UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASM IP HOLDING B.V.
Petitioner,

v.

KOKUSAI ELECTRIC CORPORATION
Patent Owner.

Case No. TBD
U.S. Patent 7,808,396

DECLARATION OF ALEXANDER GLEW, PH.D., IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,808,396

ASM Ex. 1003
IPR Petition - USP 7,808,396

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1006	Translation of KR 2003-0058863 (Kang)
1007	US 5,859,885 (Rusnica)
1008	US 7,079,984 (Eryurek)
1009	Declaration of Brian Crawford
1010	https://www.merriam-webster.com/dictionary/condition
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1021	Printout of https://web.archive.org/web/19961229182640/ http://www.tencor.com:80/

Exhibit No.	Description
1022	Printout of https://web.archive.org/web/19970302032823/http://www.tencor.com:80/requestlit.html
1023	K.H. Baek et al., *Global pattern density effects on aluminum alloy etching for sub-0.25 mm technology logic devices*, Journal of Vacuum Science & Technology B, vol. 19 (2001) 2104–2107
1024	C. Gu, SIMS Quantification of Matrix and Impurity Species in III-Nitride Alloys (2006) (Ph.D. dissertation, North Carolina State University) and library record

1. I, Alexander D. Glew, Ph.D., have been retained by Knobbe, Martens, Olson & Bear, LLP, counsel for ASM IP Holding B.V. ("ASM"). I understand that ASM is petitioning for inter partes review of U.S. Patent No. 7,808,396 ("the '396 patent," Ex. 1001) and requests that the United States Patent and Trademark Office cancel Claims 1-10 of the '396 patent as unpatentable. The following discussion and analysis provide my opinion as to why Claims 1-10 are unpatentable. I understand that the '396 patent claims the benefit of two Japanese applications filed June 8, 2006 and September 26, 2005, the latter of which is the earliest possible priority date for purposes of determining prior art under §102(e). I understand that the effective filing date for determining prior art under §102(b) is the PCT filing date of September 26, 2006.

I. BACKGROUND AND QUALIFICATIONS

2. I earned a B.S. degree in Mechanical Engineering in 1985 and a M.S. degree in Mechanical Engineering in 1987 from the University of California, Berkeley.

3. I earned a M.S. degree in Materials Science and Engineering in 1995 and a Ph.D. in Materials Science and Engineering in 2003 from Stanford University.

4. I am the Founder and President of Glew Engineering Consulting, Inc., based in Mountain View, California. I have been President of Glew Engineering Consulting, Inc. since I started the company in 1997. In my role as President, I have provided consulting services to clients in the field of semiconductor manufacturing

and materials, as well as to clients in other fields. I have reviewed and analyzed semiconductor technologies and products. My consulting work has involved semiconductor process equipment, thin film deposition and characterization, process development, project turnaround/rescue, gas flow and vacuum metrology, design of experiments, corrosive gas applications, finite element analysis, and related market analysis.

5. I have over 30 years of experience in semiconductor manufacturing and materials, including in semiconductor equipment and processing. I have implemented numerous manufacturing processes for the formation of semiconductors, including chemical vapor deposition ("CVD"), plasma enhanced chemical vapor deposition ("PECVD"), high density plasma chemical vapor deposition ("HDPCVD"), etch processing (including dry plasma and wet processing), reactive-ion etching ("RIE"), chemical-mechanical planarization ("CMP"), spin-on dielectrics ("SOD"), epitaxy ("EPI"), molecular beam epitaxy ("MBE"), rapid thermal processing ("RTP"), and others.

6. In 1987, before receiving my Ph.D., I worked at Applied Materials, Inc. in Santa Clara, California. At Applied Materials, Inc., I served in a number of roles, including Engineering Manager, Core-Technologist Project Manager, CVD Supplier Quality Engineering Manager, Core Technologist, CVD Engineering Manager, and Systems Engineer. In these roles, I provided engineering services and supervised other employees on projects related to technologies used to manufacture

semiconductors, including CVD, epitaxy, physical vapor deposition ("PVD"), rapid thermal processing ("RTP"), etch, and thermal. I oversaw gas, vacuum, and chemical component evaluation, testing, and supplier quality management. I successfully proposed and executed a project to develop industry methods to determine the effects of trace chemicals on semiconductor processing and equipment reliability. I worked on the development and release of the Precision 5000 CVD product, the first cluster tool for semiconductor manufacturing.

7. I am a licensed professional mechanical engineer in the state of California.

8. I have published articles and presented on topics related to semiconductor manufacturing. My curriculum vitae includes a list of selected publications. Ex. 1004.

9. I am a co-inventor of four U.S. patents: (a) U.S. Patent No. 6,204,174, directed to a method and apparatus to control the deposition rate of material in a semiconductor fabrication process; (b) U.S. Patent No. 9,224,626, directed to a method of forming a heater assembly for use in semiconductor processing; and (c) U.S. Patent Nos. 6,679,476 and 7,118,090, both directed to control valves for use in ultra pure applications such as semiconductor processing. I have another patent application pending.

10. I am a member of the American Society of Mechanical Engineers ("ASME"), International Microelectronics and Packaging Society ("IMAPS"),

Materials Research Society ("MRS"), Institute of Electrical and Electronics Engineers ("IEEE"), and Semiconductor Equipment and Materials International ("SEMI").

11. I am qualified to render an opinion regarding the design and development of semiconductor manufacturing devices and semiconductor materials based on my experience. Based on my expertise and qualifications, I am qualified to provide an opinion as to what a person of ordinary skill in the art would have understood, known, or concluded around the priority date.

12. Attached as Exhibit 1004 is a copy of my curriculum vitae setting forth my educational experience, employment history, and publications.

II. MATERIALS CONSIDERED

13. At the front of this document is a list of documents that I have considered and reviewed in connection with providing this declaration. Tencor (Ex. 1005) is a non-patent literature reference. It embodies a manual providing operating instructions for the "Tencor P-20H Long Scan Profiler" ("the P-20H"). A person of ordinary skill in the art would have been familiar with Tencor and its successor company KLA-Tencor by the time of the '396 patent. KLA-Tencor was (and still is) a major supplier to semiconductor manufacturers and researchers and its products were in the vast majority of semiconductor manufacturing and research facilities at the time of the patent, and still are today. In my experience, operation manuals were ubiquitous in semiconductor fabrication and research facilities. They

were disseminated to the purchasers of the equipment (typically, commercial semiconductor manufacturers and research institutions like universities). I note that, according to a representative of KLA-Tencor, customers purchasing the P-20H were given copies of Tencor. Ex. 1009 (Crawford Declaration) ¶7. These customers included semiconductor manufacturers, data storage manufacturers, and research institutions. *Id.* ¶4. Thus, persons receiving a copy of Tencor were interested persons and persons of ordinary skill in the art. In addition, operation manuals were readily available if a person of ordinary skill in the art wanted to refer to them. I note that a 2001 article on aluminum alloy etching in semiconductor devices refers to the "Profiler P20H™ from Tencor." Ex. 1023 (Baek) at 2105. The article is from a journal and regards a topic that skilled artisans would have referred to and relied on. In addition, a 2006 Ph.D. dissertation actually cites Tencor. Ex. 1024 at 167. The dissertation relates to a topic of interest to skilled artisans (semiconductor materials) (*id.* at 1), it is dated 2005 (*id.* at i) and indicates that the author started the Ph.D. program in 2002 (*id.* at iii). In my experience, Ph.D. research occurs well before the publication of the dissertation, and these dates show months, if not years, of access to Tencor before the '396 patent's §102(b) date.

14. I was asked whether the materials embodied in Exhibits 1005-1008 are either 1) from the same field of endeavor as the claimed invention, regardless of the problem addressed; or 2) if not within the same field of endeavor as the claimed

invention, reasonably pertinent because they logically would have commended themselves to an inventor's attention in considering the inventor's problem.

15. Kang (Ex. 1006) and Tencor (Ex. 1005) are from the same field of endeavor as the claimed inventions because these references relate to semiconductor processing apparatuses for processing substrates of semiconductor devices. Kang relates to a semiconductor wafer burn-in system and Tencor relates to a semiconductor metrology apparatus.

16. Rusnica (Ex. 1007) and Eryurek (Ex. 1008) are at least reasonably pertinent to the claimed inventions. The '396 patent explains that signal indicators (buzzers and signal towers) of the prior art were known to operate in accordance with "predetermined operation conditions" that, when satisfied, cause their associated signal indicators to operate in a specified way. Ex. 1001 ('396 patent) at 1:11-21. Because semiconductor processing apparatuses can be complex systems with multiple possible operation conditions, the specification explains that "there has been a problem that it is difficult to recognize under which one of the operation conditions the current signal … is being displayed on the signal indicator in the case of controlling the signal indicator under [multiple possible] operation conditions." *Id.* at 1:42-46. Put simply, when a signal indicator is operating, a user may not fully appreciate **why** it is operating (its status) because the user does not know which of the multiple possible operation conditions was satisfied and caused the signal indictor to operate.

17. The specification accordingly seeks to "provide a substrate processing apparatus that solves the above-described problem and is capable of displaying under which one/ones of a plurality of operation conditions a signal indictor operates." *Id.* at 1:47-50; *see also id.* at 2:20-25. This allows users to appreciate more fully why an error occurs. *Id*. at 18:27-34 ("[I]n the case where an error occurs when the apparatus state is 'run', it is possible to make sound in accordance with the setting for occurrence of error.").

18. Rusnica discloses a "functional approach to an information display system that enables a fast and easy understanding of the status of a complex process." Ex. 1007 (Rusnica) at Abstract. Just as the '396 patent includes a display unit that displays a number of operating conditions that, when satisfied, cause their associated signal indictors to operate, Rusnica's includes display system with a display screen that displays process functions "which must be … maintained in order to achieve the respective objectives." *Id.* In the '396 patent, a display of running states related to each operation condition is mapped onto the display, *see* Ex. 1001 ('396 patent) at Figures 9, 11, and in Rusnica, a "display of control functions related to each process function is mapped onto the regional displays," Ex. 1007 (Rusnica) at Abstract. In Rusnica, the "individual display elements use a combination of coded background color, border color and other indicia of information … to present a significant amount of information about the status of the process and its components in a manner that is readily absorbed and easily understood." *Id.*

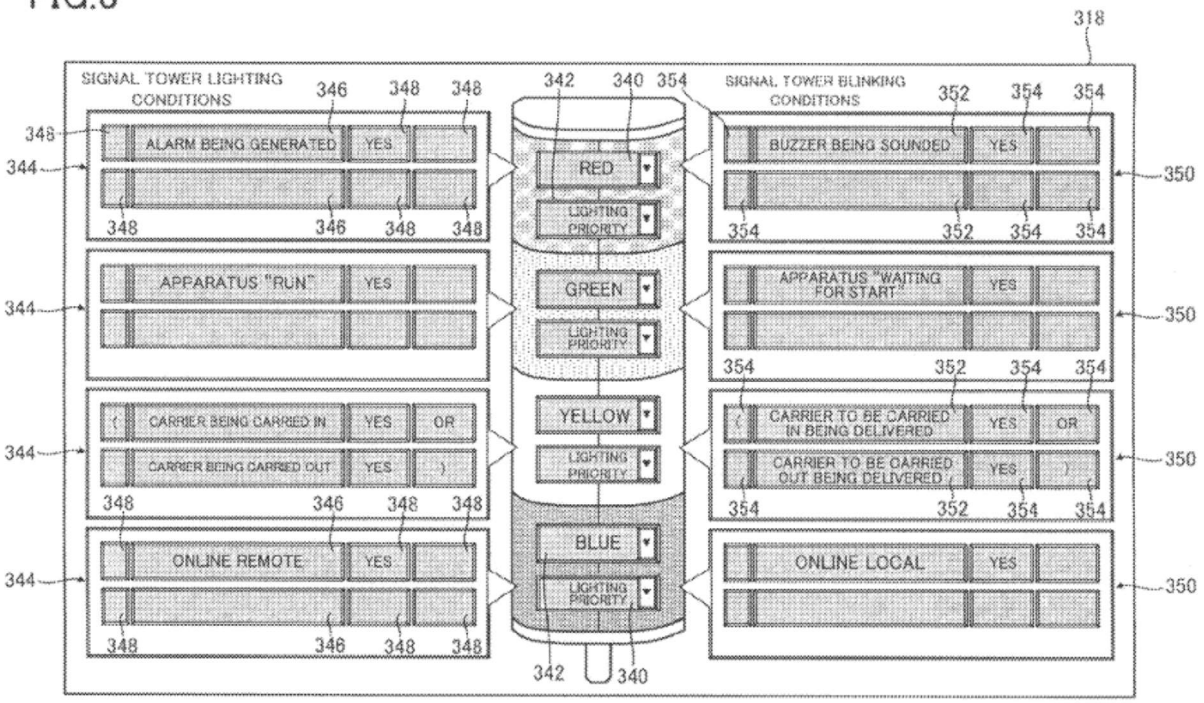
19. Because both the '396 patent and Rusnica seek to present information in an easily understandable way, Rusnica would have logically commended itself to an inventor's attention in considering the inventor's problem.

