (571) 273-3201

Authorized officer

David N. Spector

Telephone No. (571) 272-2338

Form PCT/ISA/210 (second sheet) (April 2005)

Amazon Ex. 1002.0076

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2006/039215

International filing date: 06 October 2006 (06.10.2006)

Document type: Certified copy of priority document

Document details: Country/Office: US  
Number: 60/818,058  
Filing date: 30 June 2006 (30.06.2006)

Date of receipt at the International Bureau: 01 December 2006 (01.12.2006)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1545534

# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*November 20, 2006*

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/818,058

FILING DATE: *June 30, 2006*

RELATED PCT APPLICATION NUMBER: PCT/US06/39215

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US60/818,058



Certified by

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

Amazon Ex. 1002.0078

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**PROVISIONAL APPLICATION FOR PATENT COVER SHEET**

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

EV700000659US

**INVENTOR(S)**

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Paul	Ryznar	Northville, Michigan

☐ Additional inventors are being named on the \_\_\_\_\_ separately numbered sheets attached hereto
**TITLE OF THE INVENTION (500 characters max)**

LIGHT GUIDED ASSEMBLY SYSTEM

Direct all correspondence to:

**CORRESPONDENCE ADDRESS**

Customer Number

28 101

Place Customer Number  
Bar Code Label here

OR

Type Customer Number here

Firm or  
Individual Name

Van Dyke, Gardner, Linn &amp; Burkhardt, LLP

Address

2851 Charlevoix Drive, S.E., Suite 207

Address

City

Grand Rapids

State

MI

ZIP

49546

Country

USA

Telephone

616.975.5500

Fax

616.975.5505

**ENCLOSED APPLICATION PARTS (check all that apply)**

Specification Number of Pages

24



CD(s), Number



Drawing(s) Number of Sheets

5



Other (specify)



Application Data Sheet. See 37 CFR 1.76

**METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT**

Applicant claims small entity status. See 37 CFR 1.27.



A check or money order is enclosed to cover the filing fees



The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number:

22 0190



Payment by credit card. Form PTO-2038 is attached.

FILING FEE  
AMOUNT (\$)

\$100.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.



No.



Yes, the name of the U.S. Government agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted,

SIGNATURE

Karl T. Ondersma

Date

06/30/2006

TYPED or PRINTED NAME

Karl T. Ondersma

TELEPHONE

616.975.5500

REGISTRATION NO.

(if appropriate)

Docket Number:

55 894

RYZ01 P-100A

**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

**P A T E N T**  
**RYZ01 P-100A**  
**Express Mail No. EV700000659US**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Paul Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Customer No. : 28 101

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

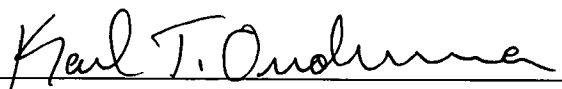
Dear Sir:

**CERTIFICATE OF MAILING BY EXPRESS MAIL**

I certify that the attached return postcard; Check (1) in the amount of \$100.00 (Provisional Patent Application Filing Fee – Small Entity); Provisional Application for Patent Cover Sheet (1 page, in duplicate); Bibliographic Data Sheet (1 page); Provisional Patent Application [24 pages of Specification and 5 Sheets of Drawings] are being deposited with the United States Postal Service as Express Mail in an envelope having Express Mail Label Number EV700000659US addressed to:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

on June 30, 2006.

  
Karl T. Ondersma  
Van Dyke, Gardner, Linn & Burkhardt, LLP  
2851 Charlevoix Drive, S.E.  
P.O. Box 888695  
Grand Rapids, MI 49588-8695  
(616) 975-5500

KTO:wen  
RYZ01 P-100A  
Enclosures

LIGHT GUIDED ASSEMBLY SYSTEM  
BACKGROUND OF THE INVENTION

[0001] The present invention is directed to a system for guiding an individual in the performance of operational steps, and in particular a system that provides visual indicators to the individual.

[0002] Numerous activities involve the performance of pre-designated operational steps to properly complete a particular task, with some such activities needing to be completed within a specified or standard time allowance. For example, in a manufacturing environment the selection and assembly of components to a work piece must be properly completed to satisfy the specified design criteria of the work piece. Numerous problems arise when such activities are improperly performed either from a workmanship standpoint and/or outside the standard time allowance. In the case of workmanship, if the problem is not discovered prior to shipment of the work piece, a failure in the field may occur that can result in significant warranty costs to the manufacturer. If the problem is discovered prior to shipment, the work piece may have to be scrapped or require re-work operations, both of which add significant and undesirable cost and complexity to the manufacturing operations. In the case of failure to meet a standard time allowance, the entire assembly process may become unbalanced resulting in costly bottlenecks, excess inventory, and additional workmanship risk.

[0003] Several methods of preventing the improper assembly of a work piece exist. One such method is the use of automated machine vision systems that utilize cameras to compare a work piece to the preprogrammed specification of a properly assembled work piece. Automated machine vision systems, however, are expensive and are highly customized such that they are only able to handle a limited assortment of work pieces. Other types of systems may involve human inspection of work piece products. Such systems inherently involve human error such that a higher degree of nonconforming parts may go undetected. Furthermore, when human inspection systems are constructed as separate "inspection stations" apart from the value added work operations, manufacturing costs are increased by allowing nonconforming work pieces to leave work stations.

[0004] In addition to manufacturing assembly operations, numerous other activities involve human performance of particular tasks that are desired to be performed without omitting any steps. Such activities include, by way of example only, the testing or measuring of various components, packaging products, preparation and production of food

and chemical goods, air flight checklist activities, the proper performance of critical safety routines, and multi-person choreographed physical activities.

[0005] Therefore, a cost effective and flexible method of providing guidance to individuals performing tasks is desired whereby the occurrence of missed or improperly performed steps is reduced.

#### SUMMARY OF THE INVENTION

[0006] The present invention provides an operational guide system or assembly guide system adapted to provide visual indicators to an individual to guide sequential actions at a work location. According to one aspect of the present invention, an operational guide system comprises at least one sensor apparatus operable to detect operation information and generate an output indicative of the operation information, a controller receiving at least a first input signal indicative of the operation information and selectively providing at least one command signal in response to the first input signal, and at least one directional light device selectively operable to project and target at least one indicating light in response to the at least one command signal from the control module.

[0007] According to another aspect of the present invention, a method for guiding assembly actions by providing visual indicators includes identifying a characteristic of a work piece requiring assembly actions and communicating identification information to a controller in response to the identification of the presence of the work piece. The method further includes communicating a first command signal to at least one directional light device in response to the identification information and selectively projecting at least one indicating light via the directional light device in response to the first command signal. The method also includes communicating a confirmation signal to the control module upon completion of a first operation step.

[0008] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been fully completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part present at a work station provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station. The control module may also be used to monitor cycle times of the individual operational steps and combined operations

undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable in environments involving, for example, significant employee turnover and/or language and literacy barriers.

[0009] These and other objects, advantages, purposes, and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is an illustration of the operational guide system of the present invention constructed as an assembly guide system at a work station of an assembly line;

[0011] FIG. 2 is a schematic illustration of the operation of the assembly guide system of FIG. 1;

[0012] FIG. 3 is an image of a program screen generated on a display device used to program operational guide system software according to the present invention;

[0013] FIG. 4 is an image of an operator display screen generated on a display device of the operational guide system of the present invention; and

[0014] FIG. 5 is an image of the operator display screen of FIG. 4 shown with an additional display image of a work instruction.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The present invention will now be described with reference to the accompanying figures, wherein the numbered elements in the following written description correspond to like-numbered elements in the figures. An operational guide system or assembly guide system 10 is illustrated in FIG. 1 in connection with the providing of visual indicators to an operator 12 performing one or more assembly actions on a work piece 14 at a work station 16 of an assembly line 18. The illustrated assembly guide system 10 includes a controller or a control module 20, two directional light devices 22, 24, a sensor apparatus 26, and a confirmation module or device or element 28, shown as a foot pedal 30. Assembly guide system 10 includes a component location 32, which is illustrated as a parts bin 34, a display device 36, and a tool 38 and tool holder 40. The system is operable, in response to an operation information or characteristic or identification information associated with work piece 14 detected by sensor apparatus 26, to selectively provide indicating lights 46, 52 to guide an operator in the selection and/or assembly of parts to

work piece 14, with the indicating lights 46, 52 being directed and/or provided based on, at least in part, the operation information detected by sensor apparatus 26.

[0016] Referring to FIGS. 1 and 2, when work piece 14 initially enters work station 16, the sensor apparatus 26 detects an operation information or characteristic or identification information associated with the work piece 14, such as, for example, the presence of and/or the type of work piece 14 present at the work station 16. In response to the detection by sensor apparatus 26, a first input signal 42 is communicated or transmitted to the control module 20 and, based on the detected or identified work piece 14 that the operator 12 is or will be working on, the control module 20 communicates or transmits a command signal 44 (FIG. 2) to directional light device 22 to project an indicating light 46 at a location on parts bin 34 to guide the operator 12 to a part required for a particular step in the assembly action. After the proper part has been selected, a confirmation signal 48 (FIG. 2) is sent to the control module 20, the control module 20 then transmits a command signal 50 (FIG. 2) to directional light device 24 to project indicating light 52 to indicate the operational step location 54 on the work piece 14 where the selected component is to be installed. Upon completion of a particular operation step, the operator 12 actuates the foot pedal 30 to transmit a confirmation signal 56 (FIG. 2) to the control module 20 verifying that the operation step has been completed. The control module 20 may then send another command signal 49, 50 to one of the directional light devices 22, 24 to indicate the next operation step, or may release the work piece 14 to a subsequent work station 58, 60 for further operations if all required pick and assembly steps have been properly completed.

[0017] Assembly guide system 10 is able to provide visual indicators to operator 12 that are specific to a particular work piece 14 such that, for example, multiple different styles or types of work pieces requiring different components or parts may be processed at work station 16 with a significant reduction in the risk of the occurrence of assembly errors. The assembly guide system 10 thus provides a cost effective and accurate method of guiding an operator 12 through a series of tasks and provides confirmation that the tasks have been fully accomplished and completed in the proper order. Furthermore, the ability of the assembly guide system 10 to identify/recognize the presence and/or type of work piece 14 present at the work station 16 provides a flexible system that enables different types or models of work pieces to be processed at a particular work station 16, as well as provide notification to an operator 12 of the presence of the work piece 14 at the work station 16 and thereby improves throughput of the assembly line 18. The control module

20 may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station 16 for system productivity reporting, or the like.

[0018] Assembly guide system 10 is shown in FIG. 1 in connection with work station 16, where work station 16 is part of an assembly line 18 that includes additional work stations 58, 60 for performing subsequent operations. Although not shown, it should be appreciated that additional assembly guide systems could be included at the other work stations of assembly line, or that a single assembly guide system could be used to aid operations at more than one work station. Assembly line 18 may be constructed to transport work pieces 14 in an automatic fashion, such as by known chain, belt, or roller conveyors, or may require work pieces 14 to be manually moved by sliding rails, rollers, or the like. In addition, depending on the type of work piece and assembly line involved, the work pieces may be supported on a frame, tray, pallet, or the like, or may be supported directly on the assembly line.

[0019] As noted, sensor apparatus 26 functions to detect an operation information or characteristic or identification information associated with work piece 14, such as the presence and/or type of work piece 14 located at the work station 16, and may be constructed as one or more of a number of known sensors such as, for example, a proximity switch, light curtain, photo eye, radio frequency identifier device, bar code reader, or the like. When constructed as a radio frequency identifier device or bar code reader, a readable tag or bar code may be placed on either the work piece or the structure upon which the work piece is supported while traveling on the assembly line. The tag or bar code may contain information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. A scanner or reader may be mounted to the assembly line, such as to framework of the assembly line, with the scanner being able to read the information from the tag or bar code when the work piece enters the work station. Alternatively, an operator may manually enter a part type into the system

[0020] It should be appreciated, however, that the type of part present at a particular work station need not be determined using a bar code or radio frequency system. For example, and as is known in the art, standard binary type sensors may be used to detect geometrically distinguishing features of a work piece or the structure upon which it is located to “identify” the work piece. Alternatively, the sensor apparatus could include multiple components whereby one component would detect the presence of a work piece

and another could detect the type of work piece. Still further, an assembly guide system could be constructed in accordance with the present invention where an operator uses a hand held scanner to scan a bar code label affixed to the work piece or the structure supporting the work piece as opposed to the scanner being mounted directly to the assembly line. The sensor apparatus may also be used to detect the relative orientation of a work piece with respect to the work station, with the control module adapted to receive the positional information and provide accordingly adjusted command signals to the directional light devices such that the projected indicating lights accurately impinge on the desired operational step locations. Still further, the presence of a part at a workstation may be supplied to the operational guide system by a manual operator activated input signal, such as by a touch screen, a palm button, or the like.

[0021] Control module 20, in the illustrated embodiment, is a computer controller device and as indicated is adapted to receive and send various signals to monitor and guide the assembly actions at work station 16. Control module 20 may be constructed as a desktop or laptop style PC, a PLC, or the like, or may be a networked computer system that may be used to control and monitor other aspects of the assembly line and work stations. It should be understood, however, that the control module may alternatively comprise a combination of interacting computer devices and still function as intended within the scope of the present invention. For example, a local computer device present at a particular work station may be adapted to receive and provide communication information with a network computer system associated with an assembly line.

[0022] As previously indicated, control module 20 is adapted to receive a first input signal 42 regarding identification information of the work piece present at the work station. In the illustrated embodiment of FIG. 1, the first input signal 42 is transmitted to the control module 20 directly from the sensor apparatus 26 along communication link 62, where link 62 is a computer cable, fiber optic line, or the like. Alternatively, however, a first input signal may be transmitted to a network computer system and, in response to the first input signal, the network system may provide the control module with the identification information regarding the work piece present at the work station. The identification information, as previously indicated, may simply indicate the presence of a part at the work station and/or may include information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. Optionally, a sensor apparatus and control module may be alternatively constructed to wirelessly transmit and receive identification information

such as the type, location, dimensions, or the like, of the work piece present at the work station without a link 62, such as via RF, IR, etc. communication.

[0023] In response to the first input signal 42 received, the control module 20 outputs command signals 44, 50 to directional light devices 22, 24 along link 64 to provide visual indicators to the operator, as described in more detail below, with the command signals 44, 50 being communicated based on, at least in part, the first input signal 42. In the illustrated embodiment, two substantially similar directional light devices 22, 24 are provided at work station 16 and are responsive to the command signals 44, 50 of the control module 20. Directional light device 22 is used to project indicating lights 46 at the component location 32, while the other directional light device 24 is used to project indicating lights 52 at operational step locations 54 on work piece 14. Each directional light device 22, 24 includes a light source 66 for projecting indicating lights 46, 52, with the directional light devices 22, 24 constructed such that the indicating lights 46, 52 may be selectively and movably positionable to direct the indicating light 46, 52 at pre-targeted locations. The light sources 66 may also be constructed to provide an indicating light beam of selectively adjustable brightness to compensate for ambient surroundings and/or the distance from the light source to the selected impingement point. Although light sources 66 are illustrated in FIG. 1 as projecting a single indicating light beam, it should also be appreciated that light sources 66 may be constructed to simultaneously project two or more beams such that, for example, multiple parts may be indicated for selection from location 32 by the operator 12 or multiple assembly locations may be indicated.

[0024] In the illustrated embodiment, light sources 66 are constructed as laser light sources that are able to project a focused, coherent beam of light at a desired location. Laser light sources may preferably be class 3 or lower lasers for employment within a visual setting for operators. A directional light device utilizing such a laser light source capable of producing variously configured and targeted indicating lights is available, for example, from Laser Compliance in Utah, while Phoenix Contact GmbH & Co. KG of Blomberg, Germany, for example, may be the supplier of all interface Input/Output Control between the shop floor and an operational guide system. Alternatively, light sources other than lasers may be used and still function as intended without affecting the scope of the present invention, such as incandescent lights, light emitting diodes (LEDs), or the like. Still further, a light source may be constructed as a Digital Light Processing (DLP ®) projector, such as an industrial grade DLP ® projector able to project signals of sufficiently high-lumens to be visible by an operator. It should also be understood that in

embodiments incorporating more than one light source both laser based and DLP ® based projector sources may be simultaneously and/or alternatively employed.

[0025] In the illustrated embodiment, directional light devices 22, 24 are mounted to a mounting structure 68 to retain the directional light devices 22, 24 in a pre-determined and positively located orientation relative to the work station 16. The mounting structure 68 may comprise framework of the work station 16 or assembly line 18, or may be a structural element of the building, such as the roof or a wall, or may even be a separate stand, post, or pole.

[0026] Directional light devices 22, 24 may use controllable servo motors for movably positioning light sources 66 to selectively direct the indicating light 46, 52 in response to the command signal 44, 50 transmitted by the control module 20. Alternatively, directional light devices 22, 24 may include optical manipulation devices, such as adjustable mirrors, that function to selectively and movably position the projected indicating lights 46, 52 at the desired locations. Still further, directional light devices 22, 24 may employ robotics to selectively position the light sources 66, with the robotics comprising robotic gantry or XYZ type arms, or the like.

[0027] Light sources 66 may be constructed such that they produce light of differing color from each other to provide further visual cues to the operator 12 while working at work station 16. For example, as illustrated in FIG. 1 the indicating light 46 produced by light source 66 of directional light device 22 may be used to project light at component location 32 and may be of a first color, and the indicating light 52 produced by light source 66 of directional light device 24 may be used to project light at operational step locations 54 on work piece 14 and be of a second color. In such an embodiment, the differing colors serve as a further visual indicator or cue to the operator 12 with one color representing part selection and the other color representing the location where the selected part is to be assembled. It should also be appreciated, however, that each light source 66 may project multiple different colors, such as green, red, yellow, and/or blue. Furthermore, light sources may be adapted to project animated images onto a surface, such as a training video, .mpeg, .wmv, and other such files provided, for example, by a control module of an operational guide system.

[0028] The directional light devices 22, 24 may also include known optical effect devices for fanning or adapting or configuring the projected indicating lights 46, 52 produced by the light sources 66 into a desired shape, pattern, or form at the point or location at which the indicating light 46, 52 impinges the component location 32 or operational step location

54. For example, the indicating light may initially be projected as a geometric shape, such as a circle, about a particular location to quickly attract the operator's attention, and then focus to a point or circle of smaller diameter at the specific location. The indicating light may also be projected to produce alpha numeric characters, blink, and/or produce rotating images. For example, sequential numbers may be projected where each number indicates a step in the assembly action being preformed by the operator at the work station, or part numbers or textual information may be projected to provide written guidance to the operator. The indicating lights may also be projected at an initially higher intensity level to attract the attention of an operator, with the intensity level being subsequently reduced after a brief period.

[0029] As previously noted, indicating lights 46, 52 may be projected at component location 32 or at operation step locations 54 associated with work piece 14. Component location 32 is exemplified as a parts bin 34 having multiple storage locations 70 for holding various parts required in the assembly of work pieces 14. As shown, directional light device 22 is functional to selectively project an indicating light 46 at discrete storage locations 70 of parts bin 34 in response to command signal 44 to prompt the operator 12 regarding part selection. Although not shown, storage locations 70 of parts bin 34 may include luminescent tape, paint, reflectors, Radio Frequency Identification tags (RFID) ,or the like, onto which an indicating signal is directed for providing further contrasts or visual prompts to an operator.

[0030] In the illustrated embodiment of FIG. 1, storage locations 70 of parts bin 34 include detection devices 72 that are intended to detect or sense when a component has been withdrawn from a particular storage location 70. Detection devices 72 may be of known construction and are selected based on a particular application, taking into consideration the types or models of work pieces 14 and parts to be assembled. Detection devices 72, for example, may comprise light curtains, proximity sensors, electronic mats, such as pressure sensitive mats, machine vision systems, or the like.

[0031] The detection devices 72 are operable to transmit a confirmation signal 48 to the control module 20 along link 74 upon selection by the operator 12 of a part from a particular storage location 70, with control module 20 being functional to determine whether or not the operator 12 has selected the correct part as prompted. In response to the confirmation signal 48, if the operator 12 selected the proper part as directed by the indicating light 46, control module 20 may terminate the indicating light 46 projecting from directional light device 22 at the storage location 70 and transmit a subsequent

command signal 50 to directional light device 24 to project an indicating light 52 to the operational step location 54 on the work piece 14 where the just selected part is to be assembled. However, if control module 20 determines that an incorrect part has been selected as compared to what should have been selected as prompted by the indicating light 46, control module 20 will not provide the subsequent command signal 50. In addition, control module 20 may be constructed to provide a visual or audible signal to the operator 12 when an improper part has been selected from a storage location 70. For example, although not illustrated, control module may prompt a visible alert, such as a red warning light mounted in the vicinity of the operator, to activate or illuminate, or may cause an audible alert, such as a warning alarm or buzzer to sound.

[0032] Although not illustrated, the parts bin may additionally employ a known pick-to-light system whereby each storage location includes an illumination device, such as an LED light or the like, that lights up to prompt the operator as to the proper storage location from where a part is to be selected. When the assembly guide system of the present invention includes such a pick-to-light system, the directional light device 24 used to project an indicating light 46 at a component location 32 may optionally be excluded.