20. Another problem discussed in the '396 patent relates to entering operating conditions. Again, the '396 patent explains that signal indicators of the prior art were known to operate in accordance with "predetermined operation conditions" that, when satisfied, cause their associated signal indicators to operate in a specified way. Ex. 1001 ('396 patent) at 1:11-21. As a threshold matter, users needed to define, somehow, the operation conditions for operating the signal indicators. As I shall explain later in this declaration, in the '396 patent, "operation conditions" are essentially rules for operating the signal indicators akin to the "IF" portion of an "IF/THEN" expression. *Infra* Paragraphs 37-48. IF an "operation condition" is satisfied, THEN an associated signal indicator will be instructed to operate in a specific manner. Therefore, an issue that needed to be addressed by '396 patent was how to enter these rules or "IF" conditions. *Id.*

21. The '396 patent settled on a textually driven approach for entering operation conditions. In the preferred embodiment of the '396 patent, a user sets up an operation condition as a logical formula of textual "components" (running states) and textual "conjunctions" (Boolean operators, like AND and OR, and Boolean values, YES and NO).

22. As shown below in this excerpt from Figure 8 of the '396 patent, brackets can be used to set off logical formulas with multiple components (running states). *E.g.*, Ex. 1001 ('396 patent) at 10:43-54, 11:14-19.

FIG.8



The operation condition created in this blinking condition input section 350 states that, IF ("YES," the running state is "CARRIER TO BE CARRIED IN BEING DELIVERED" **OR** "YES," the running state is "CARRIER TO BE CARRIED OUT BEING DELIVERED") THEN the associated yellow light of the signal tower is blinked. Ex. 1001 ('396 patent) at Figure 8. The brackets in the top left and bottom right second approval condition input sections 354 set off the logical formula.

23. The patent explains that the ability to set the logical formula and the brackets in one frame makes it "possible not only to **prevent setting error** but also

to **offer a display that is easy for users to understand**."[1] *Id.* at 11:19-23. (emphasis added)

24. Eryurek discloses a system that detects "abnormal conditions" in a process (manufacturing) plant and determines if an action should be taken. Ex. 1008 (Eryurek) at Abstract. Eryurek teaches that if a user knows that certain abnormal condition are known to indicate a problem in the process, the user can "create an appropriate rule to detect this condition and, if desired, to generate an alarm or alert or to take some other action based on the detected existence of this condition." Ex. 1008 (Eryurek) at 35:26-32; *see also id.* at 35:61-66. More specifically, a configuration screen "enables the user to create one or more IF-THEN or Boolean type rules to be stored in [a] rules database 292." *Id.* at 35:66-36:3. Like the user interfaces in the '396 patent, the user interface in Eryurek that enables a user to create a rule is also textually driven. *Id.* at Figure 38. A "box 320 allows a user to select or define a Boolean logic operator, such as an AND operator or an OR operator, to be applied between each set of condition statements to define the manner in which these condition statements are to be logically combined to define the overall 'IF' condition." *Id.* at 36:25-30. The user interface allows the user to group condition statements with sets of parentheses: a leading parenthesis "indicates the beginning

[1] Whenever bold text appears in a quotation in this declaration, the emphasis has been added, unless otherwise indicated.

of a new set of condition statement" and the close parenthesis "indicates the end of a set of condition statement within a set of parenthesis." *Id.* at 36:34-45.

25. Because both the '396 patent and Eryurek seek to provide user interfaces for entering the "IF" portion of "IF/THEN" expressions to define how an alarm responds to a known process condition, Eryurek would have logically commended itself to an inventor's attention in considering the inventor's problem.

III. LEGAL STANDARDS

26. I am not a patent attorney nor have I independently researched the law on patentability.

27. I understand that 35 U.S.C. § 103 governs the determination of obviousness. I understand that 35 U.S.C. § 103 states:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the art to which the subject matter pertains.

28. I further understand that the four factors to be considered in an obviousness inquiry are: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims; (3) the level of ordinary skill in the pertinent art; and (4) secondary considerations including long-felt need, commercial success, and unexpected results.

29. I also understand that when there is some recognized reason to solve a problem, and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If such an approach leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In such a circumstance, when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.

IV. THE PERSON OF ORDINARY SKILL IN THE ART

30. I understand that obviousness is analyzed from the perspective of a hypothetical person of ordinary skill in the art. A person of ordinary skill in the art related to the '937 patent would have had a Bachelor degree in materials science, engineering, or similar technical discipline, and had at least two years of experience relating to the design and development of semiconductor manufacturing devices. Alternatively, such a person may have had additional graduate education as a substitute for professional experience, or significant work experience as a substitute for formal education. My opinions concerning the unpatentability of the '937 patent claims, as set forth herein, are from the perspective of a person of ordinary skill in the art, as set forth above. As I mentioned above, I understand that the timeframe for determining prior art is around September 2005 or September 2006. My opinions regarding what a person of ordinary skill in the art would have understood during

that timeframe do not change depending which date is applied because the state of the art in the field of the invention did not change significantly in the mid-2000s.

V. BACKGROUND

31. The '396 patent is directed to the operation of light towers and sound buzzers on semiconductor manufacturing apparatuses. *See generally* Ex. 1001 ('396 patent) at 1:11-36. Semiconductors manufacturing apparatuses have had light towers and sound buzzers since well before the mid-2000s, and by that time they were ubiquitous in the industry. In fact, they were standardized internationally by the IEC (International Electrotechnical Commission) under IEC 60073 before the time of the patent. The '396 patent statement of the "related art" says that these "signal indicators" have "widely been used as a means for displaying (informing) a running state to the outside of the apparatus." *Id.* at 1:11-13. The '396 patent also acknowledges that the conditions for operating light towers and sound buzzers are not now, and even combined conditions ("for example, turn light on when the substrate apparatus is in A-state or B-state") are not new. *Id.* at 1:31-36.

VI. INDEPENDENT CLAIM 1

32. Independent Claim 1 of the '937 patent recites a "substrate processing apparatus." Claim 1 is reproduced below with bracketed labels added:

> 1. [preamble] A substrate processing apparatus comprising a signal indicator for indicating a running state, comprising:
> [a] a plurality of signal indicators operating under any one of a plurality of operation conditions, and

[b] a display unit for displaying the operation conditions of the signal indicators, the operation conditions being set independently in advance of being displayed, wherein

[c] the display unit displays whole operation causes which corresponds to the signal indicators and

[d] [the display unit] displays with a different color the operation cause which corresponds to the operation of the signal indicator among the whole operation causes.

VII. INDEPENDENT CLAIM 9

33. Independent Claim 9 also recites a "substrate processing apparatus." Claim 9 is reproduced below with bracketed labels added:

9. [preamble] A substrate processing apparatus comprising a signal tower and a buzzer as a plurality of signal indicators for indicating a running state, comprising:

[a] a display unit displaying operation conditions that are set independently and in advance corresponding to the signal tower and the buzzer,

[b] wherein the display unit sets sound of the buzzer as the operation condition of the signal tower.

VIII. INDEPENDENT CLAIM 10

34. Independent Claim 10 recites a "substrate processing system." Claim 10 is reproduced below with bracketed labels added.

10. [preamble] A substrate processing system comprising a substrate processing apparatus comprising a plurality of signal indicators indicating a running state and a host computer connected to the substrate processing apparatus via a communication line,

[a] wherein: the display unit displays, in the case where the signal indicators operate under instructions from the host computer, all of operation causes of the signal indicators and

[b] [wherein: the display unit] displays the instructions from the host computer with a different color.

IX. CLAIM CONSTRUCTION

35. I have been instructed to accord claim terms their plain and ordinary meaning.

36. The independent claims include terms relating to "operation condition"/"operation conditions" and "operation cause"/"operation causes." Dependent Claims 5-8 specify that "sound of the buzzer is recognized depending on a lighting state of the signal tower." Independent Claim 9 specifies "the display unit sets sound of the buzzer as the operation condition of the signal tower." They are not technical terms of art. I discuss them below.

A. "the operation condition" (Claim 9) and "operation conditions" (Claims 1 and 9)

37. Independent Claims 1 and 9 refer to operation conditions.

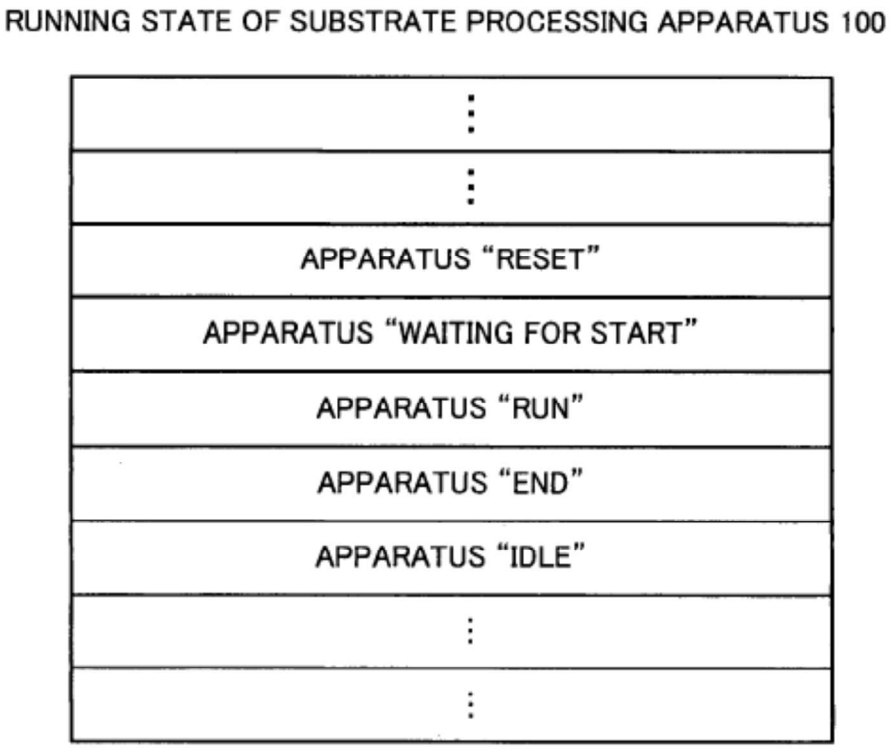
- Claim 1 recites "a plurality of signal indicators operating under any one of a plurality of **operation conditions**" and "a display unit for displaying the **operation conditions**…being set independently in advance of being displayed."
- Claim 9 recites "a display unit for displaying **operation conditions** that are set independently and in advance corresponding to the signal tower

and the buzzer" representing "a plurality of signal indicators" and "specifies that display unit sets sound of the buzzer as **the operation condition** of the signal tower."

38. As I explain in more detail below, in the specification, "operation conditions" are predetermined conditions for operating the signal indicators (the signal tower and buzzer) based on the running states of the semiconductor processing apparatus. An "operation condition" can be conceptualized in terms of an "IF" portion, or condition precedent, of an "IF/THEN" expression for instructing the signal indicators to operate. IF an "operation condition" is satisfied, THEN an associated signal indicator will be instructed to operate in a specific manner.

39. The specification sometimes refers to operating conditions as "factors" or "requirements" based on possible running states. Ex. 1001 ('396 patent) at 2:50-54, 9:59-62, 9:63-10:2, 12:10-18, 12:22-36. Figure 7 of the '396 patent, reproduced below, shows an example set of possible running states. *See also id.* at 9:62-10:2. A person of ordinary skill in the art would have understood these "running states" represent various equipment states that can occur when operating a substrate processing apparatus, that is, operational states of the substrate processing apparatus.

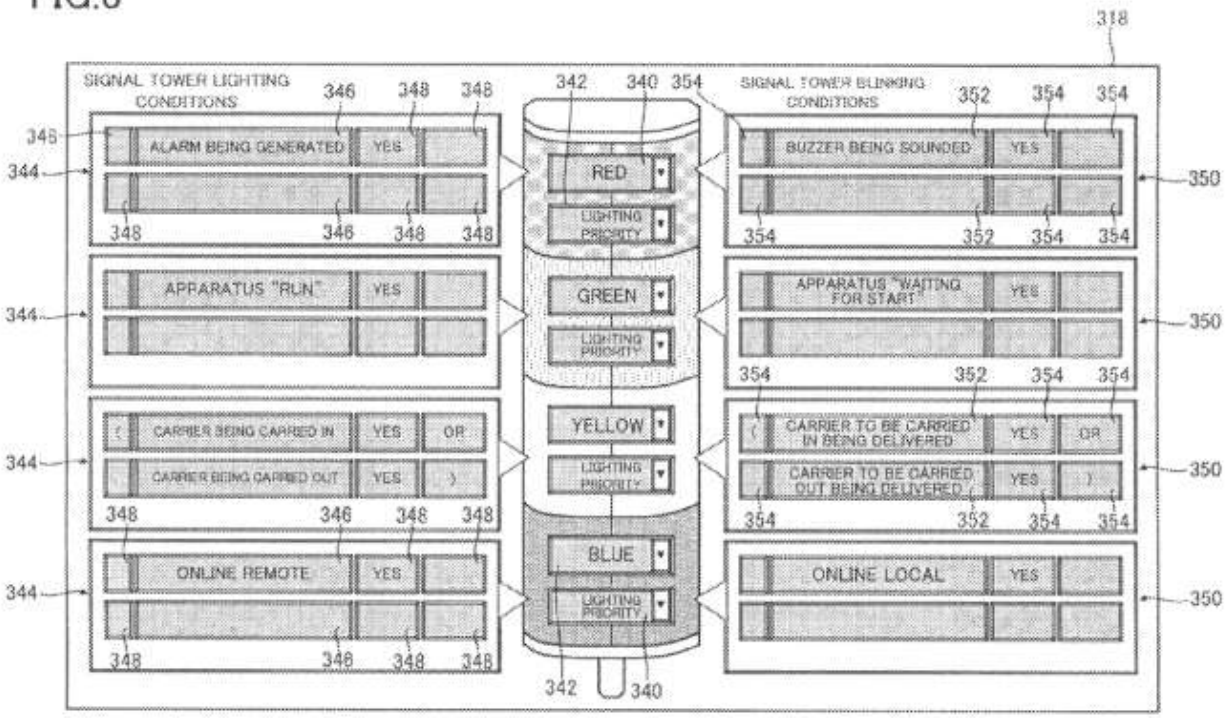
FIG.7



40. The operation conditions associate some (or all, depending on what a user choose to set up) of these running states with the signal indicators such that, when a certain running state occurs, the operation condition of the IF/THEN expression is satisfied, and this causes the associated signal indicator to operate.

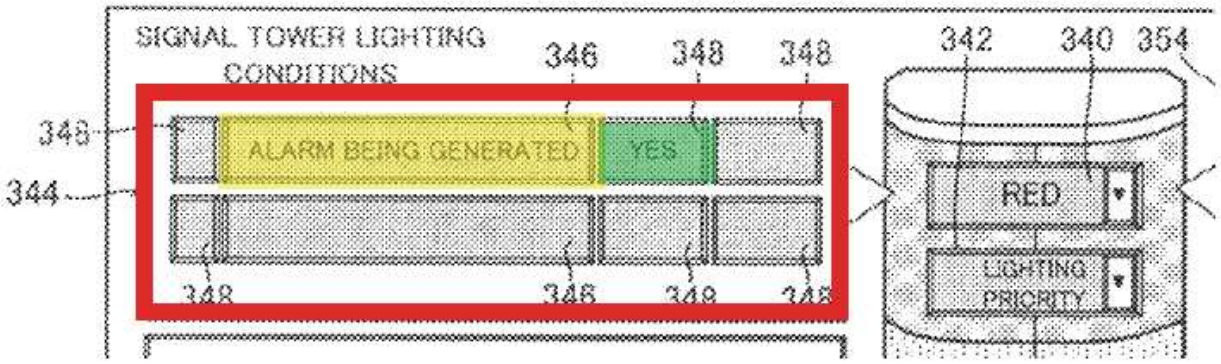
41. For instance, Figure 8 illustrates a user interface ("first input screen 318") displayed on display unit 314 "to set an operation condition of the signal tower" based on possible running states. *Id.* at 10:7-8.

FIG.8



42. The left and right columns, the lighting condition input sections 344 and blinking condition input sections 350, are the input sections for setting the operation conditions of the signal tower. *Id.* at 10:9-11:6. The lighting conditions set in the lighting conditions input sections 344 control when a light color on the signal tower is turned on. *Id.* at 10:47-52. The blinking conditions set in the blinking condition input sections 350 control when a light color on the signal tower blinks. *Id.* at 10:62-11:6. Both the lighting conditions (in 344) and the blinking conditions (in 350) serve as the "IF" portions, or conditions precedent, of "IF/THEN" expressions for instructing for the signal tower to operate. IF a lighting condition (in 344) or a blinking condition (in 350) is satisfied, THEN the signal tower will be instructed to operate in a specific manner.

43. The lighting condition input section 344 in the upper left corner of first input screen 318 in Figure 8 is shown below in a color-annotated excerpt. The red box highlights the example light condition input section 344.



44. The specification explains that an operation condition (as the condition precedent for operating a signal indictor) can be a logical formula with "components" and "conjunctions." *Id.* at 10:28-61. For example, the specification states:

> That is, in the lighting condition input section 344, it is possible to set the logical formula (**component** and **conjunction**) … in each of frames (e.g. first device state input section 340 [sic, 346], first approval condition input section 348, and the like) as a lighting condition (operation condition) of the signal tower 304.

Id. at 10:47-52.

45. A user enters the "components" of the logical formula in first device state input sections 346 (yellow) and enters the "conjunctions" of the logical formula in first approval condition input sections 348 (green). *Id.* at 10:39-56. The

components correspond with the possible running states in Figure 7. *Id.* at Figure 8. Conjunctions or "approval condition[s]" like YES or NO define how the component is satisfied. *See id.* at 10:43-46. In logical formulas involving multiple device states or running states as components, the conjunctions can also define Boolean relationships (AND or OR) between the running states. *Id.* at 10:44-45, 10:55-61. Figure 8 shows this in the lighting condition input section 344 and the blinking condition input section 350 associated with the yellow light (the second ones from the bottom). *Id.* at Figure 8.

46. In the color annotated excerpt above, the component is the running state ALARM BEING GENERATED and the associated conjunction is YES. The logical formula with this component and conjunction again can be conceptualized in terms of the "IF" portion in an "IF/THEN" expression: IF "YES," the running state is "ALARM BEING GENERATED," THEN the associated red light of the signal tower is lighted. *See id.* at 10:47-11:61, 12:10-18, 15:60-16:3, 16:40-55. This logical formula with the component and the conjunction is an "operation condition" for instructing for the signal tower to operate.

47. In the same way, a user sets up 1) blinking conditions of the signal tower 308 using the blinking conditions input sections 350 on first input screen 318 of Figure 8, and 2) buzzer conditions of the buzzer 310 using the tone distinction input sections 366 on second input screen 364 of Figure 10. *Id.* at 10:62-11:6, 12:45-60. Both the blinking conditions input sections 350 and the tone distinction

input sections 350 are used to associate a certain running state with a signal indicator (blinking light or buzzer sound); when that certain running state occurs, the operation condition is satisfied, and this causes the associated signal tower or buzzer to operate as defined (e.g., IF the buzzer is sounded THEN blink the red light; IF an alarm is being generated THEN play a continuous sound). *See* Figures 8, 10.

48. Consistent with the specification, a person of ordinary skill in the art would have understood that "operation conditions" are predetermined conditions for operating the signal indicators based on the running states of the semiconductor processing apparatus. Again, an "operation condition" can be conceptualized in terms of an "IF" portion of an "IF/THEN" expression: IF an "operation condition" is satisfied, THEN an associated signal indicator will be instructed to operate in a specific manner.

B. <u>"operation causes" and "operation cause" (Claim 1)</u>

49. The last limitation of Claim 1 specifies that "the display unit displays whole **operation causes** which corresponds to the signal indicators and displays with a different color **the operation cause** which corresponds to the operation of the signal indicator among the whole operation causes."

50. The terms "whole" and "operation cause" and "operation causes" appear only in the claims. As explained below, however, consistent with the context of the claims in which they appear and the written description of the specification, a person of ordinary skill in the art would have understood that "whole operation

causes" correspond to operation conditions that are displayed, regardless of whether they are satisfied by a running state. The "operation cause which corresponds to the operation of the signal indicator" refers to the operation condition that was satisfied and actually caused the operation of the associated signal indicator. S*ee* Ex. 1001 ('396 patent) at Abstract, 1:54-60, 15:1-10, 18:16-18; 15:30-34; 15:39-49. This interpretation aligns with the specification's description of the related art, the problems to be solved by the invention, the means for solving the problem, the effect of the invention. *Id.* at 1:11-2:25. It also aligns with the written description of the invention.

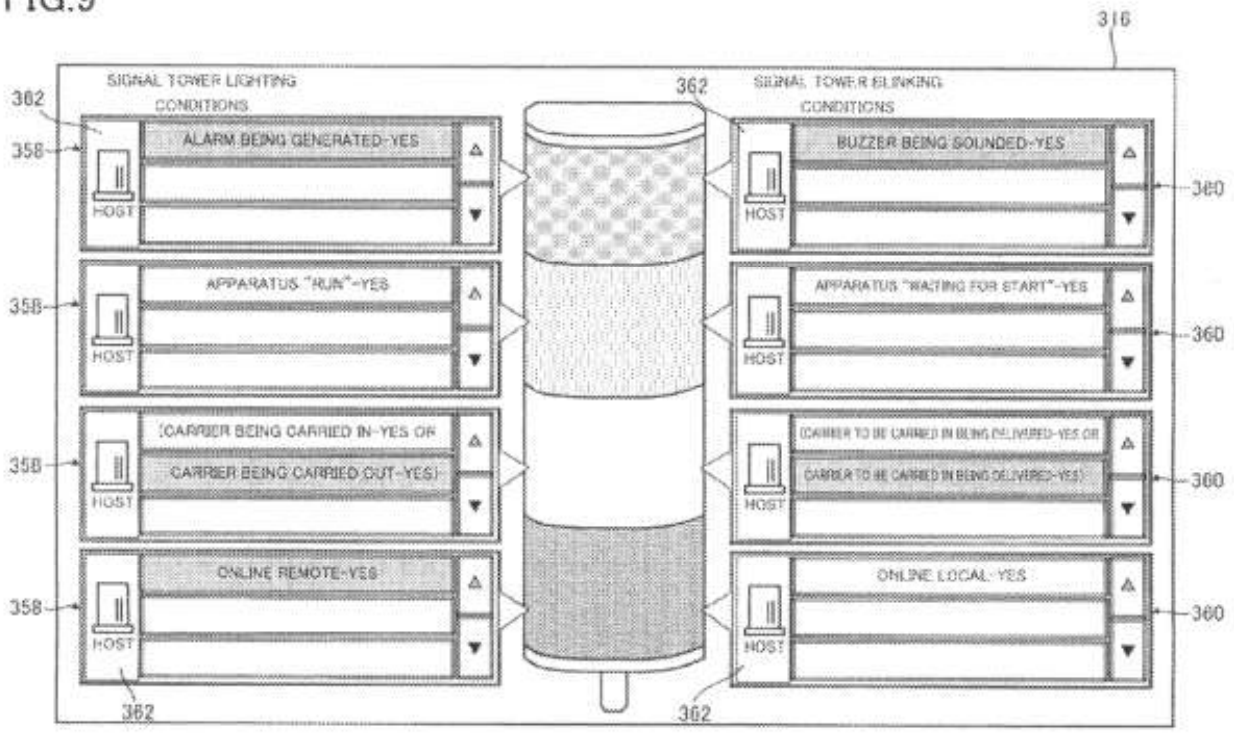
1. "operation causes" (Claim 1)

51. The word "cause" appears in the specification, and the specification states that the operation conditions "cause … the operation" of the signal indicators. Ex. 1001 ('396 patent) at Abstract, 1:58-59. The specification also explains how, if an operation condition has been associated with a running state, the operation condition "causes" the signal indicator to operate (or "does not cause" the signal indicator to operate, as specifically instructed) whenever that running state occurs on the substrate processing apparatus (*see id.* at 15:1-10, 15:39-48, 18:16-26) and how, if no operation condition has been associated with a running state, then nothing will "cause" a signal indicator to operate when that running state occurs on the substrate processing apparatus (*see id.* at 15:30-34).