[0033] As noted above, assembly guide system 10 includes confirmation module 28, which in the illustrated embodiment is a foot pedal 30. Confirmation module 28 is constructed to transmit a confirmation signal 56 along link 76 to control module 20 to signal that the operational step indicated by directional light device 22 or 24 has been completed. To transmit the confirmation signal 56, operator 12 simply depresses foot pedal 30 upon completion of the directed activity. The confirmation signal 56 transmitted by foot pedal 30 then triggers control module 20 to selectively transmit another command signal 44, 50 to provide guidance to the operator 12 regarding the subsequent operational step that must be taken by the operator 12 at the work station 16 in accordance with work piece 14. For example, the assembly guide system 10 may cause an indicating light 46 to be projected at a storage location 70 for the next required part. Alternatively, the control module 20 may provide a command signal that releases the work piece to the next work station 58 if all of the operational steps at the current work station 16 have been completed.

[0034] Although illustrated as a foot pedal 30, it should be understood that numerous alternative confirmation modules 28 may be utilized and still function as intended within the scope of the present invention. For example, confirmation module 28 may be constructed as a pressure sensitive mat, push button, toggle switch, palm button, light

curtain, touch screen, touch pad, or the like, which is constructed to be depressed, switched, or otherwise activated by a manual action of the operator 12. A sound activated signal may alternatively be employed, such as a voice command, to provide a confirmation signal. Confirmation module 28 may also be constructed as a wireless transmitter, such as a transmitter that an operator may carry by affixing to his or her belt, or the like, thereby eliminating the need for a physical link. Further, operational guide system may be adapted to receive and/or respond to other confirmation signals and/or sources as additional technologies become available such as, for example, the potential future computer technology of reading an operators's mind.

[0035] Still further, a confirmation module or device or element may be constructed to automatically detect when an operator has completed an assembly step. For example, a confirmation module may be constructed as a vision system that is able to detect the presence or absence of a component at a location, such as by processing an image captured by a pixilated imaging device, as is known in the art. Alternatively, for example, the confirmation module may be constructed as a proximity sensor, photo eye, light curtain, or the like, constructed to automatically detect the presence or absence of a part upon assembly to the work piece. Still further, a confirmation signal may be transmitted by an automated tool or measuring device, such as a weight scale or other type of measuring device, as described in more detail below. In which case, the automated tool or measuring device may function as a confirmation module. An indicating light projected by a light source of an operational guide system may also be used to provide a confirmation signal where, for example, a sensor is employed at the light source or elsewhere on the operational guide system to detect the reflection of an indicating light from a part or component that requires verification. Still further, the indicating lights projected by the light sources of an operational guide system may be used in connection with a light detecting sensor to detect, for example, a part height or other part feature. The light sources may also be used as a "light curtain" by being projected at a particular location or parts bin, or the like, with a sensor adapted to detect that an operator has properly selected from that location.

[0036] Assembly guide system 10 also includes a display device 36 that is able to receive display signals 78 (FIG. 2) along link 80 (FIG. 1) from control module 20 and to relay information to the operator 12. Display device 36 may be constructed as a television, LCD, LED device, or other type of viewable display mechanism. Display device 36 may be used to present information to the operator 12 such as, for example, the sequential steps

needing to be performed, work instructions associated with the work station 16, images of a work piece 14 properly affixed with the part that is to be assembled, information regarding a missed or improperly performed assembly step, or the like. The display device 36 may be constructed as a touch screen device adapted to be depressed by an operator to provide a confirmation signal regarding completion of a particular step. The inclusion of such a touch screen device may also provide the ability to prompt or guide an operator through certain operational or assembly steps that do not require guidance via indicating light signals. The display device may also be used to show or provide instructional videos, display running cycle times, desired cycle times, and/or alerts, or the like. It should be understood, however, that an assembly guide system may be constructed without a display device and still function as intended within the scope of the present invention.

[0037] Although not shown, one or more additional display devices may also be included with an operational guide system of the present invention. For example, a first display device may be used to display sequential operational steps, such as steps completed, the current step needing to be performed, and subsequent yet to be performed steps with the second display device used to display work instructions and/or a blueprint of the assembly. In such an embodiment, the displayed blueprint may be sequentially highlighted to indicate the particular component or feature associated with the sequential operational steps.

[0038] Optionally, assembly guide system 10 may be used in connection with a tool 38 and a tool holder 40. Tool 38 may comprise, for example, a manual tool such as a wrench, torque wrench, pliers, screwdriver, or the like, or may be an automated tool such as an electric screwdriver, air gun, electric torque wrench, or the like. Tool 38 may otherwise be a manual or automated measuring device such as calipers, a gauge block, feeler gauges, air gauge device, or the like. Tool holder 40 is intended to provide a storage location for tool 38 when tool 38 is not in use. Directional light devices 22, 24 may project an indicating light onto tool 38 and/or tool holder 40 in response to a command signal when tool 38 is required to complete a pending operational step, such as in a similar manner as described above with respect to storage locations 70 of parts bin 34 and operation step locations 54 on work piece 14. Tool holder 40 may include a sensor and thereby be integrated with the assembly guide system 10 to detect when tool 38 is positioned within or removed from tool holder 40, where the sensor may be a photo eye, proximity switch, light curtain, or the like. In such an embodiment, as illustrated, tool holder 40 may be in communication with

control module through link 82 (FIG. 1) such that a confirmation signal 84 (FIG. 2) may be transmitted from tool holder 40 to control module 20 to indicate that operator 12 has properly selected the tool 38 as prompted.

[0039] Although not illustrated, the assembly guide system may utilize an automated gauge or tool that is electrically linked to control module such that control module is able to monitor both the use of the tool as well as an operational parameter associated with the tool, without affecting the scope of the present invention. For example, if a tool is constructed as a torque wrench, the control module may be constructed to monitor the fastening torque obtained by the torque wrench and to compare the value to a preprogrammed or predetermined or threshold value prior to transmitting a subsequent command signal. The control thus may function to transmit the subsequent command signal only after the desired or appropriate torque has been applied by the torque wrench. Similarly, if the tool is constructed as a measuring device, such as digital calipers, control module may be constructed to receive a measurement value, and may compare the measurement value to a threshold measurement value, and may communicate or transmit the subsequent command signal when the measurement value is at or near the threshold measurement value.

[0040] It should also be appreciated that a tool holder may be alternatively constructed as a holding device adapted to receive a marking device or a container of adhesive, lubricant, cleaner, or other holder of other suitable or useful elements or devices or materials, or the like that may be used in the process steps at a work station.

[0041] Control module 20 is illustrated as transmitting command signal 44a to directional light device 22, which in response to command signal 44a, projects indicating light 46a on storage location 70a of parts bin 34. Upon receiving confirmation signal 48a from detection device 72 signifying that the proper part was selected, control module 20 then terminates projection of indicating light 46a and transmits command signal 50a to directional light device 24 such that indicating light 52a is projected on operational step location 54a on work piece 14 to direct operator 12 as to the proper assembly point for the selected part. Operator 12 then activates foot pedal 30 (or other confirmation device), which transmits confirmation signal 56a to control module 20 and the above process is repeated for indicating lights 46b, 52b, 46c, 52c, storage locations 70b, 70c, and operational step locations 54b, 54c.

[0042] As described in more detail below, the control module 20 and directional light devices 22, 24 of the assembly guide system 10 are programmed as to the proper spatial

positioning to where an indicating light 46, 52 is to be projected. This teaching of the assembly guide system 10 may be accomplished in various ways. For example, one teaching method involves the use of known pendant device technology, where the pendant device is used to position the projected beam of the light source 66 to a proper location, such as a storage location 70, record the coordinates, and then move to the next location, such as onto the work piece 14. Control module may also be adapted to employ voice activated programming. Alternatively, a wireless transmitter may be used that may be positioned at a desired impingement point of the projected indicating light 46, 52 and functional to transmit the spatial positioning information to the control module. Similarly, various locations, such as part bins, may be provided with wireless transmitters, such as RFID tags, with the control module being adapted to detect the signal and direct the indicating lights accordingly, in which case the operational guide system is able to compensate for movement or shifting of the desired impingement points of the indicating lights. Still further, control module 20 may be directly programmed and, for example, may utilize a touch screen having an image of the work station with the control module 20 being programmable using the touch screen. The operational guide system may also employ an alignment test pattern that may be used to “calibrate” the system, such as at the beginning of a shift, to insure that the various indicating light signals are properly aimed.

[0043] The operational programming and use of an operational guide system will now be described with reference to FIGS. 3-5. FIG. 3 illustrates an image of a program screen 100 that may be displayed or generated on a display device by a control module, such as display device 36 and control module 20. Program screen 100 includes various fields 102, 104, 106, 108 for entering descriptive text regarding an operational step, for selecting a type of display graphic or visual display feature (“VDF”) and characteristics for the VDF to be exhibited by an indicating light, such as indicating light 46 or 52, and for programming the location at which an indicating light VDF will be directed via the control module.

[0044] The VDF description field 102 enables the operational guide system to be sequentially programmed with progressive operational steps, each of which may include certain selectively input descriptive text. For example, an operational step number may be selected from the scroll down number sub-field 110 with descriptive text being assigned to that operational step number by being entered or typed in VDF description sub-field 112, such as by a keyboard (not shown). VDF description field 102 further includes various commands 114, such as “Insert”, “Copy”, “Paste”, “Promote”, and “Demote” for

accepting a particular operational step number and corresponding text, and for propagating or copying additional operational steps.

[0045] The VDF graphic selection field 104 enables various sub-steps or layers and graphics to be selected and programmed corresponding to a single operational step detailed in the VDF description field 102 noted above. For example, a single operational step detailed in the VDF description field may be specified as “Mount manifold.” In order to accomplish this step, an operator may be required to perform various sequential sub-steps or layers, such as, for example, selecting a bolt, inserting the bolt through a hole in the manifold, selecting a washer, mounting the washer to the bolt, selecting a nut, and mounting and tightening the nut to the bolt. These various sub-steps may be selected and programmed in the VDF graphic selection field.

[0046] The VDF graphic selection field 104 includes a VDF layer sub-field 116 and a VDF graphic selection sub-field 118. In the illustrated embodiment, the VDF layer sub-field comprises a drop down menu enabling up to fifteen layers or sub-steps to be associated with a single operational step. Descriptive text regarding the sub-step, such as “Select Bolt,” may be input within the VDF layer sub-field 116. The VDF graphic selection sub-field 118 enables a pre-programmed image, video, blueprint, etc. to be selectively associated with the sub-step entered in the VDF layer sub-field 116. In the illustrated embodiment, VDF graphic selection sub-field 118 is a drop down menu enabling selection of pre-programmed images such as, for example, arrows, various geometric shapes, such as circles, triangles, squares, and the like.

[0047] The VDF location field 106 is used to program the location at which the graphic associated with a particular operational step and/or sub-step is to be projected by a light device, such as directional light devices 22 or 24. In the illustrated embodiment, the VDF location field 106 includes an initial or rough location sub-field 120 and a secondary or fine tune location sub-field 122. While in the programming mode, the graphic may be constantly displayed to enable the graphic to be appropriately positioned. The initial location sub-field 120 enables the position of the projected graphic to be positioned via a cursor 124 moveable by a mouse device (not shown). Clicking on the cursor 124 and dragging the cursor within the display field 126 correspondingly causes the directional light device to move and position the graphic. A touch screen device may alternatively allow a cursor to be moved via a user’s finger. Upon obtaining a location for the projected graphic using the initial location sub-field 120, the secondary location sub-field 122 may be used to further locate the graphic if required. The secondary location sub-field 122

includes first and second axis slider bars 128, 130 for moving the graphic in first and second axis. The secondary location sub-field 122 further includes slider bars 132, 133 for altering the scale of the first and second axis, which act as a multiplier or reducer to the movement of the graphic by a light device via the first and second axis slider bars 128, 130. The secondary location sub-field 122 also includes a third axis rotation slider bar 134 that is used to rotate the displayed graphic, such as a directional arrow or written text, such that the graphic is displayed in an appropriate manner, such as pointing at a particular part or feature or displayed such that it is readable from left-to-right.

[0048] The VDF feature field 108 is used to provide further customization to the displayed graphic. A drop down color menu 136 is provided to alter the displayed color of the graphic and a brightness slider bar 138 is provided for adjusting the intensity of the displayed image. Various further selectable feature display options 140 may also be provided such as, for example, a blinking display option used to cause the graphic to flash, and rotational display options to cause the graphic to rotate in either a clockwise or counter-clockwise fashion. It should be appreciated that various additional selectable graphic customization options may be provided within the scope of the present invention.

[0049] Referring now to FIGS. 4 and 5, operator display screens 142 generated on a display device, such as display device 36, are illustrated that may be displayed while operating the operational guide system in a “run” mode. Display screen 142 discloses a header field 144 listing the particular operational step that is to be or is being performed. Display screen 142 also includes an operational step listing field 146 that may provide a list of the various operational steps that are to be performed at, for example, a particular assembly station. In use, the first operational step to be performed is displayed within the header field 144 and the operator is then guided through the various sub-steps associated with that operational step. Confirmation signals are provided upon completion of each sub-step either manually by the operator or automatically via other means described above. Upon completion of all sub-steps associated with an operational step, the next operational step to be performed is displayed in the header field.

[0050] Display screen also includes cycle time monitoring display fields 148 which may be used to display to an operator the running time associated with performance of an operational step, previous running times, average running times, and/or target times for completion of the operational steps. Display screen 142 also includes a manual confirmation button 150 that may be used to provide a confirmation signal to a control module. Display screen may be constructed as a conventional touch screen to enable the

operator to physically touch the confirmation button, as with a finger, and/or may be “clicked” via a mouse, in which case display screen may alternatively be a conventional monitor. Display screen may also include a back button 152 to enable an operator to repeat or check steps associated with prior operational steps.

[0051] FIG. 5 illustrates display screen 142 with an additional display window 154 that may be displayed to provide additional guidance or direction to an operator for a particular operational step. In the illustrated embodiment, window 154 is displaying work instructions pertaining to the operational step being performed. Although not shown, window 154 may also color code or provide animation to the display. Display window 154 may be caused to automatically appear on display screen 142 upon reaching the associated operational step or may be selectively displayed by an operator as needed.

[0052] As previously noted, control module 20 may also be used to monitor and record various parameters useful for improving productivity. For example, control module 20 may record cycle times of the individual operational steps at a work station 16 and/or the combined cycle time of operations at a work station 16. Such information is beneficial for balancing cycle times on the assembly line 18 to provide even work flow and for monitoring operator performance. The control module 20 may also be used to monitor and record the duration of time between a work piece 14 exiting a work station 16 and the next work piece entering the work station 16, which is useful for calculating the downtime of a given work station to focus efforts on upstream operations. In addition, the control module 20 may be used to monitor and record the duration of time a work piece is not able to exit a work station upon completion of all assembly actions at a particular work station due to a blocked or slower downstream operation. Further, an operator may be required to sign-on and sign-off at the start and end of his or her shift such that performance tracking to individual operators may be obtained.

[0053] Although not shown, it should also be appreciated that the operational guide system may be adapted to additionally provide audio guidance and/or instruction, such as voice or sound type instruction. For example, an operational guide system may be adapted to enable the entering or programming of verbal instructions that are output by the operational guide system, such as to a speaker or headphones worn by an operator. Such audio guidance may be programmed to the control module, for example, as part of the layered programming discussed above in regard to the VDF graphic selection field 104, where audio output commands may be supplied or programmed to the system via a

microphone, or the like, or may alternatively include selectable preprogrammed audible commands that may be associated with a sub-step.

[0054] It should be appreciated that numerous alternative structures and methods are contemplated within the scope of the operational guide system of the present invention. For example, an operational guide system need only utilize a single directional light device for projecting indicating lights at both a component location as well as operational step locations on a work piece. An operational guide system also need not employ a component location, but rather may employ one or more tools with directional light devices functioning to project indicating lights at the various tools. Furthermore, it should also be appreciated that the assembly guide system 10 of FIGS. 1 and 2 may be alternatively constructed whereby the various links are not formed by computer cables or the like, but are rather formed as wireless connections between the various devices. Still further, each assembly step need not involve both the selection of a part and the assembly of the part to a work piece.

[0055] Operational guide systems may also be incorporated into assembly line systems with the guide systems simultaneously moving along with the item or device being assembled or constructed on the assembly line. For example, an operational guide system may be affixed to a moving assembly line or a fixture used in association with such an assembly line, such as an automotive vehicle assembly line. In such case, the operational guide system may be employed to prompt or aid the progression of numerous operational assembly or qualification steps.

[0056] It should also be appreciated that the operational guide system of the present invention may be configured for use with a stand alone work station as opposed to a work station integrated into an assembly line as shown in FIG. 1. For example, an operational guide system may be constructed as a stand alone testing or gauging station using multiple tools formed as testing devices, such as air leak testers or the like, or gauges that are used to evaluate one or more characteristics, parameters, or dimensions of a work piece. A stand alone operational guide system may also be used as a training station, such as for new employees or to aid in the introduction of a new part or assembly step. An operational guide system training station may also be used for physical rehabilitation or job training programs. Still further, an operational guide system may be constructed as a standalone station or cart that may be docked or aligned with a particular operational step, such as on an assembly line, for use at only limited times in conjunction with the operational step. In such an embodiment, for example, the operational guide system may

include sensors, or the like, for identifying or detecting the particular station to which the guide system is adjacently positioned.

[0057] Although the operational guide system of the present invention is discussed above in regard to assembly operations and testing operations, it should also be appreciated that numerous alternative uses and/or configurations of the operational guide system of the present invention exist. For example, an operational guide system may be used to pick and package products into a shipping container, such as a bag or box, for fulfilling an order, such as part kitting at order fulfillment centers, supermarkets, part bin loading, or the like. In such an embodiment, the shipping container may be associated with a bar code order number that would provide information to the control module as to the particular products needed for filling the order. The operational guide system may also be used in a food production or preparation process in which, for example, the indicating lights may be projected onto sequentially required ingredients and may be timed depending upon when a particular ingredient is to be added. In like manner to a food production or preparation process, the operational guide system may also be configured for use in the production of non-edible chemical compositions such as welding fluxes, salves, creams, ointments, soaps, shampoos, drugs, and the like. It is envisioned that the guide system of the present invention may be suitable for other applications involving a step-by-step process by a human operator.

[0058] Still further, the operational guide system of the present invention may be used in connection with the cockpit of an airplane as a pilot checklist, with the control module adapted to receive, for example, information regarding the type of plane, duration of flight, and/or weather conditions. The operational guide system of the present invention may also be used in connection with multi-person choreographed activities, such as football plays, automobile racing pit stops, marching band numbers, and dance routines. Regarding football plays, for example, the control module may be programmed to direct multiple plays and adapted to receive information regarding a particular defense. Regarding automobile racing pit stops, for example, the control module may be adapted to receive information regarding the amount of fuel remaining in the race car, the number of laps left in the race, and/or the number of laps run using a particular set of tires. The operational guide system of the present invention may also be incorporated with a global positioning satellite (GPS) system adapted to provide positioning information to the control module whereby command signals may be output such that the directional light

devices provide geographical location direction guidance. Such a GPS incorporated operational guide system may be beneficial, for example, in guiding military operations.

[0059] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part or item or article present at a work station and to adapt or modify a command output based on the type or position of the part provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station and thereby improves throughput of the assembly line. The control module may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable in environments involving, for example, significant employee turnover and/or language and literacy barriers.

[0060] Changes and modifications in the specifically described embodiments can be carried out without departing from the principles of the present invention which is intended to be limited only by the scope of the appended claims, as interpreted according to the principles of patent law including the doctrine of equivalents.

## CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An operational guide system adapted to provide visual indicators to an individual to guide sequential actions, said operational guide system comprising:
  - at least one sensor apparatus, said at least one sensor apparatus operable to detect operation information and generate an output indicative of said operation information;
  - a controller, said controller receiving at least a first input signal indicative of said operation information and selectively providing at least one command signal in response to said first input signal; and
  - at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller.
2. The operational guide system of claim 1, wherein said at least one indicating light is provided to an operator performing an assembly action on a work piece at a work station.
3. The assembly guide system of claim 2, wherein said operation information comprises identification of a presence of a work piece at said work station.
4. The assembly guide system of claim 2, wherein said operation information comprises identification of a type of the work piece at said work station, and wherein said at least one command signal is selectively provided depending on the type of the work piece identified.
5. The assembly guide system of claim 2, wherein said at least one indicating light is projected at a component location, said component location retaining a part required for assembly to the work piece.
6. The assembly guide system of claim 2, wherein said at least one indicating light is projected at the work piece to indicate an operation step location.

7. The assembly guide system of claim 6, wherein said operation step location indicates where a component is to be assembled to the work piece.
8. The assembly guide system of claim 6, wherein said operation step location indicates where an operation step is to be performed by an operator.
9. The assembly guide system of claim 8, wherein said operation step comprises at least one step selected from the group consisting of a fastening step, a testing step, and a tool selection step.
10. The assembly guide system of claim 2, wherein said controller is adapted to receive at least one confirmation signal indicative of a completion of an assembly action, said at least one confirmation signal comprising at least one signal selected from the group consisting of a manually input signal and an automated input signal.
11. The assembly guide system of claim 10, wherein said manual input signal is transmitted by an operator in response to completion of an assembly action by the operator, and wherein said manual input signal is transmitted when the operator selectively actuates at least one selected from the group consisting of a foot pedal and a push button.
12. The assembly guide system of claim 10, wherein said automated input signal is transmitted by at least one of a machine vision system, a light curtain, and a confirmation sensor.
13. The assembly guide system of claim 2, wherein said at least one indicating light is produced by a laser.
14. The assembly guide system of claim 13, wherein said at least one indicating light is selectively configurable to form a pattern.
15. A method for guiding assembly actions by providing visual indicators, said method comprising:
  - identifying a characteristic of a work piece requiring assembly actions;

communicating identification information to a controller in response to the identifying of a characteristic of the work piece;  
communicating a first command signal to at least one directional light device in response to the identifying of a characteristic;  
selectively projecting at least one indicating light via the directional light device in response to the first command signal; and  
communicating a confirmation signal to the controller upon completion of a first operation step.

16. The method of claim 15, wherein identifying a characteristic of a work piece comprises identifying the presence of a work piece with a sensor apparatus.

17. The method of claim 16, including identifying the type of work piece requiring assembly actions.

18. The method of claim 15, wherein projecting at least one indicating light comprises projecting at least one indicating light toward at least one of a component location and an operation step location.

19. The method of claim 15, wherein projecting at least one indicating light comprises projecting at least one indicating light in a selectively configurable pattern.

20. The method of claim 15, wherein communicating a confirmation signal comprises communicating a confirmation signal from at least one selected from the group consisting of a manual input signal and an automated input signal.

21. The method of claim 15, including:

communicating a second command signal from the controller to the at least one directional light device in response to the confirmation signal;

projecting at least one indicating light from the directional light device in response to the second command signal; and

communicating a confirmation signal to the controller upon completion of a second operation step.

22. The method of claim 21 including:

- repeating said communicating a command signal;
- projecting at least one indicating light in response to said command signal; and
- communicating a confirmation signal until assembly actions for the work piece have been completed.

23. An operational guide system adapted to provide visual indicators to an individual to guide sequential actions, said operational guide system comprising:

- at least one sensor apparatus, said at least one sensor apparatus operable to detect operation information and generate an output indicative of said operation information;

- a controller, said controller receiving at least a first input signal indicative of said operation information and selectively providing at least one command signal in response to said first input signal; and

- at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller;

- said controller being programmable via a program screen displayable on a display device, said program screen including a plurality of input fields for entering and/or selecting indicia regarding sequential actions;

- said controller being further adapted to display at least one display screen on said display device during operation of said operational guide system, said display screen being adapted to display indicia regarding sequential actions to be performed.

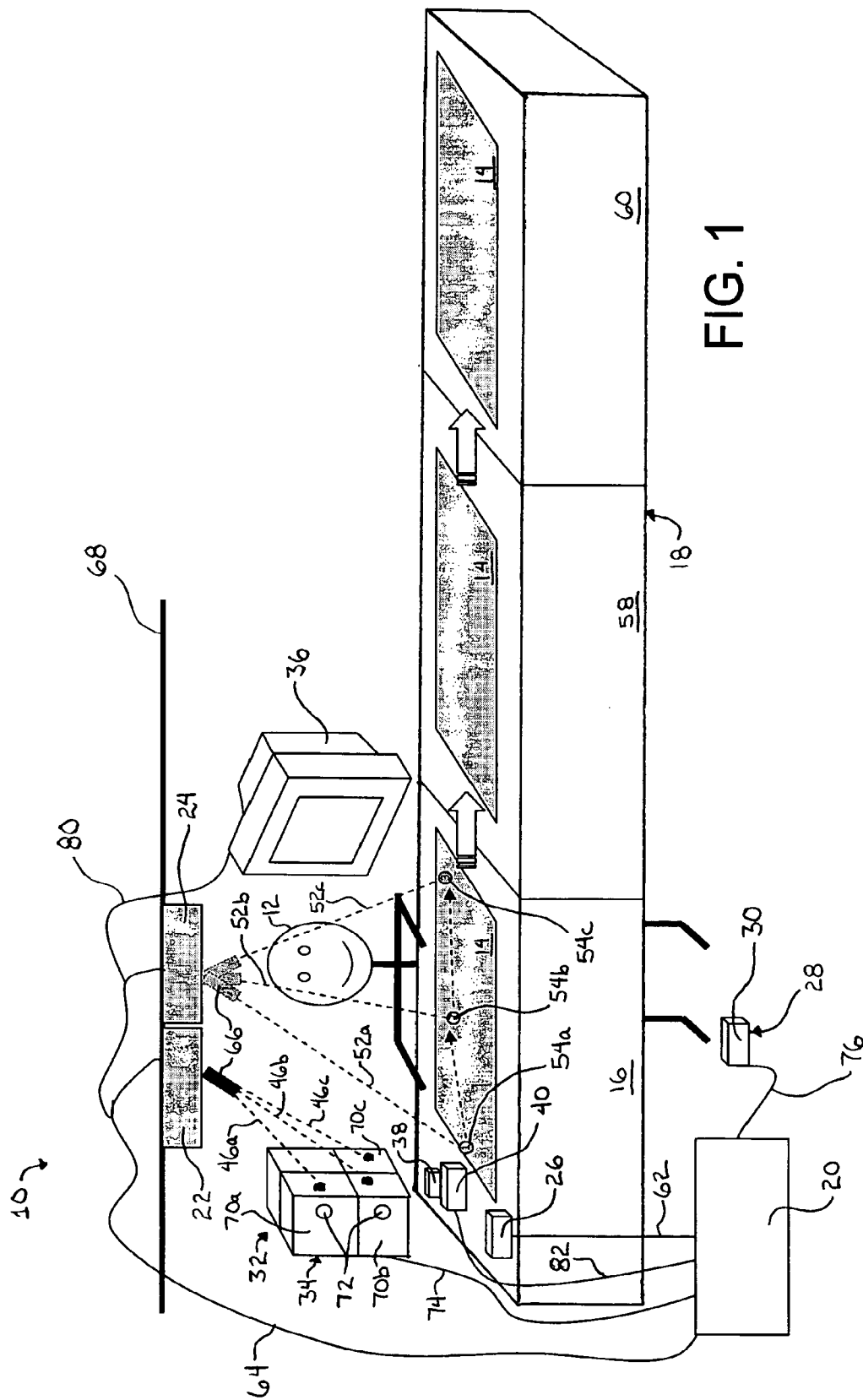


FIG. 1

Best Available Copy

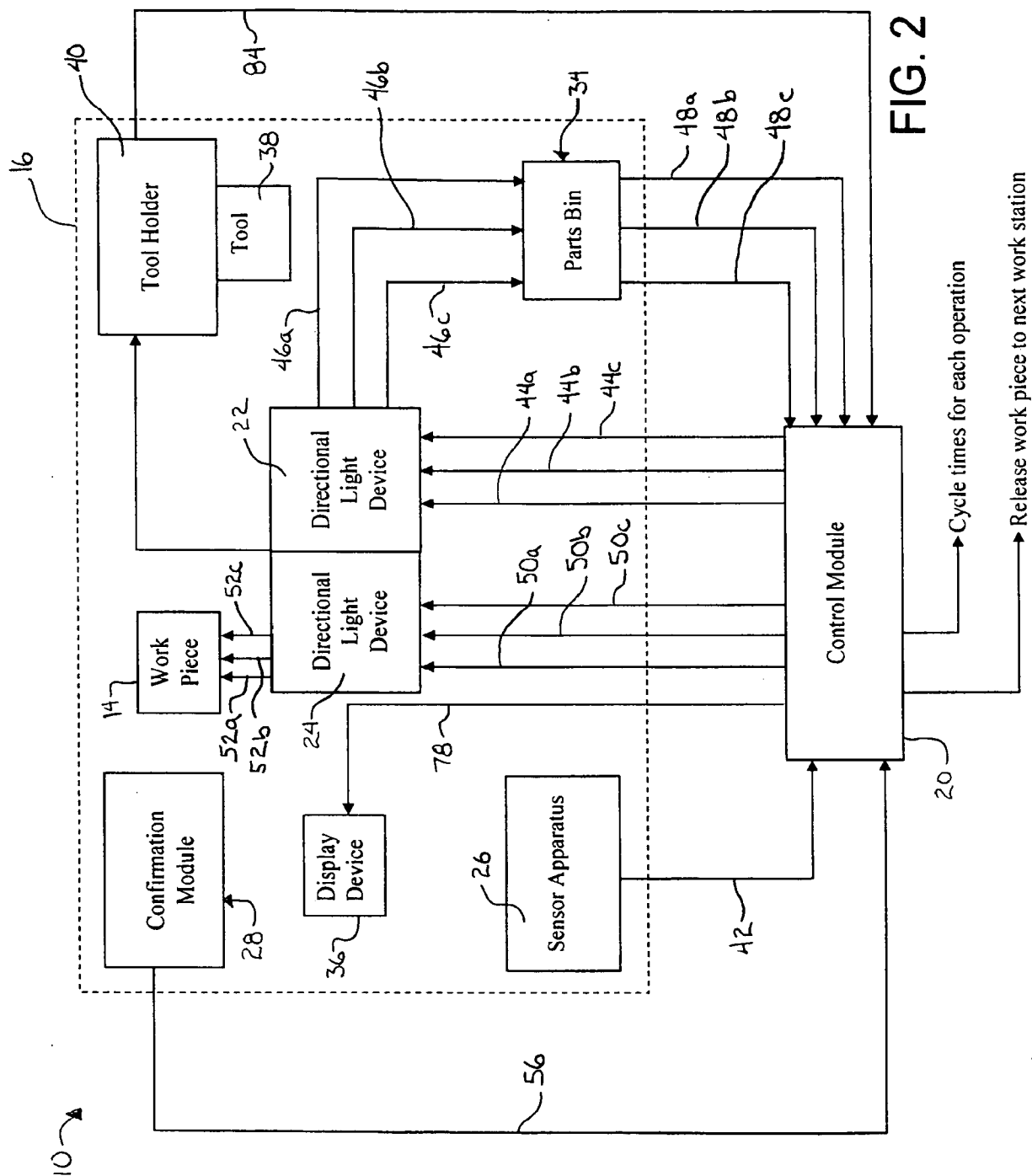


FIG. 2

Best Available Copy

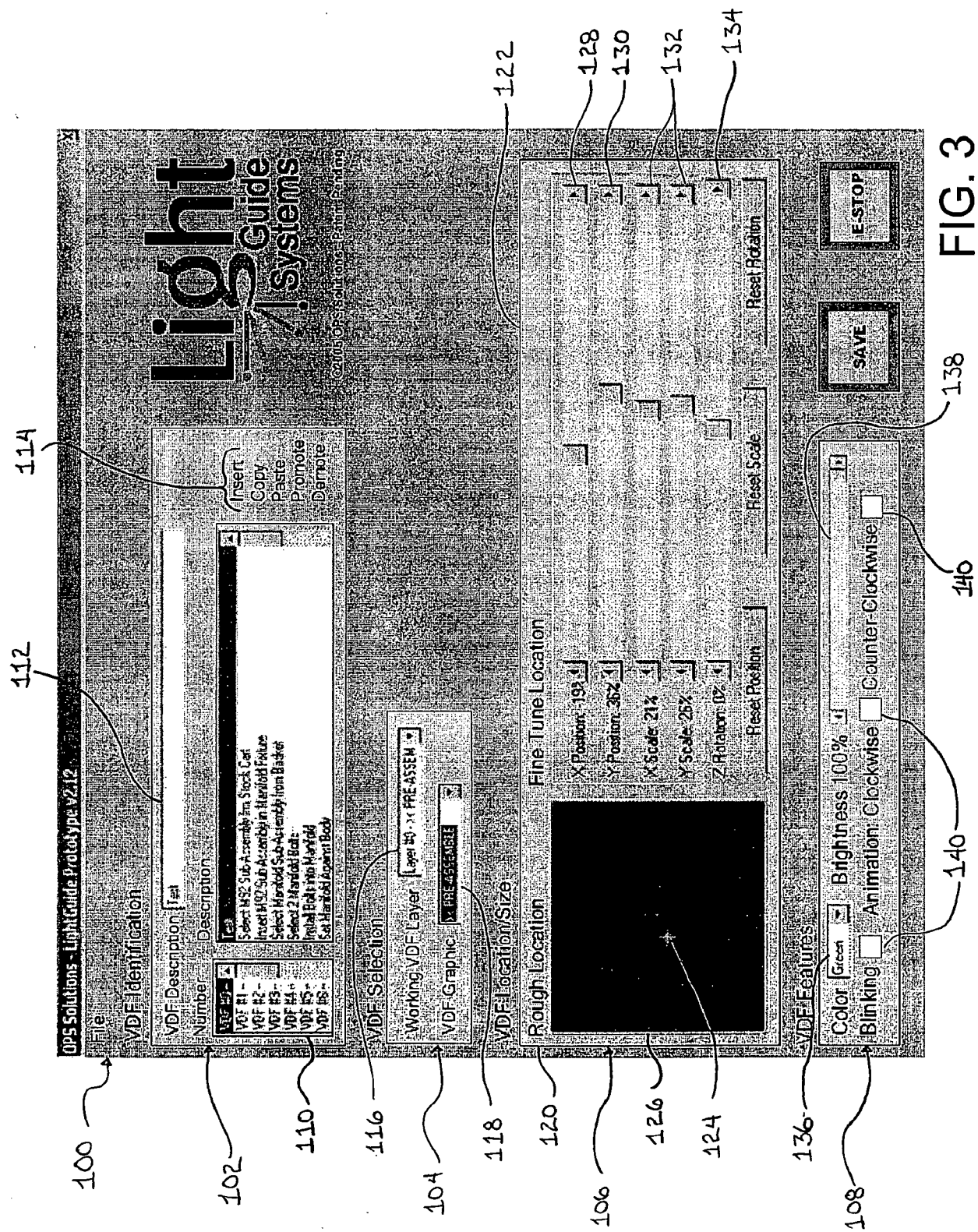


FIG. 3

Best Available Copy

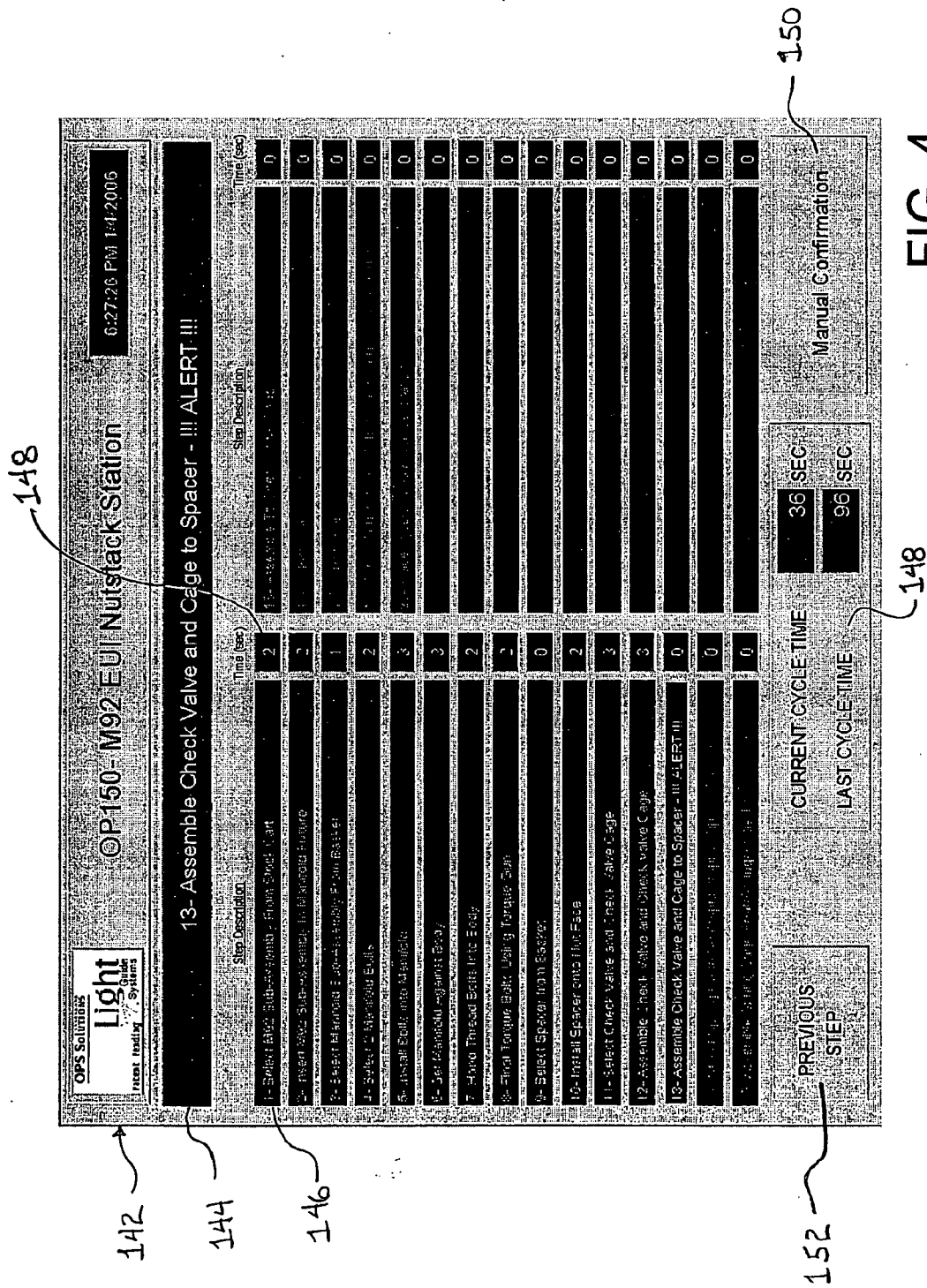


FIG. 4

Best Available Copy

[illegible]

**Best Available Copy**

## INVENTOR INFORMATION

Inventor One Given Name:: Paul  
Family Name:: Ryznar  
Postal Address Line One:: 49601 Deer Run Drive  
City:: Northville  
State or Province:: Michigan  
Country:: USA  
Postal or Zip Code:: 48167  
City of Residence:: Northville  
State or Province of Residence:: Michigan  
Country of Residence:: USA  
Citizenship Country:: USA

## CORRESPONDENCE INFORMATION

Correspondence Customer Number:: 28101  
Telephone One:: 616.975.5500  
Fax One:: 616.975.5505  
Electronic Mail One:: ondersma@vglb.com

## APPLICATION INFORMATION

Title Line One:: LIGHT GUIDED ASSEMBLY SYSTEM  
Total Drawing Sheets:: 5  
Formal Drawings?:: No  
Application Type:: Provisional  
Docket Number:: RYZ01 P-100A  
Secrecy Order in Parent Appl.?:: No

## REPRESENTATIVE INFORMATION

Representative Customer Number:: 28101  
Source:: PrintEFS Version 1.0.1

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2006/039215

International filing date: 06 October 2006 (06.10.2006)

Document type: Certified copy of priority document

Document details: Country/Office: US  
Number: 60/724,858  
Filing date: 07 October 2005 (07.10.2005)

Date of receipt at the International Bureau: 01 December 2006 (01.12.2006)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1545533

# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*November 20, 2006*

**THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.**

**APPLICATION NUMBER: 60/724,858**

**FILING DATE: *October 07, 2005***

**RELATED PCT APPLICATION NUMBER: *PCT/US06/39215***

**THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US60/724,858***



Certified by

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

Amazon Ex. 1002.0112

# PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No.

EV708293030US

## INVENTOR(S)

Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)
Paul	Ryznar	Northville, Michigan

☐ Additional inventors are being named on the \_\_\_\_\_ separately numbered sheets attached hereto

## TITLE OF THE INVENTION (500 characters max)

LIGHT GUIDED ASSEMBLY SYSTEM

Direct all correspondence to:

## CORRESPONDENCE ADDRESS

☒ Customer Number 28 101  
OR  
Type Customer Number here

Place Customer Number  
Bar Code Label here

☐ Firm or Individual Name Van Dyke, Gardner, Linn & Burkhart, LLP

Address 2851 Charlevoix Drive, S.E., Suite 207

Address

City Grand Rapids State MI ZIP 49546

Country USA Telephone 616.975.5500 Fax 616.975.5505

## ENCLOSED APPLICATION PARTS (check all that apply)

☒ Specification Number of Pages 19 ☐ CD(s), Number           
☒ Drawing(s) Number of Sheets 2 ☐ Other (specify)           
☒ Application Data Sheet. See 37 CFR 1.76

## METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☒ Applicant claims small entity status. See 37 CFR 1.27.  
☒ A check or money order is enclosed to cover the filing fees  
☒ The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account Number: 22 0190  
☐ Payment by credit card. Form PTO-2038 is attached.

FILING FEE  
AMOUNT (\$)

\$100.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.  
☐ Yes, the name of the U.S. Government agency and the Government contract number are: \_\_\_\_\_

Respectfully submitted,

SIGNATURE

Karl T. Ondersma

Date 10/07/2005

TYPED or PRINTED NAME Karl T. Ondersma

TELEPHONE 616.975.5500

REGISTRATION NO.  
(if appropriate)  
Docket Number:

55 894

RYZ01 P-100

## USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

**PATENT**  
**RYZ01 P-100**  
**Express Mail No. EV708293030US**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Paul Ryznar  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Customer No. : 28 101

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

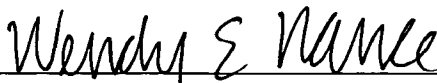
Dear Sir:

CERTIFICATE OF MAILING BY EXPRESS MAIL

I certify that the attached return postcard; Check (1) in the amount of \$100.00 (Provisional Patent Application Filing Fee – Small Entity); Provisional Application for Patent Cover Sheet (1 page, in duplicate); Bibliographic Data Sheet (1 page); Provisional Patent Application [19 pages of Specification and 2 Sheets of Drawings] are being deposited with the United States Postal Service as Express Mail in an envelope having Express Mail Label Number EV708293030US addressed to:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

on October 7, 2005.