52. Therefore, as an initial matter, a person of ordinary skill in the art would have understood that the "operation causes" that correspond to the signal indicators are operation conditions.

53. Figures 9 and 11 illustrate how operation conditions are displayed. Figure 9, reproduced below, shows a first monitor screen 316 displayed after the user sets up the lighting operation conditions with the first input screen 318 of Figure 8.

FIG.9



54. The specification explains how, in Figure 9, the signal tower lighting conditions are displayed: "In the lighting state display sections 358, **the lighting <u>conditions</u>** set by the lighting condition input sections 344 [of Figure 8] **<u>are respectively displayed</u>** …." *Id.* at 11:43-47 (emphasis added). The specification

includes a similar written description of how the signal tower blinking conditions are displayed: "In the blinking state display sections 360, **the blinking conditions** set by the blinking condition input sections 350 **are displayed** …." *Id.* at11:59-61 (emphasis added); *see also id.* at 12:10-13, 13:6-8 (describing Figure 11).

55. In light of this written description, skilled artisans would have understood that, in Figures 9 and 11, the monitor screens 316 displays operation conditions (lighting, blinking conditions) that correspond to the signal indicators in the display sections 358, 360. And the lighting conditions and blinking conditions are displayed in display sections 358, 360 on the monitor screen 316, regardless of the substrate processing apparatus's current running state. *Id.* at Fig. 9, 11:34-37, 11:43-47, 11:59-66, 12:10-13, 13:6-12.

56. The claimed "operation causes" therefore correspond to operation conditions that are displayed, regardless of whether they are satisfied by a running state.

2. "the operation cause which corresponds to the operation of the signal indicator" (Claim 1)

57. The last limitation of Claim 1 requires "the operation cause" to be "among the whole operation causes." Ex. 1001 ('396 patent) at 18:60-61. "[T]he operation cause" is also required to be **displayed with a different color** by the display unit. *Id.* at 18:58-59.

58. The reference to displaying an operation condition among other operation conditions in a different color would have led a person of ordinary skill in

the art to either Figure 9 or 11, which show how the first monitor screen 316 and second monitor screen 374 display the operation of the current signal indicator.

59. Regarding Figure 9, the specification explains that, "in the case where the lighting condition is satisfied, **the satisfaction of the lighting condition is indicated**. More specifically, **a background color of a part of the lighting condition display section 358 is displayed with a color different from that of the rest of the background part**." *Id.* at 11:49-52 (emphasis added); *see also id.* at 12:13-18.

60. Similarly, for Figure 9, the specification explains that, "in the case where the blinking condition is satisfied, **the satisfaction of the blinking condition is indicated**. More specifically, **a background color of a part of the blinking condition display section 360 is displayed with a color different from that of the rest of the background part**." *Id.* at 11:62-66 (emphasis added).

61. The specification includes a similar description of the buzzer conditions in the context of Figure 11. *Id.* at 13:8-12 (describing Figure 11).

62. In summary, the monitor screens 316, 374 display a particular operation condition (such as CARRIER BEING CARRIED OUT-YES) with a different background color when its associated running state occurs, which causes the signal indicator to operate. *Id.* at 12:10-13. In general, in light of the specification, a person of ordinary skill in the art would have understood that, in Figures 9 and 11, the monitor screen 316 or 374 displays a part of a display section 358, 360 or 376 with

a different background color when the associated operation condition of that display section is satisfied by occurrence of a running state linked to that operation condition.

63. Therefore, a person of ordinary skill in the art would have interpreted "the operation cause which corresponds to the operation of the signal indicator" to the operation condition that was satisfied by a running state and actually caused the operation of the associated signal indicator. *See* Ex. 1001 ('396 patent) at Abstract, 1:54-60, 11:43-47, 11:59-66, 12:10-13, 13:6-12, 15:1-10, 15:30-34, 15:39-49, 18:16-18.

64. This construction aligns with the inventors' characterization of the "invention" as whole. Ex. 1001, 1:42-2:25. According to the specification, an "object of [the] invention is to provide a substrate processing apparatus that … is capable of displaying under which one/ones of a plurality of operation conditions a signal indicator operates." Ex. 1001, 1:47–50; *accord id.*, Abstract. Therefore, the "invention is characterized by a substrate processing apparatus comprising … a display unit for displaying that a **cause** of the operation is **any one of the plural operation conditions** during the operation of the signal indicator." *Id.*, 1:54–60 (emphasis added). This allows users "to recognize under which one of the operation conditions the current signal (operation state of the signal indicator) is being displayed …." *See id.*, 1:42-45. Put simply, Claim 1 is directed to the idea of displaying (more specifically, displaying with a different color) which among

multiple possible causes (that is, operation conditions) actually caused the current signal indicator to operate.

C. "operation causes" (Claim 10)

65. Claim 10 specifies that "the display unit" displays "all of operation causes of the signal indicators …."

66. I understand that, in general, when the same claim terms appears in multiple claims in a patent, that claim term should be construed consistently in all such claims.

67. I explained in Paragraphs 51-56 that a person of ordinary skill in the art would have interpreted the claimed "operation causes" of Claim 1 as operation conditions that are displayed, regardless of whether they are satisfied by a running state.

68. In my opinion, the "operation causes" of Claim 10 is entitled to the same construction.

D. "wherein sound of the buzzer is recognized depending on a lighting state of the signal tower" (Claims 5-8)

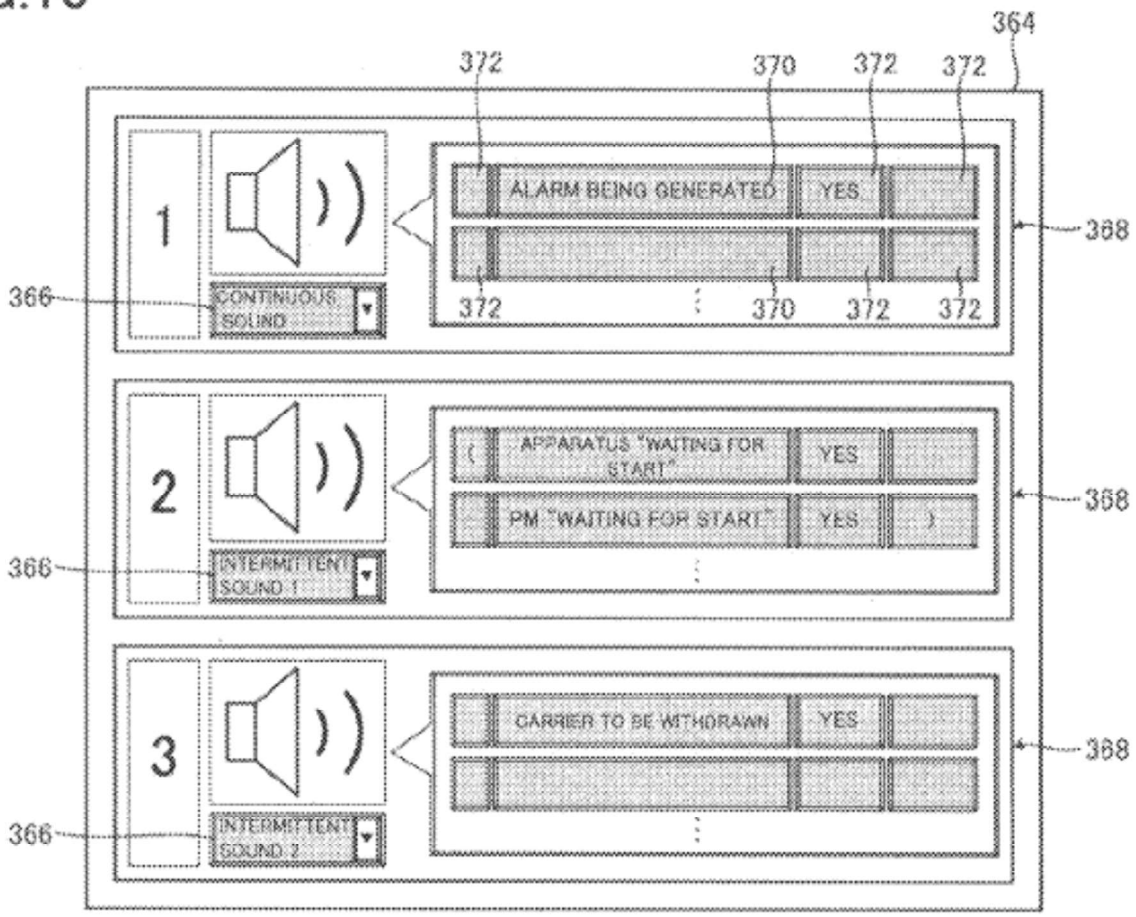
69. Claims 5-8 depend from different base claims. Each recites the additional limitation: "comprising a signal tower and a buzzer as the signal indicators, wherein sound of the buzzer is recognized depending on a lighting state of the signal tower."

70. As written, a plain language interpretation of Claims 5-8 would denote that recognition of "sound of the buzzer" depends on "a lighting state of the signal

tower." But the '396 patent does not describe this configuration as written, so the plain language of the claim is **inconsistent** with the specification.

71. A user sets up the buzzer operating conditions in the second input screen 364 of Figure 10, reproduced below.

FIG.10



72. In this example, the buzzer "operation conditions" are defined in sound condition input sections 368. Again, these buzzer operation conditions are conditions for operating the buzzer based on the possible running states of the

semiconductor processing apparatus (IF a buzzer operation condition is satisfied, THEN an associated buzzer will be instructed to operate in a specific manner).

73. Figure 10 shows that operation of the buzzer can depend, for example, on the running states:

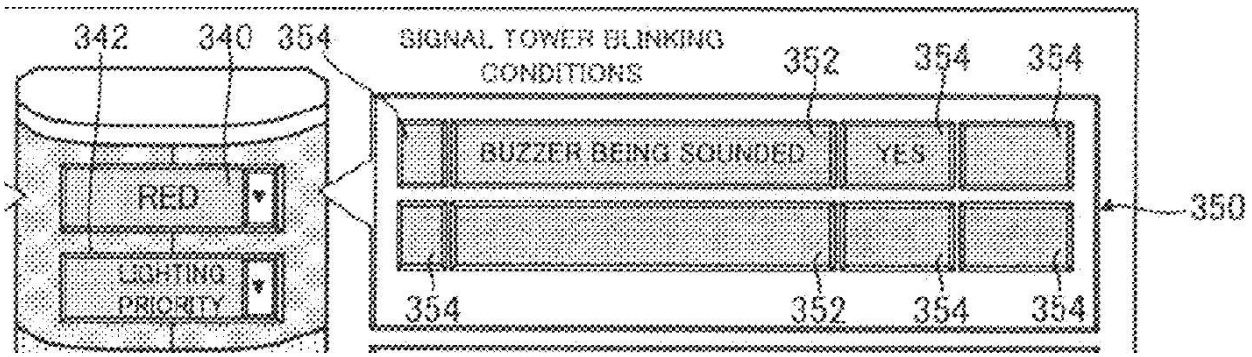
- ALARM BEING GENERATED, which indicates when an abnormality has occurred on the apparatus, *see* Ex. 1001 ('396 patent) at 16:35-37;
- APPARATUS WAITING FOR START, which indicates when a start instruction is awaited after making preparations for job execution, *see id.* at 16:7-11;
- PM WAITING FOR START, which indicates when the apparatus is waiting for a start of a recipe, *see id.* at 16:28-39; and
- CARRIER TO BE WITHDRAWN, which indicates when the carrier is in the load port after being carried out, *see id.* at 16:63-65.