  
\_\_\_\_\_  
Wendy E. Nance  
Van Dyke, Gardner, Linn & Burkhardt, LLP  
2851 Charlevoix Drive, S.E.  
P.O. Box 888695  
Grand Rapids, MI 49588-8695  
(616) 975-5500

KTO:wen  
RYZ01 P-100  
Enclosures

**LIGHT GUIDED ASSEMBLY SYSTEM**  
**BACKGROUND OF THE INVENTION**

[0001] The present invention is directed to a system for guiding an individual in the performance of operational steps, and in particular a system that provides visual indicators to the individual.

[0002] Numerous activities involve the performance of pre-designated operational steps to properly complete a particular task, with some such activities needing to be completed within a specified or standard time allowance. For example, in a manufacturing environment the selection and assembly of components to a work piece must be properly completed to satisfy the specified design criteria of the work piece. Numerous problems arise when such activities are improperly performed either from a workmanship standpoint and/or outside the standard time allowance. In the case of workmanship, if the problem is not discovered prior to shipment of the work piece, a failure in the field may occur that can result in significant warranty costs to the manufacturer. If the problem is discovered prior to shipment, the work piece may have to be scrapped or require re-work operations, both of which add significant and undesirable cost and complexity to the manufacturing operations. In the case of failure to meet a standard time allowance, the entire assembly process may become unbalanced resulting in costly bottlenecks, excess inventory, and additional workmanship risk.

[0003] Several methods of preventing the improper assembly of a work piece exist. One such method is the use of automated machine vision systems that utilize cameras to compare a work piece to the preprogrammed specification of a properly assembled work piece. Automated machine vision systems, however, are expensive and are highly customized such that they are only able to handle a limited assortment of work pieces. Other types of systems may involve human inspection of work piece products. Such systems inherently involve human error such that a higher degree of nonconforming parts may go undetected. Furthermore, when human inspection systems are constructed as separate "inspection stations" apart from the value added work operations, manufacturing costs are increased by allowing nonconforming work pieces to leave work stations.

[0004] In addition to manufacturing assembly operations, numerous other activities involve human performance of particular tasks that are desired to be performed without omitting any steps. Such activities include, by way of example only, the testing or measuring of various components, packaging products, preparation and production of food

and chemical goods, air flight checklist activities, and multi-person choreographed physical activities.

[0005] Therefore, a cost effective and flexible method of providing guidance to individuals performing tasks is desired whereby the occurrence of missed or improperly performed steps is reduced.

#### SUMMARY OF THE INVENTION

[0006] The present invention provides an operational guide system or assembly guide system adapted to provide visual indicators to an individual to guide sequential actions at a work location. According to one aspect of the present invention, an operational guide system comprises at least one sensor apparatus operable to detect operation information and generate an output indicative of the operation information, a controller receiving at least a first input signal indicative of the operation information and selectively providing at least one command signal in response to the first input signal, and at least one directional light device selectively operable to project and target at least one indicating light in response to the at least one command signal from the control module.

[0007] According to another aspect of the present invention, a method for guiding assembly actions by providing visual indicators includes identifying a characteristic of a work piece requiring assembly actions and communicating identification information to a controller in response to the identification of the presence of the work piece. The method further includes communicating a first command signal to at least one directional light device in response to the identification information and selectively projecting at least one indicating light via the directional light device in response to the first command signal. The method also includes communicating a confirmation signal to the control module upon completion of a first operation step.

[0008] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been fully completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part present at a work station provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station. The control module may also be used to monitor cycle times of the individual operational steps and combined operations

undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable in environments involving, for example, significant employee turnover and/or language and literacy barriers.

[0009] These and other objects, advantages, purposes, and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is an illustration of the operational guide system of the present invention constructed as an assembly guide system at a work station of an assembly line; and

[0011] FIG. 2 is a schematic illustration of the operation of the assembly guide system of FIG. 1.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] The present invention will now be described with reference to the accompanying figures, wherein the numbered elements in the following written description correspond to like-numbered elements in the figures. An operational guide system or assembly guide system 10 is illustrated in FIG. 1 in connection with the providing of visual indicators to an operator 12 performing one or more assembly actions on a work piece 14 at a work station 16 of an assembly line 18. The illustrated assembly guide system 10 includes a controller or a control module 20, two directional light devices 22, 24, a sensor apparatus 26, and a confirmation module or device or element 28, shown as a foot pedal 30. Assembly guide system 10 includes a component location 32, which is illustrated as a parts bin 34, a display device 36, and a tool 38 and tool holder 40. The system is operable, in response to an operation information or characteristic or identification information associated with work piece 14 detected by sensor apparatus 26, to selectively provide indicating lights 46, 52 to guide an operator in the selection and/or assembly of parts to work piece 14, with the indicating lights 46, 52 being directed and/or provided based on, at least in part, the operation information detected by sensor apparatus 26.

[0013] Referring to FIGS. 1 and 2, when work piece 14 initially enters work station 16, the sensor apparatus 26 detects an operation information or characteristic or identification information associated with the work piece 14, such as, for example, the presence of and/or the type of work piece 14 present at the work station 16. In response to the detection by sensor apparatus 26, a first input signal 42 is communicated or transmitted to

the control module 20 and, based on the detected or identified work piece 14 that the operator 12 is or will be working on, the control module 20 communicates or transmits a command signal 44 (FIG. 2) to directional light device 22 to project an indicating light 46 at a location on parts bin 34 to guide the operator 12 to a part required for a particular step in the assembly action. After the proper part has been selected, a confirmation signal 48 (FIG. 2) is sent to the control module 20, the control module 20 then transmits a command signal 50 (FIG. 2) to directional light device 24 to project indicating light 52 to indicate the operational step location 54 on the work piece 14 where the selected component is to be installed. Upon completion of a particular operation step, the operator 12 actuates the foot pedal 30 to transmit a confirmation signal 56 (FIG. 2) to the control module 20 verifying that the operation step has been completed. The control module 20 may then send another command signal 49, 50 to one of the directional light devices 22, 24 to indicate the next operation step, or may release the work piece 14 to a subsequent work station 58, 60 for further operations if all required pick and assembly steps have been properly completed.

[0014] Assembly guide system 10 is able to provide visual indicators to operator 12 that are specific to a particular work piece 14 such that, for example, multiple different styles or types of work pieces requiring different components or parts may be processed at work station 16 with a significant reduction in the risk of the occurrence of assembly errors. The assembly guide system 10 thus provides a cost effective and accurate method of guiding an operator 12 through a series of tasks and provides confirmation that the tasks have been fully accomplished and completed in the proper order. Furthermore, the ability of the assembly guide system 10 to identify/recognize the presence and/or type of work piece 14 present at the work station 16 provides a flexible system that enables different types or models of work pieces to be processed at a particular work station 16, as well as provide notification to an operator 12 of the presence of the work piece 14 at the work station 16 and thereby improves throughput of the assembly line 18. The control module 20 may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station 16 for system productivity reporting, or the like.

[0015] Assembly guide system 10 is shown in FIG. 1 in connection with work station 16, where work station 16 is part of an assembly line 18 that includes additional work stations 58, 60 for performing subsequent operations. Although not shown, it should be appreciated that additional assembly guide systems could be included at the other work

stations of assembly line, or that a single assembly guide system could be used to aid operations at more than one work station. Assembly line 18 may be constructed to transport work pieces 14 in an automatic fashion, such as by known chain, belt, or roller conveyors, or may require work pieces 14 to be manually moved by sliding rails, rollers, or the like. In addition, depending on the type of work piece and assembly line involved, the work pieces may be supported on a frame, tray, pallet, or the like, or may be supported directly on the assembly line.

[0016] As noted, sensor apparatus 26 functions to detect an operation information or characteristic or identification information associated with work piece 14, such as the presence and/or type of work piece 14 located at the work station 16, and may be constructed as one or more of a number of known sensors such as, for example, a proximity switch, light curtain, photo eye, radio frequency identifier device, bar code reader, or the like. When constructed as a radio frequency identifier device or bar code reader, a readable tag or bar code may be placed on either the work piece or the structure upon which the work piece is supported while traveling on the assembly line. The tag or bar code may contain information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. A scanner or reader may be mounted to the assembly line, such as to framework of the assembly line, with the scanner being able to read the information from the tag or bar code when the work piece enters the work station. Alternatively, an operator may manually enter a part type into the system

[0017] It should be appreciated, however, that the type of part present at a particular work station need not be determined using a bar code or radio frequency system. For example, and as is known in the art, standard binary type sensors may be used to detect geometrically distinguishing features of a work piece or the structure upon which it is located to “identify” the work piece. Alternatively, the sensor apparatus could include multiple components whereby one component would detect the presence of a work piece and another could detect the type of work piece. Still further, an assembly guide system could be constructed in accordance with the present invention where an operator uses a hand held scanner to scan a bar code label affixed to the work piece or the structure supporting the work piece as opposed to the scanner being mounted directly to the assembly line. The sensor apparatus may also be used to detect the relative orientation of a work piece with respect to the work station, with the control module adapted to receive the positional information and provide accordingly adjusted command signals to the

directional light devices such that the projected indicating lights accurately impinge on the desired operational step locations.

[0018] Control module 20, in the illustrated embodiment, is a computer controller device and as indicated is adapted to receive and send various signals to monitor and guide the assembly actions at work station 16. Control module 20 may be constructed as a desktop or laptop style PC, a PLC, or the like, or may be a networked computer system that may be used to control and monitor other aspects of the assembly line and work stations. It should be understood, however, that the control module may alternatively comprise a combination of interacting computer devices and still function as intended within the scope of the present invention. For example, a local computer device present at a particular work station may be adapted to receive and provide communication information with a network computer system associated with an assembly line.

[0019] As previously indicated, control module 20 is adapted to receive a first input signal 42 regarding identification information of the work piece present at the work station. In the illustrated embodiment of FIG. 1, the first input signal 42 is transmitted to the control module 20 directly from the sensor apparatus 26 along communication link 62, where link 62 is a computer cable, fiber optic line, or the like. Alternatively, however, a first input signal may be transmitted to a network computer system and, in response to the first input signal, the network system may provide the control module with the identification information regarding the work piece present at the work station. The identification information, as previously indicated, may simply indicate the presence of a part at the work station and/or may include information regarding the type of work piece at the work station, such as the model of the work piece, measurements related to the work piece, or the type of components required. Optionally, a sensor apparatus and control module may be alternatively constructed to wirelessly transmit and receive identification information such as the type, location, dimensions, or the like, of the work piece present at the work station without a link 62, such as via RF, IR, etc. communication.

[0020] In response to the first input signal 42 received, the control module 20 outputs command signals 44, 50 to directional light devices 22, 24 along link 64 to provide visual indicators to the operator, as described in more detail below, with the command signals 44, 50 being communicated based on, at least in part, the first input signal 42. In the illustrated embodiment, two substantially similar directional light devices 22, 24 are provided at work station 16 and are responsive to the command signals 44, 50 of the control module 20. Directional light device 22 is used to project indicating lights 46 at the

component location 32, which the other directional light device 24 is used to project indicating lights 52 at operational step locations 54 on work piece 14. Each directional light device 22, 24 includes a light source 66 for projecting indicating lights 46, 52, with the directional light devices 22, 24 constructed such that the indicating lights 46, 52 may be selectively and movably positionable to direct the indicating light 46, 52 at pre-targeted locations. The light sources 66 may also be constructed to provide an indicating light beam of selectively adjustable brightness to compensate for ambient surroundings and/or the distance from the light source to the selected impingement point. Although light sources 66 are illustrated in FIG. 1 as projecting a single indicating light beam, it should also be appreciated that light sources 66 may be constructed to simultaneously project two or more beams such that, for example, multiple parts may be indicated for selection from location 32 by the operator 12 or multiple assembly locations may be indicated. In the illustrated embodiment, light sources 66 are constructed as laser light sources that are able to project a focused, coherent beam of light at a desired location. Alternatively, light sources other than lasers may be used and still function as intended without affecting the scope of the present invention, such as incandescent lights, light emitting diodes (LEDs), or the like.

[0021] In the illustrated embodiment, directional light devices 22, 24 are mounted to a mounting structure 68 to retain the directional light devices 22, 24 in a pre-determined and positively located orientation relative to the work station 16. The mounting structure 68 may comprise framework of the work station 16 or assembly line 18, or may be a structural element of the building, such as the roof or a wall, or may even be a separate stand, post, or pole.

[0022] Directional light devices 22, 24 may use controllable servo motors for movably positioning light sources 66 to selectively direct the indicating light 46, 52 in response to the command signal 44, 50 transmitted by the control module 20. Alternatively, directional light devices 22, 24 may include optical manipulation devices, such as adjustable mirrors, that function to selectively and movably position the projected indicating lights 46, 52 at the desired locations. Still further, directional light devices 22, 24 may employ robotics to selectively position the light sources 66, with the robotics comprising robotic gantry or XYZ type arms, or the like.

[0023] Light sources 66 may be constructed such that they produce light of differing color from each other to provide further visual cues to the operator 12 while working at work station 16. For example, as illustrated in FIG. 1 the indicating light 46 produced by light

source 66 of directional light device 22 may be used to project light at component location 32 and may be of a first color, and the indicating light 52 produced by light source 66 of directional light device 24 may be used to project light at operational step locations 54 on work piece 14 and be of a second color. In such an embodiment, the differing colors serve as a further visual indicator or cue to the operator 12 with one color representing part selection and the other color representing the location where the selected part is to be assembled.

[0024] The directional light devices 22, 24 may also include known optical effect devices for fanning or adapting or configuring the projected indicating lights 46, 52 produced by the light sources 66 into a desired shape, pattern, or form at the point or location at which the indicating light 46, 52 impinges the component location 32 or operational step location 54. For example, the indicating light may initially be projected as a geometric shape, such as a circle, about a particular location to quickly attract the operator's attention, and then focus to a point or circle of smaller diameter at the specific location. The indicating light may also be projected to produce alpha numeric characters. For example, sequential numbers may be projected where each number indicates a step in the assembly action being preformed by the operator at the work station, or part numbers or textual information may be projected to provide written guidance to the operator.

[0025] As previously noted, indicating lights 46, 52 may be projected at component location 32 or at operation step locations 54 associated with work piece 14. Component location 32 is exemplified as a parts bin 34 having multiple storage locations 70 for holding various parts required in the assembly of work pieces 14. As shown, directional light device 22 is functional to selectively project an indicating light 46 at discrete storage locations 70 of parts bin 34 in response to command signal 44 to prompt the operator 12 regarding part selection.

[0026] In the illustrated embodiment of FIG. 1, storage locations 70 of parts bin 34 include detection devices 72 that are intended to detect or sense when a component has been withdrawn from a particular storage location 70. Detection devices 72 may be of known construction and are selected based on a particular application, taking into consideration the types or models of work pieces 14 and parts to be assembled. Detection devices 72, for example, may comprise light curtains, proximity sensors, electronic mats, such as pressure sensitive mats, machine vision systems, or the like.

[0027] The detection devices 72 are operable to transmit a confirmation signal 48 to the control module 20 along link 74 upon selection by the operator 12 of a part from a

particular storage location 70, with control module 20 being functional to determine whether or not the operator 12 has selected the correct part as prompted. In response to the confirmation signal 48, if the operator 12 selected the proper part as directed by the indicating light 46, control module 20 may terminate the indicating light 46 projecting from directional light device 22 at the storage location 70 and transmit a subsequent command signal 50 to directional light device 24 to project an indicating light 52 to the operational step location 54 on the work piece 14 where the just selected part is to be assembled. However, if control module 20 determines that an incorrect part has been selected as compared to what should have been selected as prompted by the indicating light 46, control module 20 will not provide the subsequent command signal 50. In addition, control module 20 may be constructed to provide a visual or audible signal to the operator 12 when an improper part has been selected from a storage location 70. For example, although not illustrated, control module may prompt a visible alert, such as a red warning light mounted in the vicinity of the operator, to activate or illuminate, or may cause an audible alert, such as a warning alarm or buzzer to sound.

[0028] Although not illustrated, the parts bin may additionally employ a known pick-to-light system whereby each storage location includes an illumination device, such as an LED light or the like, that lights up to prompt the operator as to the proper storage location from where a part is to be selected. When the assembly guide system of the present invention includes such a pick-to-light system, the directional light device 24 used to project an indicating light 46 at a component location 32 may optionally be excluded.

[0029] As noted above, assembly guide system 10 includes confirmation module 28, which in the illustrated embodiment is a foot pedal 30. Confirmation module 28 is constructed to transmit a confirmation signal 56 along link 76 to control module 20 to signal that the operational step indicated by directional light device 22 or 24 has been completed. To transmit the confirmation signal 56, operator 12 simply depresses foot pedal 30 upon completion of the directed activity. The confirmation signal 56 transmitted by foot pedal 30 then triggers control module 20 to selectively transmit another command signal 44, 50 to provide guidance to the operator 12 regarding the subsequent operational step that must be taken by the operator 12 at the work station 16 in accordance with work piece 14. For example, the assembly guide system 10 may cause an indicating light 46 to be projected at a storage location 70 for the next required part. Alternatively, the control module 20 may provide a command signal that releases the work piece to the next work

station 58 if all of the operational steps at the current work station 16 have been completed.

[0030] Although illustrated as a foot pedal 30, it should be understood that numerous alternative confirmation modules 28 may be utilized and still function as intended within the scope of the present invention. For example, confirmation module 28 may be constructed as a pressure sensitive mat, push button, toggle switch, palm button, light curtain, touch screen, touch pad, or the like, which is constructed to be depressed, switched, or otherwise activated by a manual action of the operator 12. Confirmation module 28 may also be constructed as a wireless transmitter, such as a transmitter that an operator may carry by affixing to his or her belt, or the like, thereby eliminating the need for a physical link.

[0031] Still further, a confirmation module or device or element may be constructed to automatically detect when an operator has completed an assembly step. For example, a confirmation module may be constructed as a vision system that is able to detect the presence or absence of a component at a location, such as by processing an image captured by a pixilated imaging device, as is known in the art. Alternatively, for example, the confirmation module may be constructed as a proximity sensor, photo eye, light curtain, or the like, constructed to automatically detect the presence or absence of a part upon assembly to the work piece. Still further, a confirmation signal may be transmitted by an automated tool or measuring device, as described in more detail below. In which case, the automated tool or measuring device may function as a confirmation module.

[0032] Assembly guide system 10 also includes a display device 36 that is able to receive display signals 78 (FIG. 2) along link 80 (FIG. 1) from control module 20 and to relay information to the operator 12. Display device 36 may be constructed as a television, LCD, LED device, or other type of viewable display mechanism. Display device 36 may be used to present information to the operator 12 such as, for example, work instructions associated with the work station 16, images of a work piece 14 properly affixed with the part that is to be assembled, information regarding a missed or improperly performed assembly step, or the like. It should be understood, however, that an assembly guide system may be constructed without a display device and still function as intended within the scope of the present invention.

[0033] Optionally, assembly guide system 10 may be used in connection with a tool 38 and a tool holder 40. Tool 38 may comprise, for example, a manual tool such as a wrench, torque wrench, pliers, screwdriver, or the like, or may be an automated tool such as an

electric screwdriver, air gun, electric torque wrench, or the like. Tool 38 may otherwise be a manual or automated measuring device such as calipers, a gauge block, feeler gauges, air gauge device, or the like. Tool holder 40 is intended to provide a storage location for tool 38 when tool 38 is not in use. Directional light devices 22, 24 may project an indicating light onto tool 38 and/or tool holder 40 in response to a command signal when tool 38 is required to complete a pending operational step, such as in a similar manner as described above with respect to storage locations 70 of parts bin 34 and operation step locations 54 on work piece 14. Tool holder 40 may include a sensor and thereby be integrated with the assembly guide system 10 to detect when tool 38 is positioned within or removed from tool holder 40, where the sensor may be a photo eye, proximity switch, light curtain, or the like. In such an embodiment, as illustrated, tool holder 40 may be in communication with control module through link 82 (FIG. 1) such that a confirmation signal 84 (FIG. 2) may be transmitted from tool holder 40 to control module 20 to indicate that operator 12 has properly selected the tool 38 as prompted.

[0034] Although not illustrated, the assembly guide system may utilize an automated gauge or tool that is electrically linked to control module such that control module is able to monitor both the use of the tool as well as an operational parameter associated with the tool, without affecting the scope of the present invention. For example, if a tool is constructed as a torque wrench, the control module may be constructed to monitor the fastening torque obtained by the torque wrench and to compare the value to a preprogrammed or predetermined or threshold value prior to transmitting a subsequent command signal. The control thus may function to transmit the subsequent command signal only after the desired or appropriate torque has been applied by the torque wrench. Similarly, if the tool is constructed as a measuring device, such as digital calipers, control module may be constructed to receive a measurement value, and may compare the measurement value to a threshold measurement value, and may communicate or transmit the subsequent command signal when the measurement value is at or near the threshold measurement value.

[0035] It should also be appreciated that a tool holder may be alternatively constructed as a holding device adapted to receive a marking device or a container of adhesive, lubricant, cleaner, or other holder of other suitable or useful elements or devices or materials, or the like that may be used in the process steps at a work station.

[0036] Control module 20 is illustrated as transmitting command signal 44a to directional light device 22, which in response to command signal 44a, projects indicating light 46a on

storage location 70a of parts bin 34. Upon receiving confirmation signal 48a from detection device 72 signifying that the proper part was selected, control module 20 then terminates projection of indicating light 46a and transmits command signal 50a to directional light device 24 such that indicating light 52a is projected on operational step location 54a on work piece 14 to direct operator 12 as to the proper assembly point for the selected part. Operator 12 then activates foot pedal 30 (or other confirmation device), which transmits confirmation signal 56a to control module 20 and the above process is repeated for indicating lights 46b, 52b, 46c, 52c, storage locations 70b, 70c, and operational step locations 54b, 54c.

[0037] The control module 20 and directional light devices 22, 24 of the assembly guide system 10 are programmed as to the proper spatial positioning to where an indicating light 46, 52 is to be projected. This teaching of the assembly guide system 10 may be accomplished in various ways. For example, one teaching method involves the use of known pendant device technology, where the pendant device is used to position the projected beam of the light source 66 to a proper location, such as a storage location 70, record the coordinates, and then move to the next location, such as onto the work piece 14. Alternatively, a wireless transmitter may be used that may be positioned at a desired impingement point of the projected indicating light 46, 52 and functional to transmit the spatial positioning information to the control module. Still further, control module 20 may be directly programmed and, for example, may utilize a touch screen having an image of the work station with the control module 20 being programmable using the touch screen.

[0038] As previously noted, control module 20 may also be used to monitor and record various parameters useful for improving productivity. For example, control module 20 may record cycle times of the individual operational steps at a work station 16 and/or the combined cycle time of operations at a work station 16. Such information is beneficial for balancing cycle times on the assembly line 18 to provide even work flow and for monitoring operator performance. The control module 20 may also be used to monitor and record the duration of time between a work piece 14 exiting a work station 16 and the next work piece entering the work station 16, which is useful for calculating the downtime of a given work station to focus efforts on upstream operations. In addition, the control module 20 may be used to monitor and record the duration of time a work piece is not able to exit a work station upon completion of all assembly actions at a particular work station due to a blocked or slower downstream operation.

[0039] It should be appreciated that numerous alternative structures and methods are contemplated within the scope of the operational guide system of the present invention. For example, an operational guide system need only utilize a single directional light device for projecting indicating lights at both a component location as well as operational step locations on a work piece. An operational guide system also need not employ a component location, but rather may employ one or more tools with directional light devices functioning to project indicating lights at the various tools. Furthermore, it should also be appreciated that the assembly guide system 10 of FIGS. 1 and 2 may be alternatively constructed whereby the various links are not formed by computer cables or the like, but are rather formed as wireless connections between the various devices. Still further, each assembly step need not involve both the selection of a part and the assembly of the part to a work piece.

[0040] It should also be appreciated that the operational guide system of the present invention may be configured for use with a stand alone work station as opposed to a work station integrated into an assembly line as shown in FIG. 1. For example, an operational guide system may be constructed as a stand alone testing or gauging station using multiple tools formed as testing devices, such as air leak testers or the like, or gauges that are used to evaluate one or more characteristics, parameters, or dimensions of a work piece.

[0041] Although the operational guide system of the present invention is discussed above in regard to assembly operations and testing operations, it should also be appreciated that numerous alternative uses and/or configurations of the operational guide system of the present invention exist. For example, an operational guide system may be used to pick and package products into a shipping container, such as a bag or box, for fulfilling an order. In such an embodiment, the shipping container may be associated with a bar code order number that would provide information to the control module as to the particular products needed for filling the order. The operational guide system may also be used in a food production or preparation process in which, for example, the indicating lights may be projected onto sequentially required ingredients and may be timed depending upon when a particular ingredient is to be added. In like manner to a food production or preparation process, the operational guide system may also be configured for use in the production of non-edible chemical compositions such as welding fluxes, salves, creams, ointments, soaps, shampoos, drugs, and the like. It is envisioned that the guide system of the present invention may be suitable for other applications involving a step-by-step process by a human operator.

[0042] Still further, the operational guide system of the present invention may be used in connection with the cockpit of an airplane as a pilot checklist, with the control module adapted to receive, for example, information regarding the type of plane, duration of flight, and/or weather conditions. The operational guide system of the present invention may also be used in connection with multi-person choreographed activities, such as football plays, automobile racing pit stops, marching band numbers, and dance routines. Regarding football plays, for example, the control module may be programmed to direct multiple plays and adapted to receive information regarding a particular defense. Regarding automobile racing pit stops, for example, the control module may be adapted to receive information regarding the amount of fuel remaining in the race car, the number of laps left in the race, and/or the number of laps run using a particular set of tires. The operational guide system of the present invention may also be incorporated with a global positioning satellite (GPS) system adapted to provide positioning information to the control module whereby command signals may be output such that the directional light devices provide geographical location direction guidance. Such a GPS incorporated operational guide system may be beneficial, for example, in guiding military operations.

[0043] The operational guide system of the present invention thus provides a cost effective and accurate method of guiding an individual through a series of tasks and provides confirmation that the tasks have been completed in the proper order. The operational guide system is useful in a wide array of applications, such as assembly, packaging, process preparation, and the like. Furthermore, the ability of the assembly guide system to recognize the presence, type, and/or relative position of a part or item or article present at a work station and to adapt or modify a command output based on the type or position of the part provides a flexible system that enables different types or models of parts to be processed at a particular work station, as well as provide notification to an operator of the presence of a work piece at the work station and thereby improves throughput of the assembly line. The control module may also be used to monitor cycle times of the individual operational steps and combined operations undertaken at the work station, and to confirm that a proper part has been selected by an operator prior to proceeding to the next operational step. The operational guide system also provides an effective means of training individuals with regard to various activities, which is desirable in environments involving, for example, significant employee turnover and/or language and literacy barriers.

**[0044]** Changes and modifications in the specifically described embodiments can be carried out without departing from the principles of the present invention which is intended to be limited only by the scope of the appended claims, as interpreted according to the principles of patent law including the doctrine of equivalents.

## CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An operational guide system adapted to provide visual indicators to an individual to guide sequential actions, said operational guide system comprising:

at least one sensor apparatus, said at least one sensor apparatus operable to detect operation information and generate an output indicative of said operation information;

a controller, said controller receiving at least a first input signal indicative of said operation information and selectively providing at least one command signal in response to said first input signal; and

at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller.

2. The operational guide system of claim 1, wherein said at least one indicating light is provided to an operator performing an assembly action on a work piece at a work station.

3. The assembly guide system of claim 2, wherein said operation information comprises identification of a presence of a work piece at said work station.

4. The assembly guide system of claim 2, wherein said operation information comprises identification of a type of the work piece at said work station, and wherein said at least one command signal is selectively provided depending on the type of the work piece identified.

5. The assembly guide system of claim 2, wherein said at least one indicating light is projected at a component location, said component location retaining a part required for assembly to the work piece.

6. The assembly guide system of claim 2, wherein said at least one indicating light is projected at the work piece to indicate an operation step location.

7. The assembly guide system of claim 6, wherein said operation step location indicates where a component is to be assembled to the work piece.
8. The assembly guide system of claim 6, wherein said operation step location indicates where an operation step is to be performed by an operator.
9. The assembly guide system of claim 8, wherein said operation step comprises at least one step selected from the group consisting of a fastening step, a testing step, and a tool selection step.
10. The assembly guide system of claim 2, wherein said controller is adapted to receive at least one confirmation signal indicative of a completion of an assembly action, said at least one confirmation signal comprising at least one signal selected from the group consisting of a manually input signal and an automated input signal.
11. The assembly guide system of claim 10, wherein said manual input signal is transmitted by an operator in response to completion of an assembly action by the operator, and wherein said manual input signal is transmitted when the operator selectively actuates at least one selected from the group consisting of a foot pedal and a push button.
12. The assembly guide system of claim 10, wherein said automated input signal is transmitted by at least one of a machine vision system, a light curtain, and a confirmation sensor.
13. The assembly guide system of claim 2, wherein said at least one indicating light is produced by a laser.
14. The assembly guide system of claim 13, wherein said at least one indicating light is selectively configurable to form a pattern.
15. A method for guiding assembly actions by providing visual indicators, said method comprising:
  - identifying a characteristic of a work piece requiring assembly actions;

communicating identification information to a controller in response to the identifying of a characteristic of the work piece;

communicating a first command signal to at least one directional light device in response to the identifying of a characteristic;

selectively projecting at least one indicating light via the directional light device in response to the first command signal; and

communicating a confirmation signal to the controller upon completion of a first operation step.

16. The method of claim 15, wherein identifying a characteristic of a work piece comprises identifying the presence of a work piece with a sensor apparatus.

17. The method of claim 16, including identifying the type of work piece requiring assembly actions.

18. The method of claim 15, wherein projecting at least one indicating light comprises projecting at least one indicating light toward at least one of a component location and an operation step location.

19. The method of claim 15, wherein projecting at least one indicating light comprises projecting at least one indicating light in a selectively configurable pattern.

20. The method of claim 15, wherein communicating a confirmation signal comprises communicating a confirmation signal from at least one selected from the group consisting of a manual input signal and an automated input signal.

21. The method of claim 15, including:

communicating a second command signal from the controller to the at least one directional light device in response to the confirmation signal;

projecting at least one indicating light from the directional light device in response to the second command signal; and

communicating a confirmation signal to the controller upon completion of a second operation step.

22. The method of claim 21 including:

- repeating said communicating a command signal;
- projecting at least one indicating light in response to said command signal; and
- communicating a confirmation signal until assembly actions for the work piece have been completed.

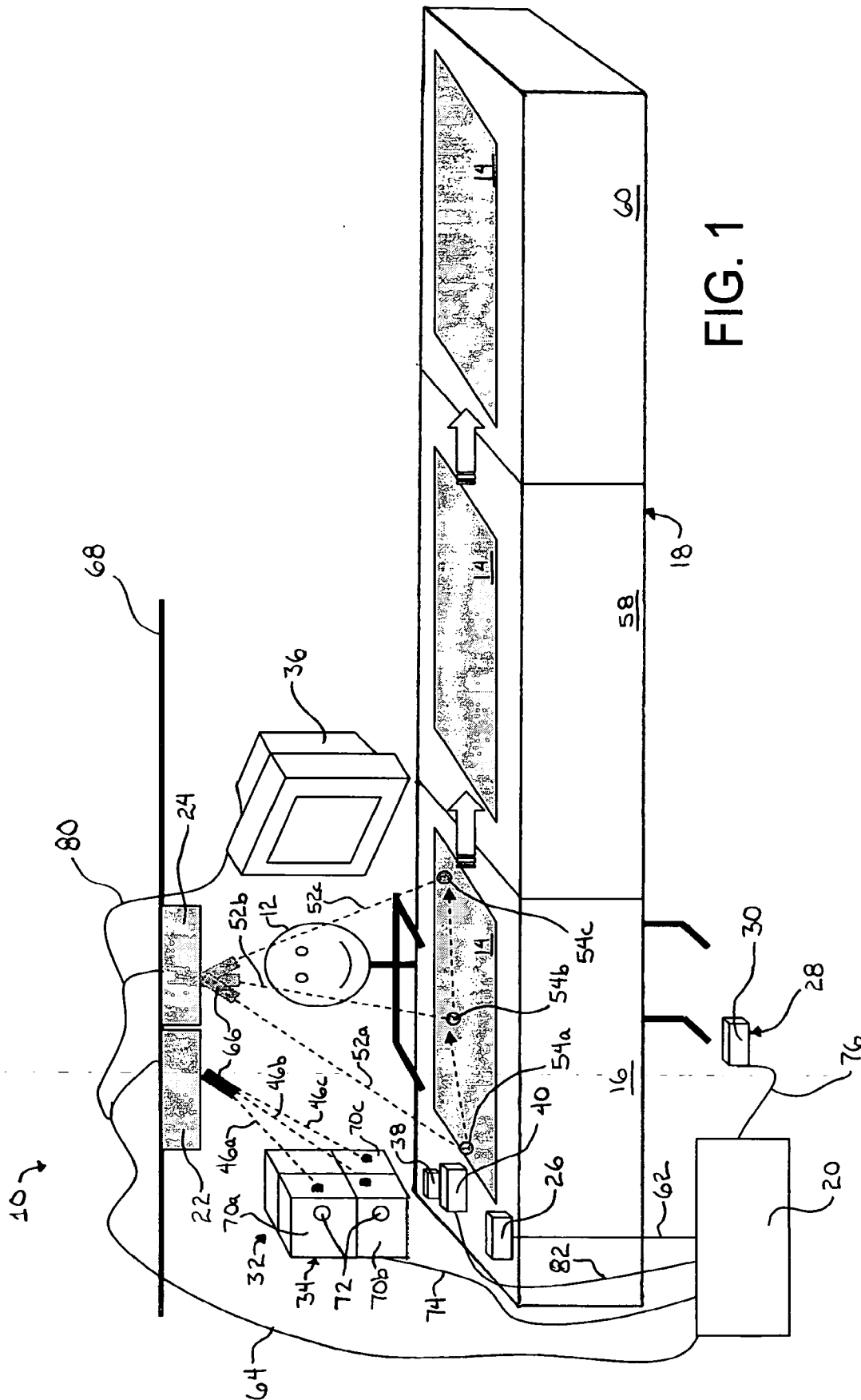
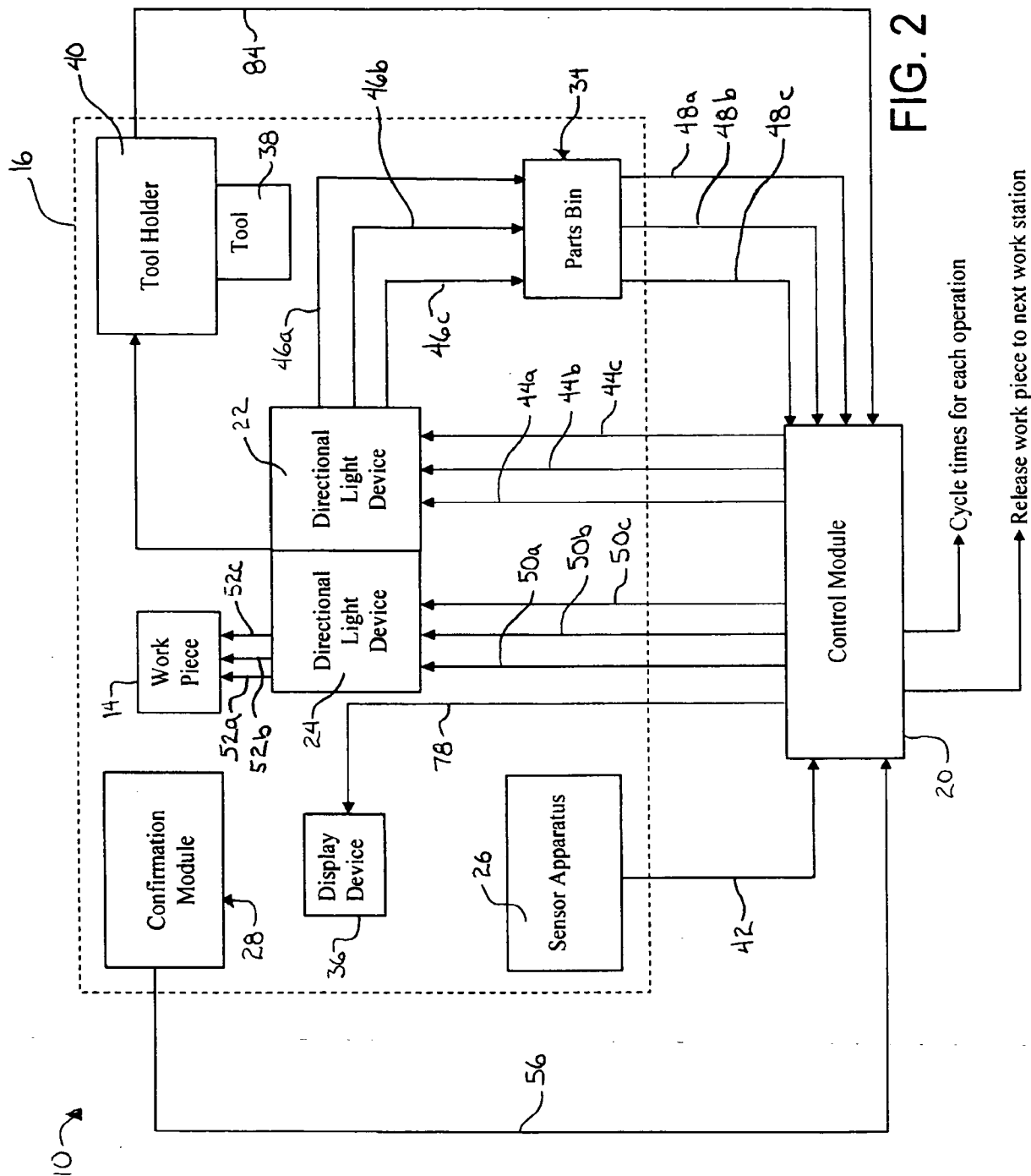


FIG. 1



**FIG. 2**

## INVENTOR INFORMATION

Inventor One Given Name:: Paul  
Family Name:: Ryznar  
Postal Address Line One:: 49601 Deer Run Drive  
City:: Northville  
State or Province:: Michigan  
Country:: USA  
Postal or Zip Code:: 48167  
City of Residence:: Northville  
State or Province of Residence:: Michigan  
Country of Residence:: USA  
Citizenship Country:: USA

## CORRESPONDENCE INFORMATION

Correspondence Customer Number:: 28101  
Telephone One:: 616.975.5500  
Fax One:: 616.975.5505  
Electronic Mail One:: andersma@vglb.com

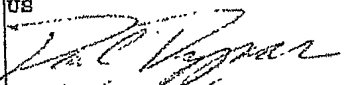
## APPLICATION INFORMATION

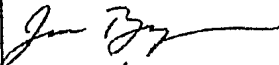
Title Line One:: LIGHT GUIDED ASSEMBLY SYSTEM  
Total Drawing Sheets:: 2  
Formal Drawings?:: Yes  
Application Type:: Provisional  
Docket Number:: RYZ01 P-100  
Secrecy Order in Parent Appl.?:: No

## REPRESENTATIVE INFORMATION

Representative Customer Number:: 28101  
Source:: PrintEFS Version 1.0.1

VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

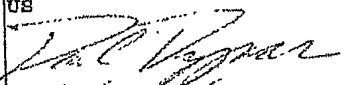
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

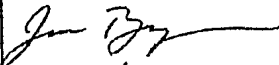
VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

VIII-2-1	<b>Declaration: Entitlement to apply for and be granted a patent</b> Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis 1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate: Name (LAST, First)	<b>in relation to this international application</b>  OPS SOLUTIONS LLC is entitled to apply for and be granted a patent by virtue of the following:
VIII-2-1(i v)		an assignment from RYZNAR, Paul to OPS SOLUTIONS LLC, dated 04 October 2006 (04.10.2006)
VIII-2-1(i v)		an assignment from RYZNAR, James to OPS SOLUTIONS LLC, dated 04 October 2006 (04.10.2006)

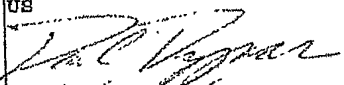
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

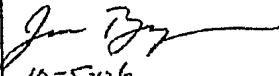
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First, Last)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

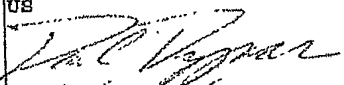
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

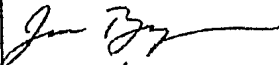
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

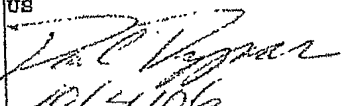
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

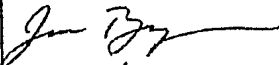
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

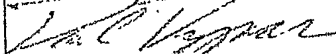
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

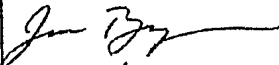
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (Last, First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

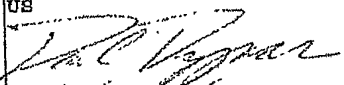
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

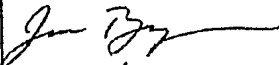
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

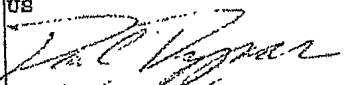
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)</p> <p>Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

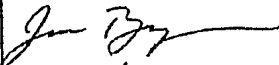
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

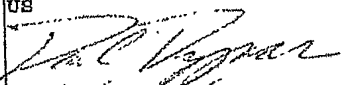
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

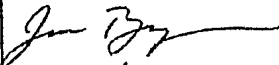
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (Last, First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

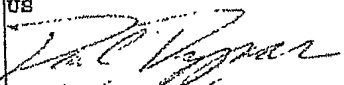
VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

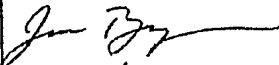
		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America)  Declaration of Inventorship (Rules 4.17(iv) and 5.1(b)(iv)) for the purposes of the designation of the United States of America:</p>	<p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to the international application of which it forms a part (if filing declaration with application).</p> <p>This declaration is directed to international application No. PCT/ . . . . .  . . . . . (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1-1	Prior applications:	60/724,858, US, 07 October 2005 (07.10.2005)
		I hereby acknowledge the duty to

		<p>disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1-1	Name (i.e., First, Last)	RYZNAR, Paul
VIII-4-1-2	Residence: (city and either US State, if applicable, or country)	Northville, Michigan
VIII-4-1-3	Mailing address:	49601 Deer Run Drive Northville, MI 48167 United States of America
VIII-4-1-4	Citizenship:	US
VIII-4-1-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-6	Date:	10/4/06

VIII-4-1-2-1	Name (LAST, First)	RYZNAR, James
VIII-4-1-2-2	Residence: (city and either US State, if applicable, or country)	Belleville, Michigan
VIII-4-1-2-3	Mailing address:	11535 Ryznar Drive Belleville, MI 48111 United States of America
VIII-4-1-2-4	Citizenship:	US
VIII-4-1-2-5	Inventor's Signature: (The signature must be that of the inventor, not that of the agent)	
VIII-4-1-2-6	Date	10-5-06

VIII-3-1	<p><b>Declaration: Entitlement to claim priority</b>  Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51bis.1(a)(iii))</p> <p>Name</p>	<p>in relation to this international application</p> <p>OPS SOLUTIONS LLC  is entitled to claim priority of earlier application No. 60/724,858 by virtue of the following:</p>
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, Paul
VIII-3-1(i)		OPS SOLUTIONS LLC is entitled as employer of the inventor, RYZNAR, James

Document code: WFEE

United States Patent and Trademark Office  
Sales Receipt for Accounting Date: 02/06/2008

JANDERSO	SALE	#00000001	Mailroom Dt:	09/18/2007	220190	11909002
		01	FC : 2633	100.00	DA	
		02	FC : 2641	50.00	DA	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
11/909,002	Paul Ryznar	RYZ01 P-100B

28101  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI 49546

INTERNATIONAL APPLICATION NO.