None of these operation conditions links sound of the buzzer with a lighting state of the signal tower

74. I could not find an example or general description in the '396 patent indicate or implying the sound of the buzzer can depend on a lighting state of the signal tower (that is, by linking them via an operation condition). According to the '396 patent, the running state ALARM BEING GENERATED indicates that an **abnormality has occurred** on the apparatus. *Id.* at 16:35-37. The specification does not disclose, however, that ALARM BEING GENERATED or any other

possible running state relates to the **lighting state** of the signal tower. Furthermore, while the specification explains that the "sound control unit 404 controls the sound of the buzzer 310 based on the states received by the state receiving unit 402," *id.* at 15:1-10; *see also id.* at 18:11-15, Figures 13-14, the specification does not mention that a lighting state is one of those possible states received by the state receiving unit 402. *See also id.* at 15:57-17:56.

75. Figures 8 and 9 of the '396 patent, however, depict the opposite relationship, that is, that the lighting state of the signal tower can depend on sound of the buzzer. Figure 8 shows one example of input operation conditions in which the lighting state of the signal tower depends on the sound of the buzzer. In Figure 8, the blinking "operation conditions" are defined in blinking condition input sections 350. As shown in the following excerpt of Figure 8 depicting the blinking condition input section 350 in the upper right corner, a user has associated a blinking operation condition BUZZER BEING SOUNDED-YES with the red light of signal tower 308.



76. This blinking operation condition dictates that, IF the blinking operation condition is satisfied because, "yes," the buzzer is being sounded, THEN the signal tower 308 will blink red, as instructed. This single example shown in Figure 8 (repeated in Figure 9) is the only instance in the '396 patent where "a lighting state of the signal tower" is linked to a "sound of the buzzer." The written description of the specification does not describe this this option. *See, e.g.*, *id.* at 15:57-17:56. For example, the written description of the specification mentions a "step buzzer," but it explains that the step buzzer represents "that the processing designated by the recipe has been executed" and not that the buzzer is being sounded. *Id.* at 16:32-34. Furthermore, in this example, the lighting state depends on the sound of the buzzer, and not the other way around, as claimed in Claims 5-8.

77. A possible conclusion is that the '396 patent uses "is recognized depending on" in a non-standard way. This conclusion is consistent with the specification, because the specification also uses the term "recognizing" broadly:

> Particularly, in a large-scale factory or the like where plural substrate processing apparatuses are installed, there is a demand for a signal indicator capable of **recognizing** each of the running states of the substrate processing apparatuses on real-time basis.

Id. at 1:26-30 (emphasis added).

78. Based on this passage, skilled artisans would have appreciated that the '396 patent uses "recognizing" more broadly than its plain meaning would ordinarily

imply. Signal indicators in the '396 patent may be **associated with** running states through the operation conditions, thereby allowing running states to be recognized via the display unit. *Id.* But the signal indicators themselves are passive devices that operate as defined by operation conditions; they do not "recognize" running states.

79. In light of 1) the lack of a written description of a "sound of the buzzer" that depends on "a lighting state of the signal tower"; 2) the example in Figures 8 and 9 showing "a lighting state of the signal tower" that depends on a "sound of the buzzer"; and 3) the non-standard and broad use of "recognizing" in the '396 patent specification, skilled artisans would have understood "wherein sound of the buzzer is recognized depending on a lighting state of the signal tower" to mean that sound of the buzzer is associated with a lighting state of the signal tower.

X. GROUND 1: OBVIOUSNESS OF CLAIMS 1-3 AND 6-8 OVER KANG IN VIEW OF TENCOR, AND FURTHER IN VIEW OF RUSNICA

A. Claim 1 is obvious over Kang in view of Tencor, and further in view of Rusnica

80. This section demonstrates that Kang, Tencor, and Rusnica teach all limitations recited in Claim 1, and that Claim 1 would have been obvious over these references.

1. Preamble

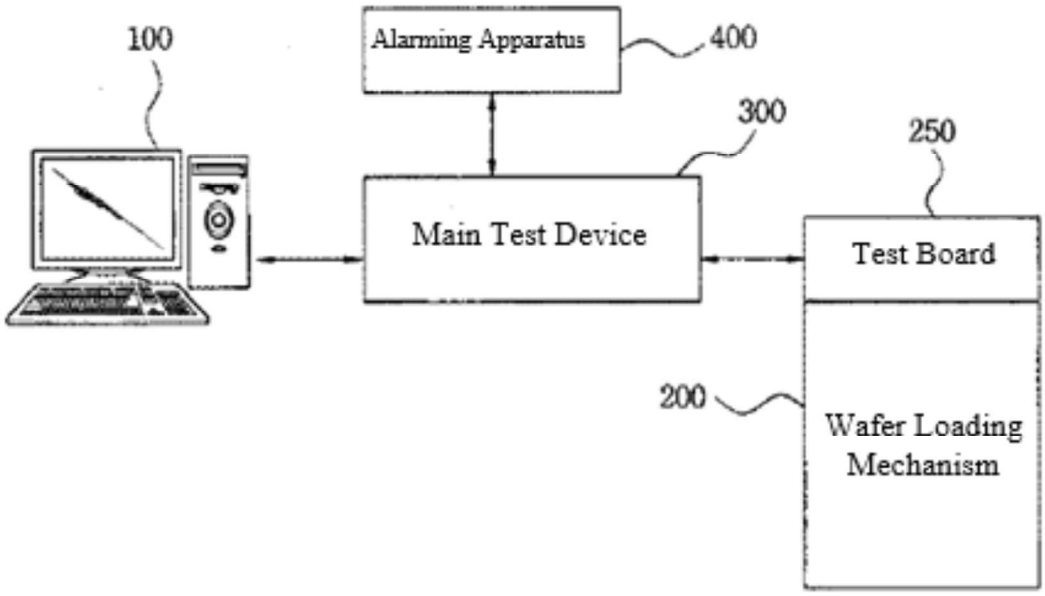
81. The preamble of Claim 1 recites a "substrate processing apparatus comprising a signal indicator for indicating a running state."

82. Kang discloses the preamble.

83. Kang discloses a substrate processing apparatus, namely, a wafer burn-in system. Ex. 1006 (Kang) at Abstract. A wafer burn-in system is a testing and quality control system used to identify and eliminate defective chips on a wafer before the chips are sold or integrated into larger systems. Each tested wafer is a substrate, and therefore the wafer burn-in system is a substrate processing system.

84. Figure 1 of Kang, reproduced below, "is a block diagram showing the overall configuration of the general wafer burn-in system." *Id.* at 1 para.5.[2]

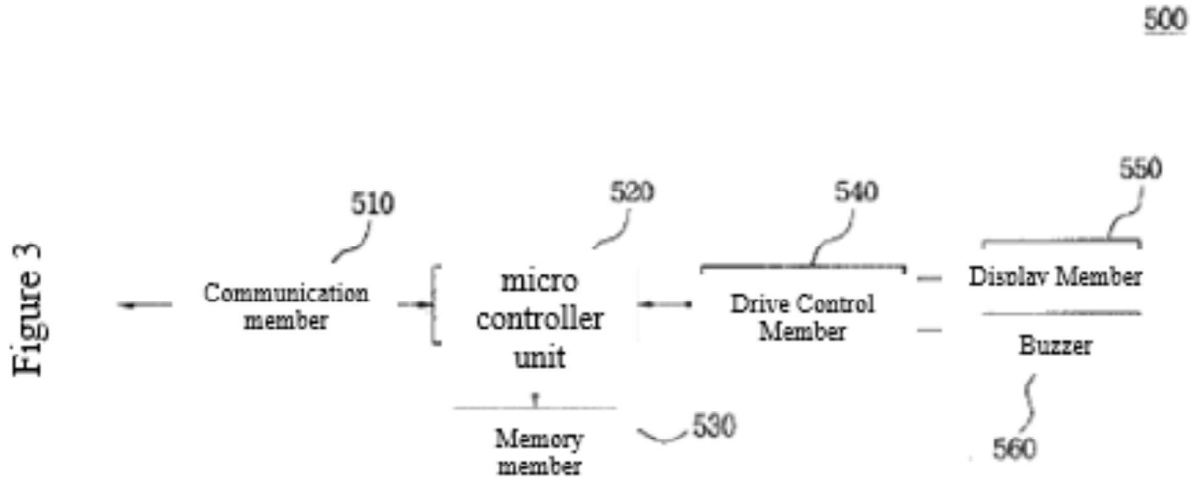
Figure. 1



[2] The references to Ex. 1006 are in the form "X para.Y." X refers to the page number and Y refers to the unnumbered paragraph from the top of the page. Each carriage return (including headings) represents a new paragraph.

85. The wafer burn-in system of Figure 1 includes main test device (300) and alarming apparatus (400). *Id.* The main test device (300) "is the main component which performs and controls the overall test process in the wafer burn-in process …." *Id.* at 2 para.11. Alarming apparatus (400) "receives the test result" and "generates a prescribed alarm … in accordance with the test result signal received so that the on-site operator can recognize this." *Id.* at 2 para.13. It also generates an error state message. *Id.* at Figure 4.

86. Kang shows a preferred embodiment of alarming apparatus (400) in Figure 3. *Id.* at 4 para.3. Figure 3, below, shows that the alarming apparatus includes display member (550) and buzzer (560). *See also id.* at 4 para.3, *id.* at 2 para.13.



87. Display member (550) and buzzer (560) serve as signal indicators indicating a running state of the apparatus. Kang explains that the alarming apparatus (400) "generates an alarm corresponding to the state of an error through

the display member (550) and the buzzer (560) ….” *Id.* at 4 para.10. In addition, it generates a message for the detected error stare and sends it to the main test device (300) to have it displayed. *Id.* These states of error can relate to the state of system itself/the wafers’ interaction with the system and include “poor contact with the multiple pins of the test board (250), etc. as well as the alignment error of a wafer, temporary suspension of an inspection, response timeout, suspension of an inspection, measurement temperature limit exceeded, wafer ID recognition error, etc….” *Id.* at 3 para.6.

88. Kang states that, with the improved wafer burn-in system, “it is going to be possible at the field performing the wafer burn-in process to identify the error state of the wafers being tested through the operational status of the lamp, which is a component of the alarming apparatus (400), or whether or not the buzzer tone has been generated.” *Id.* at 2 para.13.

89. Therefore, display member (550) and buzzer (560) serve as a plurality of signal indicators that provide visual and audible signals to a user indicating the “error state of the wafers being tested,” which is a running state because it is a state of a process (wafer testing) running in the burn-in system. Further, the main test device (300) displays the error as text help identify in more detail the cause of the error: “ … a detected error state can be displayed in the form of a message as well, and the conditions for the generation of alarm can be set up freely by the operator.” *Id.* at 2 para.13; *see also id.* at Abstract.

90. To summarize, Kang discloses a substrate processing system (the wafer burn-in system in Figure 1) comprising a signal indicator (either display member (550) or buzzer (560)) for indicating a running state ("error state of the wafers being tested"), as well as display of the error as a text message on the main test device (300).

2. Limitation 1[a]

91. Limitation 1[a] recites: "a plurality of signal indicators operating under any one of a plurality of operation conditions."

92. Kang discloses this limitation.

93. Display member (550) and buzzer (560) serve as signal indicators. Therefore, Kang discloses that the substrate processing apparatus comprises a plurality of signal indicators of display member (550) and buzzer (560).

94. As explained in Paragraphs 37-48, "operation conditions" are predetermined conditions for operating the signal indicators based on the running states of the semiconductor processing apparatus. An "operation condition" can be conceptualized in terms of an "IF" portion of an "IF/THEN" expression: IF an "operation condition" is satisfied, THEN an associated signal indicator will be instructed to operate in a specific manner.

95. Kang's display member (550) and buzzer (560) operate under any one of a plurality of operation conditions. In Kang, users define "operating conditions" or "conditions for the generation of an alarm corresponding to the detected error

state" (Ex. 1006 (Kang) at 3 para.11, *see also id.* at 4 para.10), and Kang uses similar terms as the '396 patent: "conditions for the generation of an alarm… are the **operating conditions** to operate the display member (550) and the buzzer (560)…." *Id.* at 4 para.8 (emphasis added). The operating conditions are operation conditions because they are predetermined conditions (set up by an operator) for operating the display member (550) and buzzer (560) based on the running states (error states) of the semiconductor processing apparatus. The operator can determine the signal indication and the operation conditions: "…and the conditions for the generation of the alarm can be set up freely by the operator." *Id.* at Abstract.

96. Therefore, Kang discloses a plurality of signal indicators (display member (550) and buzzer (560)) and messages on the display screen, operating under any one of a plurality of operation conditions, which are predetermined conditions ("operating conditions") for operating the signal indicators based on the running states (error states) of the semiconductor processing apparatus (conditions for the generation of an alarm… are the operating conditions to operate the display member (550) and the buzzer (560)). *Id.* at Abstract, 4 para.8, 5 para.5, Figure 4 (S515). "Furthermore, as the main test device (300) displays the error state message through the display means (monitor) usually equipped there, the field operator can recognize the state and type of an error of the wafer more easily." *Id.* at 4 para.6; *see also id.* at 5 paras.1-2.

97. Kang discloses this limitation.

3. Limitation 1[b]

98. Limitation 1[b] recites: "a display unit for displaying the operation conditions of the signal indicators, the operation conditions being set independently in advance of being displayed."

99. In my opinion, Kang teaches or at least suggests this limitation. To the extent one does not believe that Kang alone teaches this, then the combination of Kang and Tencor teaches this limitation.

100. The "overall configuration of the general wafer burn-in system" in Figure 1 under Paragraph 84 includes a display unit embodied in workstation (100) and the display means (monitor) of main test device (300). Kang explains that a user sets up the "operating conditions" for generating an alarm using workstation (100). Ex. 1006 (Kang) at 2 para.8, 3 para.10, 4 paras. 4, 8, 10, 12. Kang also discloses that the "conditions for the generation of an alarm [are] **set up in advance by the operator**." *Id.* at 4 para.10 (emphasis added). These operating conditions are "the conditions for the generation of an alarm corresponding to the detected error state…." *Id.* at 3 para.11.

101. Therefore, Kang teaches a display unit (embodied in workstation (100) and the display means (monitor) of main test device (300)) for displaying the operation conditions ("operating conditions") of the signal indicators (display member (550) and buzzer (560)), the operation conditions being set independently in advance of being displayed ("conditions for the generation of an alarm [are] set

up in advance by the operator."). The purpose of the on-screen error messages is to make it easier to identify the source of the error once the display member (550) and buzzer (560) gets one's attention. The message on the **display unit** (monitor) clearly identifies the **operating condition** (error state) that lead to the **signal indication** (display member (550) and buzzer (560)):

> "In addition, the micro controller unit (520) generates an error state message corresponding to the state and type of an error detected by this reference signal for error detection and provides it to the main test device (300) through the communication member (510). Furthermore, as the main test device (300) displays the error state message through the display means (monitor) usually equipped there, the field operator can recognize the state and type of an error of the wafer more easily."

Id. at 4 para 7.

102. Those operating conditions are entered through the workstation (100) and inevitably displayed thereupon. Id. at 2 para.11, 6 paras. 2-5, Claim 3. The workstation (100) with a computer monitor as shown above must display the operating conditions after they were entered. Displaying data after entry would have advantageously and predictably allowed a user to confirm that the operating conditions were entered correctly and allow the user to edit them.

a. Teachings of Tencor

103. Tencor Instruments manufactured and provided an operations manual for a substrate processing (metrology) apparatus called a "Long Scan Profiler" for inspecting and analyzing wafer surfaces. Ex. 1005 (Tencor) §1.1. These devices are also known as stylus profilometers, which I have used many times; they are similar in some ways to a phonograph arm and needed. The operations manual ("Tencor") describes a signal light tower. *Id.* at §12.1. The signal light tower "is a highly visible indicator of a tool's status. The multi-light device can be used to signal that an instrument is in production or to indicate the reason that it is not in production." *Id.* The signal light tower has both tower lights and a "tower voice" with "sound capabilities." *Id.* §12.2.7. The tower voice is consistent with how the '396 patent characterizes a buzzer: a "device for making continuous sound, intermittent sound, or voice…." Ex. 1001 ('396 patent) at 1:14-15; *see also id.* at 7:48-50.

104. Therefore, to summarize, Tencor discloses a substrate processing apparatus (a long scan profiler for substrates) comprising signal indicators (including "tower lights" and "tower voice").

105. Tencor also describes a video monitor. Ex. 1005 (Tencor) at Figure 1-1, §1.4. The video monitor displays a "Signal Light Tower Configuration Editor Utility window." *Id.* at Figure 12-3, §12.2.1. The Signal Light Tower Configuration Editor Utility window is reproduced below with color annotations.

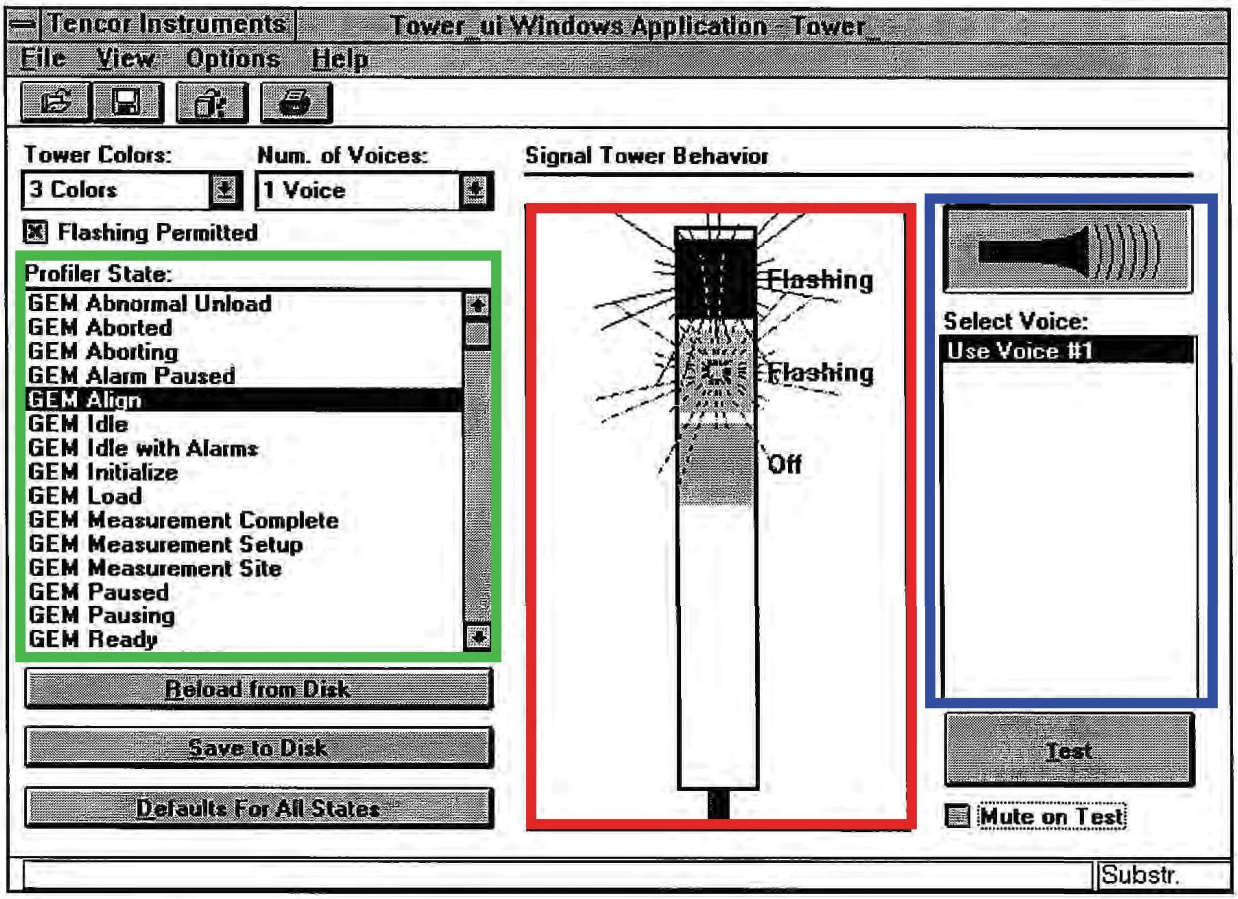


Figure 12-3 Signal Light Tower Configuration Editor Window

Id.

106. The green box is a "list box" with "Profiler State[s]" (possible running states). *Id.* at Figure 12-3, §§12.2.1, 12.2.7. The red box highlights a virtual representation of the signal light tower that displays "the proper behavior as appropriate for the settings that are current Profiler state (Figure 12-3)." *Id.* §12.2.4. The blue box indicates the "voice custom control" of the "tower voice." *Id.* §§12.2.6-12.2.7.

107. With the settings in the green, red, and blue boxes, the Signal Light Tower Configuration Editor Utility window allows a user to define and display "the

behavior of the signal tower" for each Profiler State, that is, how the Tencor substrate processing apparatus responds with lights and voice for each Profiler State. *Id.* §12.2.7. Figure 11-2 shows that each possible running state ("Profiler State") has an associated "Signal Tower Behavior." *Id.* at Figure 12-3, §12.2.1.

108. The Profiler States in Tencor are operation conditions because they are predetermined conditions for operating the signal indicators (the tower lights and the tower voice) based on the running states of the semiconductor processing apparatus. For example, **IF** a Profiler State is satisfied (for example, when the Tencor apparatus transitions to a GEM Align state), **THEN** an associated signal indicator (the tower lights and/or the tower voice) will operate, as specified by the Signal Tower Behavior set in the Signal Light Tower Configuration Editor Utility window.

109. Furthermore, each of the operation conditions (the Profiler States) in Tencor are set independently in advance of being displayed in the Signal Light Tower Configuration Editor Utility window. For example, all Profiler States have "factory default settings." *Id.* §§12.2.3, 12.2.7. In addition, all Profiler States can be independently customized by a user and later reviewed or customized further. *Id.* §12.2.7. Tencor also satisfies this limitation. Further, in 1987 when I entered the semiconductor industry I worked at Applied Materials. Our newest piece of equipment, the Precision 5000, could generate hundreds of different warnings and errors on the computer screen. The more serious warnings that needed immediate attention were text in a red box. The buzzer would not stop buzzing until one

addressed the "Red Warnings." The next most serious warnings were in a yellow box. Also, there were warnings in blue, that were more informational. These "on-screen" colored notifications were augmented by the audio warning of the buzzer, and the light bars, which were meant to be noticed from a distance. All of our equipment designed between 1987 and 1997 (while I was employed) had similar features.

b. Motivation and expectation of success

110. It would have been obvious combine Kang and Tencor. A person of ordinary skill in the art would have been motivated to combine the workstation (100) of Kang with the Signal Light Tower Configuration Editor Utility window of Tencor. Kang teaches the need for a computer-implemented interface that allows an operator to link the operations of display member (550) and buzzer (560) with various types and states of errors occurring during the burn-in process by defining "operating conditions." Ex. 1006 (Kang) at Abstract, 4 para.8, 5 para.5, Figure 4(S515). Tencor teaches precisely such a computer-implemented interface. With the Signal Light Tower Configuration Editor Utility window, a user can click through a list of Profiler States that occur during wafer processing and assign different behaviors for the "tower lights" and "tower voice" for each Profiler State. Ex. 1005 (Tencor) §12.2.7. A person of ordinary skill in the art would have been motivated to utilize an interface like Tencor's to obtain the benefits of an easy-to-use, graphically-driven UI for associating running states with signal light tower

behaviors.

111. A person of ordinary skill in the art would have had a reasonable expectation of success in combining the elements of Kang and Tencor. The combination uses known software design and programming techniques. A person of ordinary skill in the art would have used one of the well-known programming environments to design a computer-implemented interface to click through a list of types and states of errors that occur during the burn-in process and assign different operating conditions for display member (550) and buzzer (560) using design elements like those in the color-annotated boxes above. And the result would have been predictable because Tencor successfully implemented this design in a display unit for displaying operation conditions of signal indicators.

112. In light of the motivation to combine and reasonable expectation of success, it would have been obvious to combine these references.

4. Limitation 1[c]

113. Limitation 1[c] recites: "wherein the display unit displays whole operation causes which correspond[] to the signal indicators."

114. Paragraphs 51-56 explain that "operation causes" are operation conditions that are displayed, regardless of whether they are satisfied by a running state. As explained in Paragraphs 37-48, operation conditions, again, are predetermined conditions for operating the signal indicators based on the running states of the semiconductor processing apparatus.