PCT/US06/39215

I.A. FILING DATE	PRIORITY DATE
------------------	---------------

**CONFIRMATION NO. 9951  
371 ACCEPTANCE LETTER**



\*OC000000028139313\*

Date Mailed: 02/07/2008

**NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495**

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

09/18/2007  
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1),  
(c)(2) and (c)(4) REQUIREMENTS

09/18/2007  
DATE OF COMPLETION OF ALL  
35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363). Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Indication of Small Entity Status
- Copy of the International Application filed on 09/18/2007
- Copy of the International Search Report filed on 09/18/2007
- Preliminary Amendments filed on 09/18/2007
- Information Disclosure Statements filed on 09/18/2007
- Oath or Declaration filed on 09/18/2007
- Request for Immediate Examination filed on 09/18/2007
- U.S. Basic National Fees filed on 09/18/2007
- Assignment filed on 09/18/2007
- Priority Documents filed on 09/18/2007

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

JOHN L ANDERSON

---

Telephone: (703) 308-9140 EXT 211



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
11/909,002	09/18/2007		425	RYZ01 P-100B	25	2

CONFIRMATION NO. 9951

28101  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI 49546

FILING RECEIPT



Date Mailed: 02/07/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Paul Ryznar, Northville, MI;  
James Ryznar, Belleville, MI;

**Assignment For Published Patent Application**

Ops Solutions LLP, Northville, MI

**Power of Attorney:**

Karl Ondersma--55894

**Domestic Priority data as claimed by applicant**

This application is a 371 of PCT/US06/39215 10/06/2006  
which claims benefit of 60/724,858 10/07/2005  
and claims benefit of 60/818,058 06/30/2006

**Foreign Applications**

**Projected Publication Date:** 05/15/2008

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

Light Guided Assembly System

**Preliminary Class****PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

**LICENSE FOR FOREIGN FILING UNDER****Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier

license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

#### **NOT GRANTED**

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/909,002	09/18/2007	Paul Ryznar	RYZ01 P-100B

**CONFIRMATION NO. 9951**

28101  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI49546

Date Mailed. 02/07/2008

## NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 05/15/2008. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

More detailed publication information is available through the private side of Patent Application Information Retrieval (PAIR) System. The direct link to access PAIR is currently <http://pair.uspto.gov>. Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Questions relating to this Notice should be directed to the Office of Patent Publication at 1-888-786-0101.

PART 1 - ATTORNEY/APPLICANT COPY

# DO/EO WORKSHEET

U.S. Appl. No. 11/909002

International Appl. No. US2006/039215

Application filed by: ☐ 20 months ☐ 30 months

## WIPO PUBLICATION INFORMATION:

Publication No.: WO2007/044558 12 Publication Language: ☒ English ☐ Japanese

Screening Done by: JLL

☐ German ☐ French ☐ Other: \_\_\_\_\_

Publication Date: April 19, 2007

Not Published: ☐ U.S. only designated ☐ EP request

## INTERNATIONAL APPLICATION PAPERS IN THE APPLICATION FILE:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> International Application (RECORD COPY) | <input type="checkbox"/> International Appl. on Double Sided Paper (COPIES MADE) |
| <input type="checkbox"/> Article 19 Amendments                              | <input type="checkbox"/> Request form PCT/RO/101                                 |
| <input type="checkbox"/> PCT/IB/331   | <input checked="" type="checkbox"/> PCT/ISA/210 - Search Report                  |
| <input type="checkbox"/> PCT/IPEA/409 IPER (PCT/IPEA/416 on front)          | <input type="checkbox"/> Search Report References                                |
| <input type="checkbox"/> Annexes to 409                                     | <input checked="" type="checkbox"/> Other: <u>Express Processing</u>             |
| <input checked="" type="checkbox"/> Priority Document (s) No. <u>1</u>      |  |

## RECEIPTS FROM THE APPLICANT (other than checked above):

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Basic National Fee (or authorization to charge)         | <input checked="" type="checkbox"/> Preliminary Amendment(s) Filed on: <u>Sept 18, 2007</u>            |
| <input checked="" type="checkbox"/> Description   | <input checked="" type="checkbox"/> Information Disclosure Statement(s) Filed on: <u>Sept 18, 2007</u> |
| <input checked="" type="checkbox"/> Claims  | <input checked="" type="checkbox"/> Assignment Document  |
| <input checked="" type="checkbox"/> Words in the Drawing Figure(s) - (# of dwgs. <u>6</u> ) | <input type="checkbox"/> Power of Attorney/ Change of Address  |
| <input type="checkbox"/> Article 19 Amendments  | <input type="checkbox"/> Substitute Specification Filed on: _____                                      |
| <input type="checkbox"/> english transl. of annexes NOT present                             | <input checked="" type="checkbox"/> Small Entity   |
| <input type="checkbox"/> entered <input type="checkbox"/> not entered:                      | <input checked="" type="checkbox"/> Oath/ Declaration (executed)                                       |
| <input type="checkbox"/> not a page for page substitution                                   | <input type="checkbox"/> surcharge was paid at the time of filing                                      |
| <input type="checkbox"/> other: _____   | <input type="checkbox"/> DNA Diskette <input type="checkbox"/> Sequence Listing                        |
| <input type="checkbox"/> Annexes to 409   | <input type="checkbox"/> Other: 1. _____ 2. _____  |
| <input type="checkbox"/> english transl. of annexes NOT present                             |  |
| <input type="checkbox"/> entered <input type="checkbox"/> not entered:                      |  |
| <input type="checkbox"/> not a page for page substitution                                   |  |
| <input type="checkbox"/> other: _____   |  |

NOTES: ☒ I.A. used as Specification ☐ Other: \_\_\_\_\_

## 35 U.S.C. 371 - Receipt of Request (PTO-1390)

Date Acceptable Oath/ Declaration Received Sept 18 2007

Date of Completion of requirements under 35 U.S.C. 371 Sept 18 2007

102(e) Date Sept 18 2007

Date of Completion of DO/EO 903 - Notification of Acceptance Feb 5, 2008

Date of Completion of DO/EO 905 - Notification of Missing Requirements

Date of Completion of DO/EO 906 - Notification of Missing 102(e) Requirements

Date of Completion of DO/EO 907 - Notification of Acceptance for 102(e) Date

Date of Completion of DO/EO 909 - Notification of Abandonment

Date of Completion of DO/EO 911 - Application Accepted Under 35 U.S.C. 111

Date of Completion of DO/EO 916 - Notification of Defective Response

# PATENT APPLICATION FEE DETERMINATION RECORD

Effective December 8, 2004.

Application or Docket Number

11 / 909002

## CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
U.S. NATIONAL STAGE FEES		
BASIC FEE	SMALL ENT. = \$ 150	LARGE ENT. = \$ 300
EXAMINATION FEE	Satisfies PCT Article 33(1)-(4) = \$ 50 / \$ 100	All other situations = \$ 100 / \$ 200
SEARCH FEE	U.S. is ISA = \$ 50 / \$ 100 ALL other countries = \$ 200 / \$ 400	ALL other situations = \$ 250 / \$ 500
FEE FOR EXTRA SPEC. PGS.	minus 100 =	/ 50 =
TOTAL CHARGEABLE CLAIMS	25 minus 20 =	* 5
INDEPENDENT CLAIMS	2 minus 3 =	* -
MULTIPLE DEPENDENT CLAIM PRESENT		<input type="checkbox"/>

\* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR

OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	150
EXAM. FEE	100
SEARCH FEE	200
X \$ 125 =	
X \$ 25 =	125
X \$ 100 =	
+ \$ 180 =	
TOTAL	575

OR

RATE	FEE
BASIC FEE	
EXAM. FEE	
SEARCH FEE	
X \$ 250 =	
X \$ 50 =	
X \$ 200 =	
+ \$ 360 =	
TOTAL	

## CLAIMS AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	***
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			<input type="checkbox"/>

SMALL ENTITY OR

OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
X \$ 25 =	
X \$ 100 =	
+ \$ 180 =	
TOTAL ADDIT. FEE	

OR

RATE	ADDITIONAL FEE
X \$ 50 =	
X \$ 200 =	
+ \$ 360 =	
TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus	**
Independent	*	Minus	***
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			<input type="checkbox"/>

RATE	ADDITIONAL FEE
X \$ 25 =	
X \$ 100 =	
+ \$ 180 =	
TOTAL ADDIT. FEE	

OR

RATE	ADDITIONAL FEE
X \$ 50 =	
X \$ 200 =	
+ \$ 360 =	
TOTAL ADDIT. FEE	

- \* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
- \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than "20", enter "20".
- \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than "3", enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

**MULTIPLE DEPENDENT CLAIM  
FEE CALCULATION SHEET**  
(FOR USE WITH FORM PTO-875)

SERIAL NO.

11/909002

FILING DATE

APPLICANT(S)

**CLAIMS**

	AS FILED		AFTER 1 <sup>st</sup> AMENDMENT		AFTER 2 <sup>nd</sup> AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
1	1		1			
2		1		1		
3		1		1		
4		1		1		
5		1		1		
6		1		1		
7		2		1		
8		2		1		
9		2		1		
10		2		1		
11		2		1		
12		2		1		
13		2		1		
14	1		1			
15		1		1		
16		1		1		
17		1		1		
18		1		1		
19		1		1		
20		1		1		
21		1		1		
22		1		1		
23		1		1		
24				1		
25				1		
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
TOTAL IND.	2	↓	2	↓		↓
TOTAL DEP.	28	←	23	←		←
TOTAL CLAIMS	30		25			

	AS FILED		AFTER 1 <sup>st</sup> AMENDMENT		AFTER 2 <sup>nd</sup> AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63						
64						
65						
66						
67						
68						
69						
70						
71						
72						
73						
74						
75						
76						
77						
78						
79						
80						
81						
82						
83						
84						
85						
86						
87						
88						
89						
90						
91						
92						
93						
94						
95						
96						
97						
98						
99						
100						
TOTAL IND.		↓		↓		↓
TOTAL DEP.		←		←		←
TOTAL CLAIMS						



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/909,002	09/18/2007	Paul Ryznar	RYZ01 P-100B

**CONFIRMATION NO. 9951**

28101  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI49546

Date Mailed. 02/21/2008

## NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 05/29/2008. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

More detailed publication information is available through the private side of Patent Application Information Retrieval (PAIR) System. The direct link to access PAIR is currently <http://pair.uspto.gov>. Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

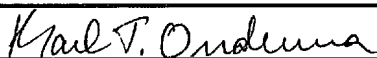
Questions relating to this Notice should be directed to the Office of Patent Publication at 1-888-786-0101.

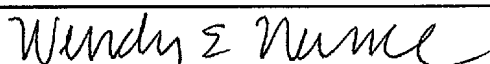
PART 1 - ATTORNEY/APPLICANT COPY

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	11/909,002
	Filing Date	September 18, 2007
	First Named Inventor	Paul Ryznar
	Art Unit	
	Examiner Name	
Total Number of Pages in This Submission	8	Attorney Docket Number RYZ01 P-100B

<b>ENCLOSURES (Check all that apply)</b>		
<input type="checkbox"/> Fee Transmittal Form <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement  <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input checked="" type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): 1.] Copy of the Written Opinion for the National Stage appl. prepared by the ISA/US (4 p.); 2.] Copy of our deposit account info for Feb. (1 p.)
<div style="border: 1px solid black; padding: 2px;">Remarks</div>		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	Van Dyke, Gardner, Linn & Burkhardt, LLP		
Signature			
Printed name	Karl T. Ondersma		
Date	May 7, 2008	Reg. No.	55 894

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:			
Signature			
Typed or printed name	Wendy E. Nance	Date	May 7, 2008

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No. : 9951  
Applicant : Paul Ryznar and James Ryznar  
Serial No. : 11/909,002  
Filing Date : September 18, 2007  
For : **LIGHT GUIDED ASSEMBLY SYSTEM**  
Atty Docket Number : RYZ01 P100B

Mail Stop 16  
Director of the U.S. Patent and Trademark Office  
Attention Refunds and Deposit Accounts  
PO Box 1450  
Arlington, VA 22313-1450

Dear Sir or Madam:

REQUEST FOR REFUND

We note that our deposit account 220190 was charged \$150.00 on February 6, 2008 for National Stage Exam and Search fees. It is our understanding that pursuant to the filing of a National Stage application in the United States with the United States Patent and Trademark Office acting as the receiving office reduced fees are available based on the results of the Written Opinion prepared by ISA/US.

Regarding the Examination fee, according to Box 22 of Form PTO-1390: "If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)" the Examination Fee is \$0.

Regarding the Search fee, according to Box 23 of Form PTO-1390: "If the written opinion of the ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)" the Search fee is also \$0.

A copy of the Written Opinion for the above National Stage application prepared by the ISA/US and mailed June 1, 2007 is attached. It is Applicants understanding that the attached Written Opinion prepared by the ISA/US indicates all claims satisfy provisions of PCT

Applicant : Paul Ryznar and James Ryznar  
Serial No. : 11/909,002  
Page 2


Article 33(1)-(4). Accordingly, the above National Stage application was charged \$150 for the National Stage Exam and Search fees in error and a refund is respectfully requested.

A copy of our deposit account info for the month of February showing the charges is attached.

Respectfully submitted,

By: Van Dyke, Gardner, Linn & Burkhart, LLP

Date: May 7, 2008.

  
Karl T. Ondersma, Reg. No. 55,894  
2851 Charlevoix Drive, S.E.  
P.O. Box 888695  
Grand Rapids, MI 49588-8695  
(616) 975-5500

KTO:wen  
Enclosure

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:  
VAN DYKE, GARDNER, LINN AND BURKHART, LLP AND  
ITS  
2851 CHARLEVOIX DRIVE S.E., SUITE 207  
P.O. BOX 888695  
GRAND RAPIDS, MI 49588-8695

*dy*

## PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference RYZ01FPI00PC		Date of mailing (day/month/year) <b>01 JUN 2007</b> <b>FOR FURTHER ACTION</b> See paragraph 2 below	
International application No. PCT/US06/39215	International filing date (day/month/year) 06 October 2006 (06.10.2006)	Priority date (day/month/year) 07 October 2005 (07.10.2005)	
International Patent Classification (IPC) or both national classification and IPC IPC: Please See Continuation Sheet USPC: 29/407.1, 407.04, 592, 700, 703, 700/95, 115		<i>Reply Due September 1, 2007</i>	
Applicant OPS SOLUTIONS LLC			

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/ US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Date of completion of this opinion 15 May 2007 (15.05.2007)	Authorized officer David N. Spector <i>[Signature]</i> Telephone No. (571) 272-2338
--	--	---

Form PCT/ISA/237 (cover sheet) (April 2005)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US06/39215

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

- ☐ a sequence listing
- ☐ table(s) related to the sequence listing

b. format of material

- ☐ on paper
- ☐ in electronic form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
- ☐ filed together with the international application in electronic form.
- ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US06/39215

**Box No. V Reasoned statement under Rule 43 bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO
Inventive step (IS)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO
Industrial applicability (IA)	Claims <u>1-23</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and explanations:

Claims 1-23 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest an operational guide system or assembly guide system adapted to provide visual indicators to an individual to guide sequential actions at a work location; comprising at least one sensor apparatus operable to detect operation information and generate an output indicative of the operation information, a controller receiving at least a first input signal indicative of the operation information and selectively providing at least one command signal in response to the first input signal, and at least one directional light device selectively operable to project and target at least one indicating light in response to the at least one command signal from the control module.

Claims 1-23 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry to facilitate product assembly and other operational tasks requiring the execution of a series of sequential steps.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US06/39215

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of IPC:

G01M 19/00( 2006.01);B23P 17/04( 2006.01),19/00( 2006.01),21/00( 2006.01);G06F 17/00G01M 19/00;B23P 17/04( 2006.01),19/00( 2006.01),21/00( 2006.01);G06F 17/00  
( 2006.01)  
G06F 19/00  
( 2006.01)



**United States  
Patent and  
Trademark Office**



**Deposit Account Statement**

**Requested Statement Month:** February 2008  
**Deposit Account Number:** 220190  
**Name:** VANDYKE GARDNER LINN & BURKHART LLP  
**Attention:** CATHY VANDENBERG  
**Street Address 1:** 2851 CHARLEVOIX DR., SE, SUITE 207  
**Street Address 2:**  
**City:** GRAND RAPIDS  
**State:** MI  
**Zip:** 49546  
**Country:** UNITED STATES

DATE	SEQ	POSTING REF TXT	ATTORNEY DOCKET NBR	FEE CODE	AMT	BAL
02/01	1510	61025048	DON01 P-1413	1005	\$210.00	\$10,478.47
02/01	7946	61025266	STR03D P203	1005	\$210.00	\$10,268.47
02/01	10834	10709527	FLE01 P-322A	2801	\$405.00	\$9,863.47
02/04	681	7320333	ELK01 FP-316 (GC)	8013	\$25.00	\$9,838.47
02/04	683	7322372	ELK01 FP-316 (GC)	8013	\$25.00	\$9,813.47
02/04	80	11969629	WILL10 P-100A	1011	-\$310.00	\$10,123.47
02/04	81	11969629	WILL10 P-100A	1111	-\$510.00	\$10,633.47
02/04	82	11969629	WILL10 P-100A	1311	-\$210.00	\$10,843.47
02/04	83	11969629	WILL10 P-100A	4011	\$75.00	\$10,768.47
02/04	84	11969629	WILL10 P-100A	2111	\$255.00	\$10,513.47
02/04	85	11969629	WILL10 P-100A	2311	\$105.00	\$10,408.47
02/05	15625	77388000	MIC01 T-311	7001	\$325.00	\$10,083.47
02/06	1	11909002	RYZ01 P-100B	2633	\$100.00	\$9,983.47
02/06	2	11909002	RYZ01 P-100B	2641	\$50.00	\$9,933.47
02/07	2384	10333565	BUC02- P-103	1614	\$210.00	\$9,723.47
02/07	2385	10333565	BUC02- P-103	1252	\$460.00	\$9,263.47
02/07	46	PAYMENT		9203	-\$7,000.00	\$16,263.47
02/08	647	61026851	BUR03 P-100	2005	\$105.00	\$16,158.47
02/08	8	PCT/US07/87778	EQA01 FP-102A(PCT)	8007	-\$40.00	\$16,198.47
02/11	1906	11940844	STR03A P-105C	8021	\$40.00	\$16,158.47
02/11	3385	11940995	STR03A P-105B	8021	\$40.00	\$16,118.47
02/11	10822	78940144	BRI02 T-111	7004	\$300.00	\$15,818.47
02/12	1311	12029066	ELK01 P-325A	4011	\$75.00	\$15,743.47
02/12	1312	12029066	ELK01 P-325A	2111	\$255.00	\$15,488.47
02/12	1313	12029066	ELK01 P-325A	2311	\$105.00	\$15,383.47
02/12	1314	12029066	ELK01 P-325A	2201	\$105.00	\$15,278.47
02/12	2304	12029066	ELK01 P-325A	8021	\$40.00	\$15,238.47
02/12	3755	11959899	HER07 P-123	1051	\$130.00	\$15,108.47
02/12	7	78392253	MAT03 T-106	6001	-\$375.00	\$15,483.47
02/12	8	78979871	MAT03 T-106	6001	\$375.00	\$15,108.47
02/12	9	78392253	MAT03 T-106	7003	-\$100.00	\$15,208.47
02/12	10	78979871	MAT03 T-106	7003	\$100.00	\$15,108.47

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	3266014
<b>Application Number:</b>	11909002
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	9951
<b>Title of Invention:</b>	Light Guided Assembly System
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar
<b>Customer Number:</b>	28101
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance
<b>Filer Authorized By:</b>	Karl T. Ondersma
<b>Attorney Docket Number:</b>	RYZ01 P-100B
<b>Receipt Date:</b>	07-MAY-2008
<b>Filing Date:</b>	18-SEP-2007
<b>Time Stamp:</b>	13:02:45
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	no
------------------------	----

### File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		RequestForRefund.pdf	416607 f7e39a6b963739411f5964249aa3b830ff8de0739	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Refund Request	2	3
	Miscellaneous Incoming Letter	4	7
	Miscellaneous Incoming Letter	8	8