115. The combination of Kang/Tencor discloses this limitation.

116. In Kang, the operating conditions entered at workstation (100) are whole operation conditions that are displayed, whether or not they are satisfied by the occurrence of a running state. (*See Supra* Paragraphs 37-48, 95). The green list box of Tencor's Signal Light Tower Configuration Editor Utility window also shows displayed operation conditions (Profiler States), whether or not they are satisfied, representing running states that can possibly cause the signal indicators (the tower lights and the tower voice) to operate. (*See Supra* Paragraphs 103-108). Therefore, Tencor's display unit (video monitor, which displays the Signal Light Tower Configuration Editor Utility window) as incorporated in Kang displays whole operation causes which correspond to the signal indicators and satisfies this limitation.

5. Limitation 1[d]

117. Limitation 1[d] recites: "[the display unit] displays with a different color the operation cause which corresponds to the operation of the signal indictor among the whole operation causes."

118. Paragraphs 57-64 (*see Supra)* explain that the "the operation cause which corresponds to the operation of the signal indicator" is the operation condition that was satisfied by a running state and actually caused the operation of the associated signal indicator.

119. The further combination of Kang/Tencor and Rusnica teaches this limitation.

120. Kang discloses that, while display member (550) and buzzer (560) are operating because of a detected error state, the "detected error state can be **displayed in the form of a message** …." Ex. 1006 (Kang) at Abstract (emphasis added); *see also id.* at 3 para.3, *id.* at 4 para.10. The "micro controller (520) generates an error state message corresponding to the state and type of the error detected at the step (S507) described above … and the main test device (300) displays this error state message on the display means (monitor) on the so the operator can check it (Step S517)." *Id.* at 5 para.1.

121. The messages correspond to the signal indicators: "As a result, the alarming apparatus of the present invention (500) configured as described above receives the test result signal provided by the main test device, detects the state and type of error of all wafers, and **generates an alarm corresponding to the state of an error through the display member (550) and the buzzer (560)** in accordance with the conditions for the generation of an alarm set up in advance by the operator. In addition, it **generates a message for the detected error state** and sends it to the main test device (300) to have it displayed." *Id.* at 4 para.10 (emphasis added).

122. An error state message generated by micro controller (520) represents "the operation cause which corresponds to the operation of the signal indicator" because it is an operation condition (operating condition based on an error state) that

was satisfied by a running state ("the detected error state") and actually caused the operation of the associated signal indicator (display member (550) and/or buzzer (560)).

123. The combined apparatus of Kang and Tencor therefore includes a display unit that displays the operation cause which corresponds to the operation of the signal indicator (the error state message) among the whole operation causes (the types and states of errors that occur during the burn-in process, displayed as in Tencor's Profiler States).

a. Teachings of Rusnica

124. I provided an overview of Rusnica in Paragraph 18. Rusnica teaches that "[o]perator performance literature is full of cases where operators failed to correctly find, integrate, and interpret typical alarm messages in order to identify and respond to disturbances." Ex. 1007 (Rusnica) at 1:67-2:3. To remedy this deficiency, Rusnica teaches displaying alarm messages on a display with different colors to help operators assimilate the presented status: "multiple levels of **color coding** … ease operator assimilation of the information and make it readily understandable." *Id.* at 19:8-10 (emphasis added).

125. At least some of the displays "are presented as text on a background within a border where the background of the text is color coded to signify a first indicia of the subject matter represented by the display." *Id.* at Claim 41; see also *id.* at 3:28-30 ("Some display elements present multiple packets of information

through use of color coded backgrounds, borders and graphics ….”). For example, Rusnica teaches displaying information using different colors depending on whether that information is representative of normal or abnormal states, such as those requiring operator intervention. *See, e.g.*, *id.* at 15:4-40 (teaching displaying normal conditions in green and abnormal conditions in yellow or red). In addition, Rusnica teaches “employ[ing] a color scheme to differentiate whether systems or components are operating or not.” *Id.* at 15:43-45.

b. Motivation and expectation of success

126. Considering Rusnica, it would have been obvious to modify the error messages in Kang such that a displayed message is displayed in a different color, for example, in the color corresponding to its associated lamp color.

127. Rusnica provides a motivation for the combination because Rusnica recognized that “multiple levels of color coding … ease operator assimilation of the information and make it readily understandable.” Ex. 1007 (Rusnica) at 19:8-10. The modified configuration would have desirably allowed an operator 1) to look at the currently displayed lamp color of display member (550) and assess the state and type of an error on the wafer burn-in system from a distance; and 2) after arriving at workstation (100), to contextualize the error message quickly, based on the display unit alone, and without needing to look again at the currently displayed lamp color of display member (550). A person of ordinary skill in the art would have been motivated to utilize these teachings of Rusnica in the wafer burn-in system of Kang

(as modified by Tencor) to improve operator assimilation of the error in a demanding manufacturing environment.

128. Skilled artisans would have had a reasonable expectation of success in combining the elements of Kang and Rusnica. The combination uses software design and programming techniques known to skilled artisans. The result would have been predictable because Rusnica successfully implemented color coded error messages, a technique well within the abilities of skilled artisans using well known programming environments.

129. In view of the foregoing motivation to combine and reasonable expcatation of success, it would have been obvious to combine Kang/Tencor and Rusnica. The obvious combination of Kang/Tencor and Rusnica teaches that the display unit (of Kang as modified by Tencor) displays with a different color (e.g., normal conditions in green and abnormal conditions in yellow or red) the operation cause which corresponds to the operation of the signal indicator (the error state message) among the whole operation causes (the types and states of errors that occur during the burn-in process, displayed as in Tencor's Profiler States) and satisfies this limitation.

130. Accordingly, Kang, Tencor, and Rusnica teach all limitations of Claim 1, and it would have been obvious to combine the reference teachings. Claim 1 is obvious over Kang in view of Tencor, and further in view of Rusnica.

B. Claim 2 is obvious over Kang in view of Tencor, and further in view of Rusnica

131. Claim 2 depends from Claim 1. I address Claim 1 in Paragraphs 80-130. Claim 2 recites the additional limitation: "wherein the display unit comprises a setting screen for setting priority to the operation conditions, and the signal indicators operate in accordance with the priority order."

132. Kang discloses that the substrate processing apparatus comprises a display unit (embodied in workstation (100) and the display means (monitor) of main test device (300)) and a plurality of signal indicators, namely, display member (550) and buzzer (560). *Supra* Paragraphs 83-90. Kang also discloses that workstation (100) includes a setting screen for setting the operating conditions. Ex. 1006 (Kang) at 4 para.4.

> In addition, another purpose of this invention is to provide an alarming apparatus of wafer burn-in system in which **the operator can freely set up the conditions for the generation of an alarm depending** on the status and type of an error occurred in the wafer burn-in process.

Id. at 3 para.10 (emphasis added).

133. Tencor explains that, on the Signal Light Tower Configuration Editor Utility window (representing a setting screen for entering settings for the light tower and tower voice), the virtual "Signal Light Tower allows you to specify any of the five lights: red, yellow, green, blue, and white." Ex. 1005 (Tencor) §12.2.4. Tencor

discloses that "[y]ou can set these lights independently of each other. Lights can be turned off, constantly on, or set to flashing." *Id.*

134. Tencor states: "You can edit the tower behavior by using the mouse. If you click on a given light, the light toggles its state. This means that if the light was off, it goes to flashing next. If the light was flashing, it goes to on next. **If the light was flashing, it turns off any other light since this control prevents illegal behavior such as two lights being on at the same time**." *Id.* (emphasis added).

135. The red box in Figure 11-2 (under Paragraph 105 *Supra*) shows the virtual signal light tower with three colored lights. For the Profiler State "GEM Align," the signal tower is configured such that the top and middle lights are "Flashing" and the bottom light is "Off." Following Tencor's description in §12.2.4, if a user clicked the middle flashing light one more time, the middle flashing light would change to solid "On" and the red flashing light would change to "Off." The bottom light is already Off. The solid "On" state for the last color light selected has priority over all other light states, because it "prevents illegal behavior such as two lights being on at the same time." *Id.*

136. For the tower voice, the "voice custom control is a two-state button (Figure 12-3). It toggles between on and off. When … it is in the *on* state, an appropriate picture shows a speaker with sound waves." *Id.* §12.2.6. When the voice option is in the *off* state, another picture shows a speaker without sound waves." *Id.* The tower voice can support up to 16 voices in the "*on*" state. *Id.* The

"*off*" state has priority over all possible voices, however, because the "*off*" state prevents **any** voice from operating.

137. The signal indicators (tower lights and tower voice) corresponding with their virtual counterparts on the Signal Light Tower Configuration Editor Utility window operate in accordance with the priority order dictated by the window. Tencor states that "[y]ou can test a state after editing it by selecting the Test button. This action immediately places the tower into that state so that you can see and hear what the state appears like." *Id.* §12.2.7.

138. To summarize, Kang allows the operator to freely enter the operation conditions on a display the controlling the signal indications as described above. Further, Tencor discloses a display unit that comprises a setting screen (a video monitor, which displays the Signal Light Tower Configuration Editor Utility window) for setting priority to the operation conditions (in each Profiler State, the solid light "On" state for the last color light selected has priority over all other light states and the voice "*off*" state has priority over all possible voices), and the signal indicators operate in accordance with the priority order (the tower lights and tower voice operate as dictated by the conditions set in the window).

139. Therefore, the combination of Kang and Tencor (as further modified by Rusnica) teaches this limitation. The combination of Kang, Tencor, and Rusnica would have been obvious for the same reasons provided for Claim 1 in Paragraphs

110-112 and 126-129 to provide an easy-to-use interface for entering Kang's operating conditions.

140. Claim 2 is obvious over Kang in view of Tencor, and further in view of Rusnica.

C. Claim 3 is obvious over Kang in view of Tencor, and further in view of Rusnica

141. Claim 3 depends from Claim 1. I address Claim 1 in Paragraphs 80-130. Claim 3 recites the additional limitation: "wherein the signal indicators operate under instructions from **the host computer**, and the display unit displays presence or absence of the instructions from the host computer with different colors." I have been instructed to interpret this claim as if it recited "wherein the signal indicators operate under instructions from **a host computer**, and the display unit displays presence or absence of the instructions from the host computer with different colors," because "the host computer" has no antecedent in Claims 1 or 3.

142. Kang discloses that the substrate processing apparatus (wafer burn-in system) comprises a plurality of signal indicators, namely, display member (550) and buzzer (560) and a display unit (embodied in workstation (100) and the display means (monitor) of main test device (300)). *Supra* Paragraphs 83-90. Kang also discloses that an operator uses workstation (100) to set up the "operating conditions" for generating an alarm using workstation (100). Ex. 1006 (Kang) at 2 para.8, 3 para.10, 4 paras. 4, 8, 10, 12. Workstation (100) is a host computer because it hosts the entry of conditions and commands for implementing the wafer burn-in process.

143. Therefore, to summarize, Kang discloses that the signal indicators (display member (550) and buzzer (560)) operate under instructions (such as whether to light a lamp or cause a type of sound) from a host computer (workstation (100)).

144. Figure 12-3 of Tencor (under Paragraph 105) teaches a PC compatible processor (a host computer that hosts the software) and Signal Light Tower Configuration Editor Utility window that displays presence or absence of instructions, for example, 1) to light a lamp or cause a type of sound or 2) whether there is no activation of the lamp or sound.

145. The red box indicates a virtual representation of the signal light tower for displaying "the proper behavior as appropriate for the settings that are current Profiler state." Ex. 1005 (Tencor) §12.2.4. The blue box indicates a "two-state button" for "voice custom control" of the "tower voice." *Id.* §§12.2.6, 12.2.7. In the example in Figure 12-3, for the Profiler State "GEM Align," the signal tower is configured such that the red and yellow lights are flashing and the green light is off. The tower voice is configured such that it is in the *on* state (with a picture of soundwaves next to the speaker). *See id.* at Figure 12-3 §12.2.1.

146. Figure 12-3 shows that Tencor displays presence or absence of the instructions from the host computer with different colors. The PC compatible processor translates input from a user (like mouse movement and clicks and keyboard entries) into corresponding actions on the video monitor. When a user

hovers a mouse icon over a Profiler State and clicks the mouse, for example, the PC compatible processor translates the input into changes on the window. In the example of Figure 12-3, Tencor displays the presence of instructions from the PC compatible processor to light the red light in a flashing state with a certain configuration of black pixels; it displays the presence of instructions to light the yellow light in a flashing state with a different configuration of black pixels; it displays the presence of instructions not to light the green light (or an absence of instructions to light the green light) with white pixels; it displays the presence of instructions to cause a sound with a black color (of the soundwaves); it displays the presence of instructions not to cause a sound (or an absence of instructions to cause a sound) with a white color (no soundwaves).