**Warnings:**

**Information:**

<b>Total Files Size (in bytes):</b>	416607
-------------------------------------	--------

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/909,002	09/18/2007	Paul Ryznar	RYZ01 P-100B

**CONFIRMATION NO. 9951**

28101  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI49546

**Title:** Light Guided Assembly System

**Publication No.** US-2008-0121168-A1

**Publication Date:** 05/29/2008

### NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at [www.uspto.gov](http://www.uspto.gov) using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

---

Pre-Grant Publication Division, 703-605-4283

Amazon Ex. 1002.0199

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875					Application or Docket Number <b>11/909,002</b>		Filing Date <b>09/18/2007</b>		<input type="checkbox"/> To be Mailed	
<b>APPLICATION AS FILED – PART I</b>										
(Column 1)			(Column 2)		SMALL ENTITY <input checked="" type="checkbox"/>		OR		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A		N/A		N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A		N/A		N/A		N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A		N/A		N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$	=	OR	X \$	=	X \$	=	X \$
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=	OR	X \$	=	X \$	=	X \$
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL		TOTAL		TOTAL		TOTAL	
<b>APPLICATION AS AMENDED – PART II</b>										
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
<b>AMENDMENT</b>	<b>09/18/2007</b>	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 25	Minus	** 25	= 0	X \$25 =	0	OR	X \$	=
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$100 =	0	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	
<b>AMENDMENT</b>	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$	=	OR	X \$	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$	=	OR	X \$	=
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))									
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

Legal Instrument Examiner:  
/Kim Downing/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

## NOTICE OF ALLOWANCE AND FEE(S) DUE

28101 7590 12/03/2008

VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI 49546

EXAMINER

SPECTOR, DAVID N

ART UNIT

PAPER NUMBER

2873

DATE MAILED: 12/03/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/909,002

09/18/2007

Paul Ryznar

RYZ01 P-100B

9951

TITLE OF INVENTION: LIGHT GUIDED ASSEMBLY SYSTEM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	03/03/2009

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

## PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
**or Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

28101 7590 12/03/2008

VAN DYKE, GARDNER, LINN & BURKHART, LLP  
 SUITE 207  
 2851 CHARLEVOIX DRIVE, S.E.  
 GRAND RAPIDS, MI 49546

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/909,002	09/18/2007	Paul Ryznar	RYZ01 P-100B	9951

TITLE OF INVENTION: LIGHT GUIDED ASSEMBLY SYSTEM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	03/03/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
SPECTOR, DAVID N	2873	700-095000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/909,002	09/18/2007	Paul Ryznar	RYZ01 P-100B	9951
28101	7590	12/03/2008	EXAMINER	
VAN DYKE, GARDNER, LINN & BURKHART, LLP SUITE 207 2851 CHARLEVOIX DRIVE, S.E. GRAND RAPIDS, MI 49546			SPECTOR, DAVID N	
			ART UNIT	PAPER NUMBER
			2873	
DATE MAILED: 12/03/2008				

## Determination of Patent Term Extension under 35 U.S.C. 154 (b)

(application filed after June 7, 1995 but prior to May 29, 2000)

The Patent Term Extension is 0 day(s). Any patent to issue from the above-identified application will include an indication of the 0 day extension on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Extension is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	11/909,002	RYZNAR ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	David N. Spector	2873	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Application filed 18 September 2007.
2. ☒ The allowed claim(s) is/are 1-25.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>0907/20070918</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
|--|--|

/David N. Spector/  
Primary Examiner, Art Unit 2873

**Claims 1-25 are allowed. All pending claims thus being allowable, prosecution on the merits is closed in this application.**

The following is an EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE for the above-noted claims. The prior art taken either singly or in combination fails to anticipate or fairly suggest the features/limitations of applicant's independent claims, in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper. More specifically, in regard to:

Independent Claim 1 the prior art taken either singly or in combination fails to anticipate or fairly suggest an operational guide system providing visual indicators to guide sequential actions including a sensor to detect operation information, and to generate an output indicative thereof; a controller to receive signals indicative of said operation information and to provide command signals in response to said signals received; and "at least one directional light device, said at least one directional light device selectively operable to project and target at least one indicating light in response to said at least one command signal from said controller" (Claim 1, Line 8-10), taken together in combination with the totality of particular features/limitations recited therein.

Independent Claim 14 the prior art taken either singly or in combination fails to anticipate or fairly suggest a method for guiding assembly actions by providing visual indicators, said method comprising: identifying a characteristic of a work piece requiring assembly actions; communicating identification information to a controller in response to the identifying of a characteristic of the work piece; communicating a first command signal "to at least one directional light device in response to the identifying of a characteristic; selectively projecting at least one indicating light via the directional light device in response to the first command signal" (Claim 14, Line 6-9), taken together in combination with the totality of particular features/limitations recited therein.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be labeled "Comments on Statement of Reasons for Allowance."

The International Search Report (PCT/ISA/210) and Written Opinion of the International Searching Authority (PCT/ISA/237) prepared by the United States Patent and Trademark Office

in connection with the parent (PCT/US2006/39512) for the instant National Stage application, has been reviewed and considered by the examiner.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hoppes et al. (U.S. Patent No. 7,027,886 B2) discloses an infinitely variable, order specific holistic assembly process control system. Anderson et al. (U.S. Patent No. 4,890,382) discloses apparatus for use in assembling electrical connectors. Latanzi (U.S. Patent No. 3,986,244) discloses optical guidance methods for treatment or assembly of printed circuit boards and similar work pieces.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any other inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Spector whose telephone number is (571) 272-2338. The examiner can normally be reached at this number Monday through Friday between 6:00 AM and 2:30 PM. The Official FAX number for the United States Patent and Trademark Office is (571) 273-8300.

**/David N. Spector/**

**Primary Examiner, Art Unit 2873**

<b>Notice of References Cited</b>	Application/Control No. 11/909,002		Applicant(s)/Patent Under Reexamination RYZNAR ET AL.	
	Examiner David N. Spector		Art Unit 2873	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,027,886 B2	04-2006	Hoppes et al.	700/108
*	B	US-4,890,382	01-1990	Anderson et al.	29/833
*	C	US-3,986,244	10-1976	Latanzi, Lewis A.	29/407.04
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

**FOREIGN PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



## UNITED STATES PATENT AND TRADEMARK OFFICE


UNITED STATES DEPARTMENT OF COMMERCE  
 United States Patent and Trademark Office  
 Address: COMMISSIONER FOR PATENTS  
 P.O. Box 1450  
 Alexandria, Virginia 22313-1450  
 www.uspto.gov

## BIB DATA SHEET

CONFIRMATION NO. 9951

<b>SERIAL NUMBER</b> 11/909,002	<b>FILING or 371(c) DATE</b> 09/18/2007 <b>RULE</b>	<b>CLASS</b> 116	<b>GROUP ART UNIT</b> 2873	<b>ATTORNEY DOCKET NO.</b> RYZ01 P-100B		
<b>APPLICANTS</b> Paul Ryznar, Northville, MI; James Ryznar, Belleville, MI; <b>** CONTINUING DATA *****</b> This application is a 371 of PCT/US06/39215 10/06/2006 which claims benefit of 60/724,858 10/07/2005 and claims benefit of 60/818,058 06/30/2006 <b>** FOREIGN APPLICATIONS *****</b> <b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY **</b>						
Foreign Priority claimed <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Verified and Acknowledged <u>/DAVID N SPECTOR/</u> Examiner's Signature		<input type="checkbox"/> Met after Allowance Initials	<b>STATE OR COUNTRY</b> MI	<b>SHEETS DRAWINGS</b> 6	<b>TOTAL CLAIMS</b> 25	<b>INDEPENDENT CLAIMS</b> 2
<b>ADDRESS</b> VAN DYKE, GARDNER, LINN & BURKHART, LLP SUITE 207 2851 CHARLEVOIX DRIVE, S.E. GRAND RAPIDS, MI 49546 UNITED STATES						
<b>TITLE</b> Light Guided Assembly System						
<b>FILING FEE RECEIVED</b> 425	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			<input type="checkbox"/> All Fees		
				<input type="checkbox"/> 1.16 Fees (Filing)		
				<input type="checkbox"/> 1.17 Fees (Processing Ext. of time)		
				<input type="checkbox"/> 1.18 Fees (Issue)		
				<input type="checkbox"/> Other _____		
			<input type="checkbox"/> Credit			




<b>Search Notes</b>  	<b>Application/Control No.</b>  11909002	<b>Applicant(s)/Patent Under Reexamination</b>  RYZNAR ET AL.
	<b>Examiner</b>  David N Spector	<b>Art Unit</b>  2873

SEARCHED			
Class	Subclass	Date	Examiner
29	592, 593, 407.1, 407.04, 428, 429, 700, 703, 707, 709, 712, 720	11/23/08	DS
700	95, 115, 116	11/23/08	DS

SEARCH NOTES		
Search Notes	Date	Examiner
reviewed priority basis (PCT/US2006/39215) for the instant National Stage application.	11/23/08	DS
reviewed provisionals ASN 60/724858; 60/818058 from which parent application (PCT/US2006/39215) claims priority;check all documents cited therein.	11/23/08	DS
reviewed International Search and Written Opinion of the International Search Authority prepared for PCT/US2006/39215 by the USPTO	11/23/08	DS
inventor/assignee search: USPAT; USPGPUB; USOCR; EPO; JPO; DERWENT; IBM-TD (see search history).	11/23/08	DS
EAST search: USPAT; USPGPUB; USOCR; EPO; JPO; DERWENT; IBM-TD (see search history).	11/23/08	DS

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
TEXT ONLY	interference search: USPAT; USPGPUB (see search history).	11/23/08	DS

	/David N Spector/ Primary Examiner.Art Unit 2873
--	---

<b><i>Index of Claims</i></b>  	<b>Application/Control No.</b>  11909002	<b>Applicant(s)/Patent Under Reexamination</b>  RYZNAR ET AL.
	<b>Examiner</b>  David N Spector	<b>Art Unit</b>  2873

✓	<b>Rejected</b>	-	<b>Cancelled</b>	N	<b>Non-Elected</b>	A	<b>Appeal</b>
=	<b>Allowed</b>	÷	<b>Restricted</b>	I	<b>Interference</b>	O	<b>Objected</b>

<input checked="" type="checkbox"/> <b>Claims renumbered in the same order as presented by applicant</b> <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47										
CLAIM		DATE								
Final	Original	11/23/2008								
2	1	=								
2	2	=								
3	3	=								
4	4	=								
5	5	=								
6	6	=								
7	7	=								
8	8	=								
9	9	=								
10	10	=								
11	11	=								
12	12	=								
13	13	=								
14	14	=								
15	15	=								
16	16	=								
17	17	=								
18	18	=								
19	19	=								
20	20	=								
21	21	=								
22	22	=								
23	23	=								
24	24	=								
25	25	=								

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1539	visual\$2 NEAR2 indicat\$4 SAME (step\$1 action\$1 activitit \$3) SAME assembl\$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 14:49
L2	3738	guid\$4 SAME (sequence\$1 sequential) NEAR2 (step\$1 action\$1 activitit\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 14:54
L3	9516	(lights (light NEAR2 sourc\$2)) SAME (project target) SAME indicat\$4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 14:59
L4	4226	sensor SAME detect\$3 SAME operation\$2 NEAR4 information	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:22
L5	112	(light\$1 indicat\$4) SAME provid\$3 SAME operator SAME (step\$1 action\$1 activitit \$3) NEAR2 assembl\$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:23
L6	12	L1 AND L2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:25
L7	16	L2 AND L3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:26
L8	8	L2 AND L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:28
L9	3	L1 AND L5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:29
L10	1	L1 AND L2 AND L3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:30
L11	1	L1 AND L2 AND L3 AND L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:30
L12	1	L1 AND L2 AND L3 AND L4 AND L5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:30
L13	8074	system SAME guid\$4 NEAR2 assembl\$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:32
L14	13	L1 AND L13	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:33
L15	1	L14 AND L4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:34
L16	1	L14 AND L5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:34

L17	538	method\$1 SAME guid\$4 SAME assembl\$3 ADJ2 (step \$1 action\$1 activitit\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:46
L18	383	(identify\$3 identification) SAME (characteristic\$1 propert \$3) SAME (work workpiece) SAME assembl\$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:46
L19	9290	project\$3 SAME indicat\$3 NEAR2 light\$1	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:47
L20	2	L17 AND L18	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:47
L21	1	L17 AND L18 AND L19	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:47
L22	321	(29/592).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:48
L23	1333	(29/593).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:48
L24	550	(29/407.1).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:48
L25	262	(29/407.04).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:48
L26	3329	(29/428).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:49
L27	937	(29/429).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:49
L28	810	(29/700).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:49
L29	810	(29/700).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:50
L30	293	(29/703).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:50
L31	199	(29/707).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51
L32	413	(29/709).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51
L33	246	(29/712).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51

L34	642	(29/720).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51
L35	746	(700/95).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51
L36	372	(700/115).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:51
L37	230	(700/116).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:52
L38	30	(US-20020038159-\$ or US-20030209404-\$ or US-20050121422-\$).did. or (US-6928332-\$ or US-6317953-\$ or US-4469553-\$ or US-6340977-\$ or US-6348058-\$ or US-5638819-\$ or US-5910894-\$ or US-3760484-\$ or US-5380978-\$ or US-6892160-\$ or US-4383359-\$ or US-5119536-\$ or US-4674181-\$ or US-5098426-\$ or US-4625396-\$ or US-5646859-\$ or US-5430662-\$ or US-6314631-\$ or US-6167607-\$ or US-6000801-\$ or US-5757647-\$ or US-5506641-\$ or US-4615093-\$ or US-4222036-\$ or US-4190890-\$ or US-4102568-\$).did. or (US-3619886-\$).did.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/11/23 15:52
L39	25	((US-20020038159-\$ or US-20030209404-\$ or US-20050121422-\$).did. or (US-6928332-\$ or US-6317953-\$ or US-4469553-\$ or US-6340977-\$ or US-6348058-\$ or US-5638819-\$ or US-5910894-\$ or US-3760484-\$ or US-5380978-\$ or US-6892160-\$ or US-4383359-\$ or US-5119536-\$ or US-4674181-\$ or US-5098426-\$ or US-4625396-\$ or US-5646859-\$ or US-5430662-\$ or US-6314631-\$ or US-6167607-\$ or US-6000801-\$ or US-5757647-\$ or US-5506641-\$ or US-4615093-\$ or US-4222036-\$ or US-4190890-\$ or US-4102568-\$).did. or (US-3619886-\$).did.) AND (light SAME project\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:52
L40	9733	(L22 L23 L24 L25 L26 L27 L28 L29 L30 L31 L32 L33 L34 L35 L35 L37)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:55
L41	16	L1 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:55

L42	21	L2 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:55
L43	19	L3 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:56
L44	10	L4 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:56
L45	1	L5 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:56
L46	8	L17 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:56
L47	4	L18 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:57
L48	14	L19 AND L40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/11/23 15:57
L49	1	((visual\$2 NEAR2 indicat\$4 SAME (step\$1 action\$1 activitit \$3) SAME assembl\$3) AND (guid\$4 SAME (sequence\$1 sequential) NEAR2 (step\$1 action\$1 activitit\$3)) AND (sensor SAME detect\$3 SAME operation\$2 NEAR4 information)).CLM.	US-PGPUB; USPAT	OR	OFF	2008/11/23 16:10
L50	0	((visual\$2 NEAR2 indicat\$4 SAME (step\$1 action\$1 activitit \$3) SAME assembl\$3) AND (guid\$4 SAME (sequence\$1 sequential) NEAR2 (step\$1 action\$1 activitit\$3)) AND (sensor SAME detect\$3 SAME operation\$2 NEAR4 information)).CLM. NOT "20080121168".PN.	US-PGPUB; USPAT	OR	OFF	2008/11/23 16:10
L51	1	((method\$1 SAME guid\$4 SAME assembl\$3 ADJ2 (step \$1 action\$1 activitit\$3)) AND ((identify\$3 identification) SAME (characteristic\$1 propert \$3) SAME (work workpiece) SAME assembl\$3) AND (project\$3 SAME indicat\$3 NEAR2 light\$1)).CLM.	US-PGPUB; USPAT	OR	OFF	2008/11/23 16:12

L52	0	((method\$1 SAME guid\$4 SAME assembl\$3 ADJ2 (step \$1 action\$1 activitit\$3)) AND ((identify\$3 identification) SAME (characteristic\$1 propert \$3) SAME (work workpiece) SAME assembl\$3) AND (project\$3 SAME indicat\$3 NEAR2 light\$1)).CLM. NOT "20080121168".PN.	US-PGPUB; USPAT	OR	OFF	2008/11/23 16:13
-----	---	---	-----------------	----	-----	------------------

11/23/08 4:15:13 PM

C:\Documents and Settings\dspector\My Documents\EAST\Workspaces\11909002.wsp

PTO/SB/08a (08-03)

Approved for use through 07/31/2006. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**

( Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Paul Ryznar
Art Unit	
Examiner Name	
Attorney Docket Number	RYZ01 P-100B

**U.S.PATENTS**

Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	6658218	B2	2007-08-15	Krolczyk et al.	
	2	6224385	B1	2001-05-01	Nitta et al.	
	3	5910894		1999-06-08	Pryor	
	4	5801946		1998-09-01	Nissen et al.	
	5	5506641		1996-04-09	Dorsey-Palmateer	
	6	5430662		1995-07-04	Ahonen	
	7	5119536		1992-06-09	Leitz et al.	
	8	4469553		1984-09-04	Whitehead	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.S./

/David Spector/

11/23/2008

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Paul Ryznar	
Art Unit		
Examiner Name		
Attorney Docket Number	RYZ01 P-100B	

	9	4318222		1982-03-09	Frohlich	
	10	4222036		1980-09-09	Troukens	
	11	41633309		1979-08-07	Stuckler	
	12	4102568		1978-07-25	Miyagi	
	13	3667104		1972-06-06	Chamillard et al.	
	14	3623066		1971-11-23	Norris	
	15	3600785		1971-08-24	Cook	
	16	2682117		1954-06-29	Wales	

If you wish to add additional U.S. Patent citation information please click the Add button.

**U.S.PATENT APPLICATION PUBLICATIONS**

Examiner Initial*	Cite No	Publication Number	Kind Code <sup>1</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20030073541	A1	2003-04-17	Carlson	

If you wish to add additional U.S. Published Application citation information please click the Add button.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.S./

**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
( Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		
First Named Inventor	Paul Ryznar	
Art Unit		
Examiner Name		
Attorney Docket Number	RYZ01 P-100B	

**FOREIGN PATENT DOCUMENTS**

Examiner Initial*	Cite No	Foreign Document Number <sup>3</sup>	Country Code <sup>2i</sup>	Kind Code <sup>4</sup>	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T <sup>5</sup>
	1							<input type="checkbox"/>

If you wish to add additional Foreign Patent Document citation information please click the Add button

**NON-PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>5</sup>
	1	International Search Report and Written Opinion of the International Searching Authority for International Application No. PCT/US2006/39215, 01 June 2007. /D.S./	<input type="checkbox"/>

If you wish to add additional non-patent literature document citation information please click the Add button

**EXAMINER SIGNATURE**

Examiner Signature	/David Spector/	Date Considered	11/23/2008
--------------------	-----------------	-----------------	------------

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> See Kind Codes of USPTO Patent Documents at [www.USPTO.GOV](http://www.USPTO.GOV) or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.S./

Receipt date: 09/18/2007

11909002 - GAU: 2873

PTO/SB/08a (08-03)

Approved for use through 07/31/2006. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> ( Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		
	First Named Inventor	Paul Ryznar	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	RYZ01 P-100B	

**U.S.PATENTS**

Examiner Initial*	Cite No	Patent Number	Kind Code <sup>1</sup>	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
179	1	6658218	B2	<del>2003-12-02</del> 2007-08-15	Krolczyk et al.	
	2	6224385	B1	2001-05-01	Nitta et al.	
	3	5910894		1999-06-08	Pryor	
	4	5801946		1998-09-01	Nissen et al.	
	5	5506641		1996-04-09	Dorsey-Palmateer	
	6	5430662		1995-07-04	Ahonen	
	7	5119536		1992-06-09	Leitz et al.	
	8	4469553		1984-09-04	Whitehead	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.S./

/David Spector/

11/23/2008

## PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
 or Fax **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

28101

7590

12/03/2008

VAN DYKE, GARDNER, LINN & BURKHART, LLP  
 SUITE 207  
 2851 CHARLEVOIX DRIVE, S.E.  
 GRAND RAPIDS, MI 49546

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Wendy E. Nance

(Depositor's name)

*Wendy E. Nance*

(Signature)

February 24, 2009

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/909,002

09/18/2007

Paul Ryznar

RYZ01 P-100B

9951

TITLE OF INVENTION: LIGHT GUIDED ASSEMBLY SYSTEM

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
-------------	--------------	---------------	---------------------	----------------------	------------------	----------

nonprovisional

YES

\$755

\$300

\$0

\$1055

03/03/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
----------	----------	----------------

SPECTOR, DAVID N

2873

700-095000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

VAN DYKE, GARDNER, LINN

1 &amp; BURKHART LLP

2

3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

OPS SOLUTIONS LLC

NORTHVILLE, MICHIGAN

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee☒ Publication Fee (No small entity discount permitted)☐ Advance Order - # of Copies

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

☐ A check is enclosed.☐ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 22 0190 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature

*Karl T. Ondersma*

Date

February 24, 2009

Typed or printed name

Karl T. Ondersma

Registration No. 55 894

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	11909002			
<b>Filing Date:</b>	18-Sep-2007			
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar			
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance			
<b>Attorney Docket Number:</b>	RYZ01 P-100B			
Filed as Small Entity				
<b>U.S. National Stage under 35 USC 371 Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
Utility Appl issue fee	2501	1	755	755
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1055

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	4847119
<b>Application Number:</b>	11909002
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	9951
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar
<b>Customer Number:</b>	28101
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance
<b>Filer Authorized By:</b>	Karl T. Ondersma
<b>Attorney Docket Number:</b>	RYZ01 P-100B
<b>Receipt Date:</b>	24-FEB-2009
<b>Filing Date:</b>	18-SEP-2007
<b>Time Stamp:</b>	14:54:05
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1055
RAM confirmation Number	246
Deposit Account	220190
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	PTOL85PartBFeeTransmittal.pdf	269703 ba9a8b0eb2e925cbe3834d2c15e0444e302964b5	no	1

## Warnings:

## Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	31878 db5f0ed883e8e0d7ded2f84b85064b94673f20a7	no	2
---	------------------------	--------------	---	----	---

## Warnings:

## Information:

Total Files Size (in bytes):			301581
------------------------------	--	--	--------

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

### New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/909,002	04/07/2009	7515981	RYZ01 P-100B	9951

28101 7590 03/18/2009  
VAN DYKE, GARDNER, LINN & BURKHART, LLP  
SUITE 207  
2851 CHARLEVOIX DRIVE, S.E.  
GRAND RAPIDS, MI 49546

## ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

### **Determination of Patent Term Extension under 35 U.S.C. 154 (b)** (application filed after June 7, 1995 but prior to May 29, 2000)

The Patent Term Extension is 0 day(s). Any patent to issue from the above-identified application will include an indication of the 0 day extension on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Extension is the filing date of the most recent CPA.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Paul Ryznar, Northville, MI;  
James Ryznar, Belleville, MI;

## UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 7,515,981 B2

APPLICATION NO.: 11/909,002

ISSUE DATE : April 7, 2009

INVENTOR(S) : Paul Ryznar and James Ryznar

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

### Column 19

Line 1, Claim 3, "assembly" should be --operational--;  
Line 5, Claim 4, "assembly" should be --operational--;  
Line 8, Claim 5, "assembly" should be --operational--;  
Line 13, Claim 6, "assembly" should be --operational--;  
Line 16, Claim 7, "assembly" should be --operational--;  
Line 22, Claim 8, "assembly" should be --operational--;  
Line 27, Claim 9, "assembly" should be --operational--;  
Line 38, Claim 10, "assembly" should be --operational--;  
Line 48, Claim 11, "assembly" should be --operational--;  
Line 51, Claim 12, "assembly" should be --operational--;  
Line 56, Claim 13, "assembly" should be --operational--

### Column 20

Line 46, Claim 22, delete "indicia" after "indicia";  
Line 52, Claim 24, "assembly" should be --operational--;  
Line 63, Claim 25, "assembly" should be --operational--

### MAILING ADDRESS OF SENDER (Please do not use customer number below):

Gardner, Linn, Burkhardt & Flory, LLP  
2851 Charlevoix Drive SE, Suite 207  
Grand Rapids, Michigan 49546 USA

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	11909002			
<b>Filing Date:</b>	18-Sep-2007			
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM			
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar			
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance			
<b>Attorney Docket Number:</b>	RYZ01 P-100B			
Filed as Small Entity				
<b>U.S. National Stage under 35 USC 371 Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
Certificate of Correction	1811	1	100	100
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				100

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	17330469
<b>Application Number:</b>	11909002
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	9951
<b>Title of Invention:</b>	LIGHT GUIDED ASSEMBLY SYSTEM
<b>First Named Inventor/Applicant Name:</b>	Paul Ryznar
<b>Customer Number:</b>	28101
<b>Filer:</b>	Karl T. Ondersma/Wendy Nance
<b>Filer Authorized By:</b>	Karl T. Ondersma
<b>Attorney Docket Number:</b>	RYZ01 P-100B
<b>Receipt Date:</b>	06-NOV-2013
<b>Filing Date:</b>	18-SEP-2007
<b>Time Stamp:</b>	15:11:20
<b>Application Type:</b>	U.S. National Stage under 35 USC 371

### Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 100
RAM confirmation Number	1707
Deposit Account	505553
Authorized User	ONDERSMA, KARL T

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		01-Trans-Request.pdf	143792 3cc405f4548283dab7a9cbf63237350c3b9a a073	yes	3

**Multipart Description/PDF files in .zip description**

Document Description	Start	End
Transmittal Letter	1	1
Transmittal Letter	2	2
Request for Certificate of Correction	3	3

**Warnings:****Information:**

2	Fee Worksheet (SB06)	fee-info.pdf	30063 cff1703b6cd374fba5a00a188de0d36b1625 6c95	no	2
---	----------------------	--------------	---	----	---

**Warnings:****Information:**

<b>Total Files Size (in bytes):</b>	173855
-------------------------------------	--------

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**TRANSMITTAL  
FORM**

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

2

Application Number

11/909,002

Filing Date

September 18, 2007

First Named Inventor

Paul Ryznar et al.

Art Unit

2873

Examiner Name

David N. Spector

Attorney Docket Number

RYZ01 P-100B

**ENCLOSURES (Check all that apply)**☐

Fee Transmittal Form

☐

Fee Attached

☐

Amendment/Reply

☐

After Final

☐

Affidavits/declaration(s)

☐

Extension of Time Request

☐

Express Abandonment Request

☐

Information Disclosure Statement

☐

Certified Copy of Priority Document(s)

☐Reply to Missing Parts/  
Incomplete Application☐Reply to Missing Parts  
under 37 CFR 1.52 or 1.53☐

Drawing(s)

☐

Licensing-related Papers

☐

Petition

☐Petition to Convert to a  
Provisional Application☐Power of Attorney, Revocation  
Change of Correspondence Address☐

Terminal Disclaimer

☐

Request for Refund

☐

CD, Number of CD(s) \_\_\_\_\_

☐ Landscape Table on CD

Remarks

☐

After Allowance Communication to TC

☐Appeal Communication to Board  
of Appeals and Interferences☐Appeal Communication to TC  
(Appeal Notice, Brief, Reply Brief)☐

Proprietary Information

☐

Status Letter

☒Other Enclosure(s) (please identify  
below):A Certificate of Correction Form PTO/SB/44  
identifying errors by Column and Line from  
the patent.**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

Firm Name

Gardner, Linn, Burkhardt &amp; Flory, LLP

Signature



Printed name

Karl T. Ondersma

Date

November 6, 2013

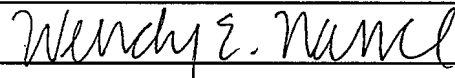
Reg. No.

55894

**CERTIFICATE OF TRANSMISSION/MAILING**

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature



Typed or printed name

Wendy E. Nance

Date

November 6, 2013

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Paul Ryznar and James Ryznar  
Serial No. : 11/909,002  
Patent : 7,515,981  
Examiner : David N. Spector  
For : LIGHT GUIDED ASSEMBLY SYSTEM  
Atty Docket : RYZ01 P-100B  
Customer No. : 15671

Certificate of Correction Branch  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir or Madam:

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 CFR §1.323

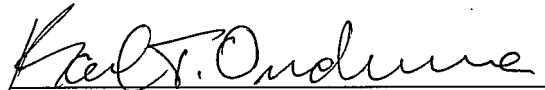
Applicants herewith submit the attached Certificate of Correction form PTO/SB/44 and fee under 37 CFR §1.20(a) to correct the noted mistakes. The preamble of claims 1 and 2 state an "operational guide system," whereas the preamble of dependent claims 3-13, 24 and 25 errantly state an "assembly guide system." Claim 22 errantly repeats the term "indicia."

The noted mistakes are clerical/typographical in nature and of minor character, and the requested corrections do not constitute new matter or require reexamination as claims 3-13, 24 and 25 are requested to be corrected to correspond to independent claim 1 from which they depend, and to delete the repeated term "indicia" in claim 22.

Respectfully submitted,

PAUL RYZNAR ET AL.

By: Gardner, Linn, Burkhardt & Flory LLP



Karl T. Ondersma  
Registration No. 55 894  
2851 Charlevoix Drive, S.E.  
Grand Rapids, Michigan 49546  
(616) 975-5500

Date: November 6, 2013

KTO/wen  
RYZ01 P-100B

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 7,515,981 B2  
APPLICATION NO. : 11/909002  
DATED : April 7, 2009  
INVENTOR(S) : Paul Ryznar and James Ryznar

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 19

Line 1, Claim 3, "assembly" should be --operational--;  
Line 5, Claim 4, "assembly" should be --operational--;  
Line 8, Claim 5, "assembly" should be --operational--;  
Line 13, Claim 6, "assembly" should be --operational--;  
Line 16, Claim 7, "assembly" should be --operational--;  
Line 22, Claim 8, "assembly" should be --operational--;  
Line 27, Claim 9, "assembly" should be --operational--;  
Line 38, Claim 10, "assembly" should be --operational--;  
Line 48, Claim 11, "assembly" should be --operational--;  
Line 51, Claim 12, "assembly" should be --operational--;  
Line 56, Claim 13, "assembly" should be --operational--.

Column 20

Line 46, Claim 22, delete "indicia" after "indicia";  
Line 52, Claim 24, "assembly" should be --operational--;  
Line 63, Claim 25, "assembly" should be --operational--.

Signed and Sealed this  
First Day of April, 2014



Michelle K. Lee  
*Deputy Director of the United States Patent and Trademark Office*

AO 120 (Rev. 08/10)

<b>TO:</b> <b>Mail Stop 8</b> <b>Director of the U.S. Patent and Trademark Office</b> <b>P.O. Box 1450</b> <b>Alexandria, VA 22313-1450</b>	<b>REPORT ON THE</b> <b>FILING OR DETERMINATION OF AN</b> <b>ACTION REGARDING A PATENT OR</b> <b>TRADEMARK</b>
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court \_\_\_\_\_ for the Eastern District of Michigan \_\_\_\_\_ on the following

☐ Trademarks or ☒ Patents. ( ☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 14-14389	DATE FILED 11/14/2014	U.S. DISTRICT COURT for the Eastern District of Michigan
PLAINTIFF  OPS Solutions LLC		DEFENDANT  Delta Sigma, LLC et al
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		see attached
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT  NOTICE of Voluntary Dismissal
---

CLERK David J Weaver	(BY) DEPUTY CLERK S. Schoenherr	DATE 1/21/2016
-------------------------	------------------------------------	-------------------

Copy 1—Upon initiation of action, mail this copy to Director    Copy 3—Upon termination of action, mail this copy to Director  
 Copy 2—Upon filing document adding patent(s), mail this copy to Director    Copy 4—Case file copy

UNITED STATES DISTRICT COURT  
 EASTERN DISTRICT OF MICHIGAN

OPS Solutions LLC  
 d/b/a OPS Solutions

Plaintiff(s),

Case No. 2:14-cv-14389

v.

Judge Paul D. Borman

Delta Sigma, LLC; Delta Sigma Corp; Projectionworks,  
 LLC; and Projectionworks, Inc.

Magistrate Judge David R. Grand

Defendant(s).

**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court, Eastern District of Michigan, on the following ☒ Patents or ☐ Trademarks

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US 7,515,981	04/07/2009	OPS Solutions LLC
2			
3			
4			
5			
6			
7			
8			
9			
10			

To list additional patent/trademark numbers, please attach another page with the number, date and holder.

Date: November 14, 2014

/Karl T. Ondersma/

P68028

Gardner, Linn, Burkhardt & Flory, LLP

2851 Charlevoix Drive SE, Ste 207

Grand Rapids, MI 49546

616-975-5500

ondersma@gibf.com

AO 120 (Rev. 08/10)

<b>TO: Mail Stop 8</b> <b>Director of the U.S. Patent and Trademark Office</b> <b>P.O. Box 1450</b> <b>Alexandria, VA 22313-1450</b>	<b>REPORT ON THE</b> <b>FILING OR DETERMINATION OF AN</b> <b>ACTION REGARDING A PATENT OR</b> <b>TRADEMARK</b>
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been  
 filed in the U.S. District Court \_\_\_\_\_ for the Eastern District of Michigan \_\_\_\_\_ on the following

☐ Trademarks or ☒ Patents. ( ☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 14-14445	DATE FILED 11/20/2014	U.S. DISTRICT COURT for the Eastern District of Michigan
PLAINTIFF  HAWK TECHNOLOGY SYSTEMS, LLC		DEFENDANT  SKECHERS-U.S.A., INC.,
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		see attached
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT  NOTICE of Voluntary Dismissal
---

CLERK David J Weaver	(BY) DEPUTY CLERK S. Schoenherr	DATE 1/21/2016
-------------------------	------------------------------------	-------------------

Copy 1—Upon initiation of action, mail this copy to Director    Copy 3—Upon termination of action, mail this copy to Director  
 Copy 2—Upon filing document adding patent(s), mail this copy to Director    Copy 4—Case file copy

UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF MICHIGAN

HAWK TECHNOLOGY SYSTEMS, LLC,

Plaintiff(s),

Case No. 2:14-cv-14445-SJM-MKM

v.

Judge Stephen J. Murphy, III

SKECHERS-U.S.A., INC.,

Magistrate Judge Mona K. Majzoub

Defendant(s).

**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court, Eastern District of Michigan, on the following ☒ Patents or ☐ Trademarks

PATENT OR TRADEMARK NO.		DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	US RE43,462 E	06/12/2012	HAWK TECHNOLOGY SYSTEMS, LLC
2			
3			
4			
5			
6			
7			
8			
9			
10			

To list additional patent/trademark numbers, please attach another page with the number, date and holder.

Date: November 24, 2014

/s/ Marc I. Shulman

P30396

2 S. Biscayne Blvd., Ste 3800

Miami, FL 33131

(248) 343- 4842

tjacques@mindellfirm.com

## PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT7273007

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT	
<b>NATURE OF CONVEYANCE:</b>	CONVERSION AND CHANGE OF NAME	
<b>CONVEYING PARTY DATA</b>		
	<b>Name</b>	<b>Execution Date</b>
	OPS SOLUTIONS LLC	06/29/2021
<b>RECEIVING PARTY DATA</b>		
<b>Name:</b>	LIGHTGUIDE, INC.	
<b>Street Address:</b>	48443 ALPHA DRIVE	
<b>Internal Address:</b>	SUITE 175	
<b>City:</b>	WIXOM	
<b>State/Country:</b>	MICHIGAN	
<b>Postal Code:</b>	48393	
<b>PROPERTY NUMBERS Total: 7</b>		
	<b>Property Type</b>	<b>Number</b>
	Patent Number:	7515981
	Patent Number:	9658614
	Patent Number:	9965897
	Patent Number:	10528036
	Patent Number:	10983500
	Application Number:	17235556
	Application Number:	17432778
<b>CORRESPONDENCE DATA</b>		
<b>Fax Number:</b>	(616)975-5505	
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>		
<b>Phone:</b>	616-975-5500	
<b>Email:</b>	vredeveld@gardner-linn.com	
<b>Correspondent Name:</b>	GARDNER, LINN, BURKHART & ONDERSMA LLP	
<b>Address Line 1:</b>	2900 CHARLEVOIX DRIVE SE	
<b>Address Line 2:</b>	SUITE 300	
<b>Address Line 4:</b>	GRAND RAPIDS, MICHIGAN 49546	
<b>ATTORNEY DOCKET NUMBER:</b>	RYZ01 A-122	
<b>NAME OF SUBMITTER:</b>	KARL T. ONDERSMA	
<b>SIGNATURE:</b>	/Karl T. Ondersma/	

<b>DATE SIGNED:</b>	04/11/2022
	This document serves as an Oath/Declaration (37 CFR 1.63).
<b>Total Attachments: 4</b> source=certificateofconversion#page1.tif source=certificateofconversion#page2.tif source=certificateofconversion#page3.tif source=DELAWARE-certificate#page1.tif	

CSCL/CD-754 (Rev. 07/19)

# MICHIGAN DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS CORPORATIONS, SECURITIES & COMMERCIAL LICENSING BUREAU

Date Received  
JUN 30 2021

AC1

(FOR BUREAU USE ONLY)

\$525 MC CEPAS 21063051530229

This document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.

**FILED****JUN 30 2021**

ADMINISTRATOR  
CORPORATIONS DIVISION

Name  
Darren Bartlette

Address  
Dentons US LLP 22 Little W 12th Street

City State ZIP Code  
New York, NY 10014

EFFECTIVE DATE:

Expiration date for new assumed names: December 31,

Expiration date for transferred assumed names appear on page 2.

Document will be returned to the name and address you enter above.  
If left blank, document will be returned to the registered office.

## CERTIFICATE OF CONVERSION

### For use by a Limited Liability Company Converting into a Business Organization

Pursuant to the provisions of Act 284, Public Acts of 1972 (profit corporations), Act 162, Public Acts of 1982 (nonprofit corporation) and Act 23, Public Acts of 1993 (limited liability companies), the undersigned limited liability company executes the following Certificate of Conversion.

#### 1. Before Conversion

Entity Name: OPS Solutions LLC		Entity ID 801342542
Indicate (X) Entity Type	<input checked="" type="checkbox"/>	Domestic Limited Liability Company
	Street Address, if different than the one provided in Item 3: 48443 Alpha Drive, Suite 175 Wixom, MI USA 48393	
	<input type="checkbox"/>	Foreign Limited Liability Company

#### 2. After Conversion

Entity Name: LightGuide, Inc.	
Indicate (X) Entity Type	<input type="checkbox"/> Domestic Profit Corporation <input type="checkbox"/> Domestic Nonprofit Corporation <input checked="" type="checkbox"/> Foreign Profit Corporation <input type="checkbox"/> Foreign Nonprofit Corporation <input type="checkbox"/> Domestic Limited Liability Company <input type="checkbox"/> Foreign Limited Liability Company

If the converting limited liability company is a domestic limited liability company that has not commenced business, has not issued any membership interests; has no debts or other liabilities, and has not received or returned any payments for its membership interests, proceed to Item 4.

If the converting limited liability company is a domestic limited liability company that has commenced business or a foreign limited liability company, proceed to Item 3.



3. Surviving Business Organization (After Conversion Entity)

Governing Statute: Delaware Corporation Act
Street Address: 48443 Alpha Drive, Suite 175 Wixom, MI USA 48393
Principal Place of Business: 48443 Alpha Drive, Suite 175 Wixom, MI USA 48393

4. (Complete only if a later effective date is desired other than the date of filing. The date must be no more than 90 days after the receipt of this document by the administrator.)

The conversion is effective on the _____ day of _____, _____.
---

The plan of conversion will be furnished by the surviving business organization, on request and without cost, to any member of the converting limited liability company.

The conversion is permitted by the law that will govern the internal affairs of the business organization after conversion and the surviving business organization complies with that law in converting.

5. The assumed names being transferred to continue for the remaining effective period of the Certificate of Assumed Name on file prior to the conversion are:

Assumed Name	Expiration Date

6. The converting limited liability company's name and/or assumed name(s) to be used as new assumed name(s) of the surviving business organization:

Assumed Name

**7. Signatures:** Complete only Section (a) or (b) if the converting entity is a domestic limited liability company.  
Proceed to Item 8 if the before conversion entity is a foreign limited liability company.

*Complete if the domestic limited liability company has not commenced business:*

- a) The domestic limited liability company has not yet commenced business, has not issued any membership interests; has no debts or other liabilities, and has not received or returned any payments for its membership interests and the plan of conversion was adopted and approved by unanimous consent of the organizers, in accordance with Section 708(1)(d) of the Act.

Signed this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
(Signature of Organizer)

\_\_\_\_\_  
(Signature of Organizer)

\_\_\_\_\_  
(Type or Print Name)

\_\_\_\_\_  
(Type or Print Name)

\_\_\_\_\_  
(Signature of Organizer)

\_\_\_\_\_  
(Signature of Organizer)

\_\_\_\_\_  
(Type or Print Name)

\_\_\_\_\_  
(Type or Print Name)

*Complete if the domestic limited liability company has commenced business:*

- b) The plan of conversion was adopted and approved by the unanimous vote of the members, entitled to vote, unless the articles of organization or operating agreement provide otherwise, in accordance with Section 708(1)(c) of the Act.

Signed this 29th day of June, 2021.

By  \_\_\_\_\_  
DocuSigned by:  
64C4C2263B2D4D8  
(Signature of Member, Manager or Authorized Agent)

Paul Ryznar

\_\_\_\_\_  
(Type or Print Name)

# Delaware

The First State

Page 1

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "LIGHTGUIDE, INC." IS DULY INCORPORATED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL CORPORATE EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE THIRTIETH DAY OF JUNE, A.D. 2021.

AND I DO HEREBY FURTHER CERTIFY THAT THE SAID "LIGHTGUIDE, INC." WAS INCORPORATED ON THE TWENTY-NINTH DAY OF JUNE, A.D. 2021.

AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL FRANCHISE TAXES HAVE BEEN ASSESSED TO DATE.



6042134 8300

SR# 20212589666

You may verify this certificate online at [corp.delaware.gov/authver.shtml](http://corp.delaware.gov/authver.shtml)

A handwritten signature in black ink, appearing to read "JB", is written over a horizontal line. Below the line, the text "Jeffrey W. Bullock, Secretary of State" is printed.

Authentication: 203569796

Date: 06-30-21

Amazon Ex. 1002.0244