147. Rusnica, of course, further teaches implementing other colors to better convey information about a state (or the absence of a state). Ex. 1007 (Rusnica) at 15:41-64 (differentiating "Standby" from "Operating" with colors).

148. The combination of Kang, Tencor, and Rusnica would have been obvious for the same reasons provided for Claim 1 in Paragraphs 110-112 and 126-129 to provide an easy-to-use interface for entering Kang's operating conditions. In addition, based on the teachings of Rusnica, skilled artisans would have logically implemented changes to the green light using a green color, changes to the red light using a red color, and so forth, with a reasonable expectation of

success when using a color monitor, which were commonplace by the time of the '396 patent.

149. Accordingly, the combination of Kang, Tencor, and Rusnica teaches the additional limitation of Claim 3, and it would have been obvious to combine the reference teachings. Claim 3 is obvious over Kang in view of Tencor, and further in view of Rusnica.

D. Claim 6-8 are obvious over Kang in view of Tencor, and further in view of Rusnica

150. Claim 6 depends from Claim 1 and intervening Claim 3. Claim 7 depends from Claim 1 and intervening Claim 2. Claim 8 depends directly from Claim 1. I address the base claims in Paragraphs 80-130 (Claim 1), Paragraphs 131-140 (Claim 2), and Paragraphs 141-149 (Claim 3). Claims 6-8 recite the additional limitation: "comprising a signal tower and a buzzer as the signal indicators, wherein sound of the buzzer is recognized depending on a lighting state of the signal tower."

151. Paragraphs 69-79 (*see Supra)* explain that a person of ordinary skill in the art would have understood "wherein sound of the buzzer is recognized depending on a lighting state of the signal tower" to mean that "sound of the buzzer" is associated with a lighting state of the signal tower."

152. Kang discloses the plurality of signal indicators include display member (550) and buzzer (560). *Supra* Paragraphs 83-90. The '396 patent states that a signal tower is a "device for lighting or blinking lamps of plural colors aligned

by color…." Ex. 1001 ('396 patent) at 1:16-17. Kang similarly discloses that the display member is "composed of a number of lamps each of which has a different color" and that an "alarming apparatus (400) is **typically** composed of multiple lamps including green, yellow and red lamps." Ex. 1006 (Kang) at Abstract, 2 para.13; *see also id.* at 4 para.9. Consistent with the '396 patent, display member (550) is a signal tower, and buzzer (560) is a buzzer within the scope of the claim.

153. Kang states that, in prior art wafer burn-in systems without error message capabilities, "the state and type of … an error [of the burn-in process] are distinguished only by the **combination** of the operational status of the display member (400) and the buzzer (450)," although Kang recognizes that a user may have difficulty doing so accurately. *Id.* at 3 para.7. Because Kang discloses a wafer burn-in system comprising a display member (400) and a buzzer (450) whose combined operations indicate an error, in Kang sound of the buzzer (450) is associated with a lighting state of the signal tower (display member 400).

154. If Claims 6-8 are to be construed as written, it also would have been obvious to configure Kang's wafer burn-in system such that a user can better recognize the buzzer sound depending on a lighting state of the signal tower based on Kang's own teachings. Kang describes combining lamp states and buzzer sounds: "the operator can set up freely the status of lighting of each lamp in the display member (550) and the type and time of buzzer tones generated through the buzzer (560) depending on the state and type of an error occurred in the burn-in

process." *Id.* at 4 para.8. The operator would have been motivated to select a combination of lamp state and buzzer sound that would have allowed the operator or other users to recognize accurately the state and type of error that occurred in the burn-in process. For example, a user would have reasonably recognized a buzzer sound occurring when the lamp color is yellow to signify a different (and likely less serious) error than the same buzzer sound occurring when the lamp color is red. And a person of ordinary skill in the art would have had a reasonable expectation of success in doing so because it would have been reasonable and predictable to select appropriate combinations that communicate the state and type of error effectively. The modification requires only defining lighting states and sound buzzers in a way that makes sense to operators.

155. The combination of Kang, Tencor, and Rusnica teaches the additional limitation of Claims 6–8, and it would have been obvious to combine the reference teachings. Claims 6-8 are obvious over Kang in view of Tencor, and further in view of Rusnica.

XI. GROUND 2: OBVIOUSNESS OF CLAIMS 4 AND 5 OVER KANG IN VIEW OF TENCOR, AND FURTHER IN VIEW OF RUSNICA AND ERYUREK

A. Claim 4 is obvious over Kang in view of Tencor, and further in view of Rusnica and Eryurek

156. Claim 4 depends from Claim 1 and intervening Claim 3. I address these claims in Paragraphs 80-130 (Claim 1) and Paragraphs 141-149 (Claim 3). Claim 4 recites the additional limitation: "wherein **the setting screen** is set by independently

inputting a logical formula and brackets in one frame." I have been instructed to interpret this claim as if it recited "wherein **a setting screen** is set by independently inputting a logical formula and brackets in one frame" because "the setting screen" has no antecedent in Claims 1 or 3.

157. Kang discloses that the substrate processing apparatus comprises a display unit (embodied in workstation (100) and the display means (monitor) of main test device (300)) and that the workstation (100) comprises a setting screen. *Supra* Paragraphs 80-130.

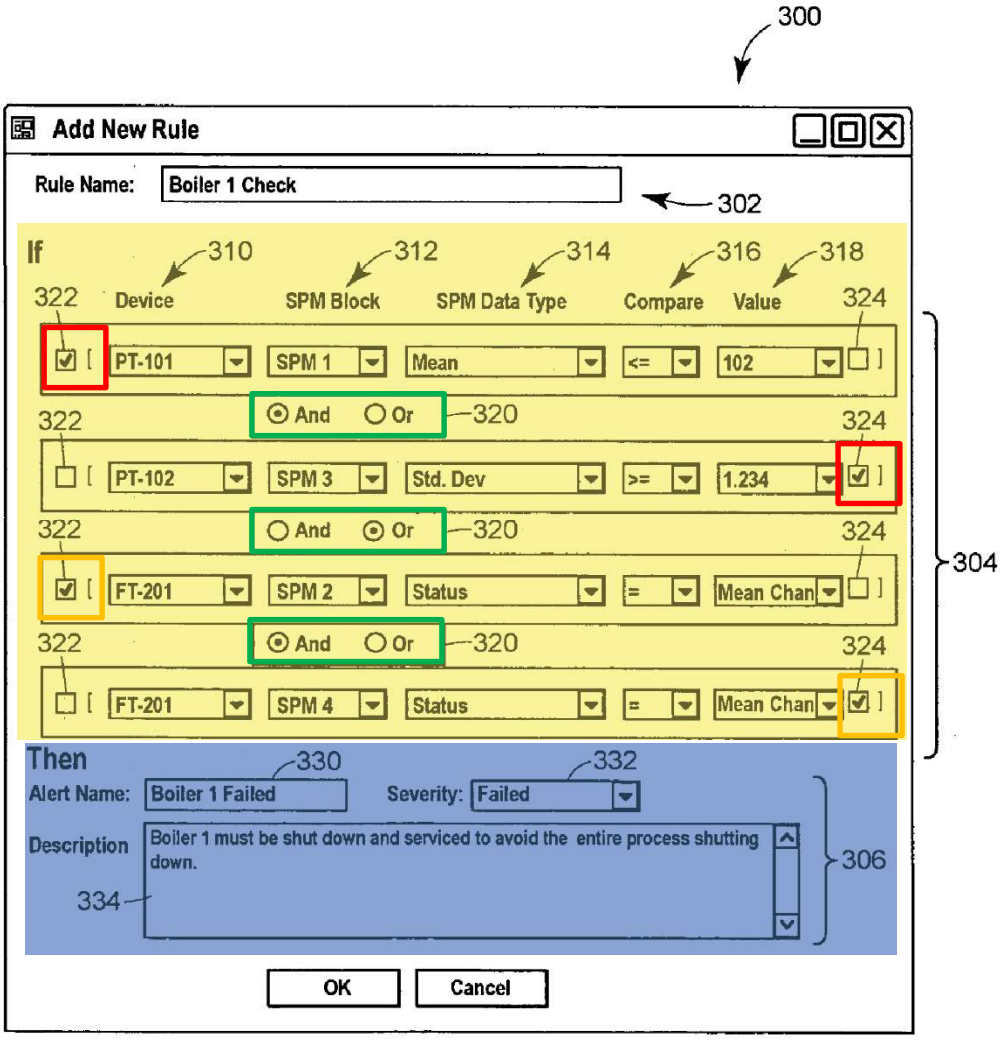
158. Tencor discloses a display unit that comprises a setting screen (a video monitor, which displays the Signal Light Tower Configuration Editor Utility window). Tencor explains that, on the Signal Light Tower Configuration Editor Utility window, a user enters the settings for each Profiler State graphically, using virtual tower lights and voice control buttons. Ex. 1005 (Tencor) at Figure 12-3 §12.2.1; *see also id.* §§12.2.4, 12.2.6, 12.2.7. Although Tencor does not expressly disclose entering the settings textually using logical Boolean and IF/THEN expressions and grouping brackets, however, skilled artisans would have understood that the Tencor PC compatible processor translates the graphical instructions into corresponding logical expressions in the underlying computer code.

a. <u>Teachings of Eryurek</u>

159. I provided an overview of Eryurek in Paragraph 24. Again, Eryurek discloses a "system [that] detects abnormal conditions associated with a process

[manufacturing] plant." Ex. 1008 (Eryurek) at Abstract. Figure 38, reproduced below with color annotations, depicts a configuration screen that enables a user to create a rule (condition) for a "rules engine development and execution system" that "enables a user to create and apply rules to statistical process monitoring data collected from a process plant." *Id.* at 7:16-23.

FIG. 38



160. Like the '396 patent, the Eryurek system is textually based and sets alerts using logical Boolean (green box) and IF (yellow highlighting)/THEN (blue

highlighting) expressions to specify the conditions causing an alert. As shown above, Eryurek teaches using brackets to group conditions in the "IF" clause of an IF/THEN expression. *Id.* at 36:34-45. The operator clicks checkboxes to indicate the starting or ending brackets for a logical group. One set of starting and ending brackets is indicated above red boxes; another set of starting and ending brackets is indicated with orange boxes.

b. Motivation and expectation of success

161. A person of ordinary skill in the art would have been motivated to combine the wafer burn-in system of Kang (as modified by Tencor and Rusnica) with the configuration screen of Eryurek to allow a user to define groups of error types and states (corresponding to groups for error type and state in Kang). For example, Tencor teaches graphically assigning appropriate light tower and tower voice settings to each Profiler State. Ex. 1005 (Tencor) Figure 12-3 §12.2.1. In light of Eryurek, a person of ordinary skill in the art would have appreciated the benefit in assigning flexible conditions that may not correspond with defined Profiler States. For example, a skilled artisan readily would have envisioned the benefit in setting a condition like: IF {[the Profiler State is GEM Aborted] AND [the light state has been red and "On" for 15 minutes]} THEN {operate voice #5, which instructs an operator to seek assistance immediately}. Even more simply, skilled artisans would have recognized that the end users would have had different preferences: some would have preferred the more graphical interface of Tencor, and others would have

preferred the more textual interface of Eryurek. Skilled artisans would certainly have been motivated to accommodate personal preferences for data entry.

162. Furthermore, a person of ordinary skill in the art would have had a reasonable expectation of success in combining Kang, Rusnica, and Tencor with the further modification of Eryurek. This modification of would have represented an obvious combination of prior art elements according to known methods yielding predictable results. Logical computer programming techniques were old and well known by the time of the '396 patent and within the capacity of skilled artisans. Eryurek shows that suitable textual based user interfaces for entering flexible logical conditions for these programs were predictable and used successfully in the art by the relevant date.

163. To summarize, Eryurek teaches a setting screen (configuration screen 300) is set by independently inputting a logical formula (logical Boolean and IF/THEN formulas) and brackets (activated by checkboxes) in one frame (as shown in Figure 38) and it would have been obvious to modify the wafer burn-in system of Kang as modified by Rusnica and Tencor to arrive at the claimed combination for the reasons discussed here and in Paragraphs 110-112 and 126-129.

164. Claim 4 is obvious over Kang in view of Tencor, and further in view of Rusnica and Eryurek.

B. Claim 5 is obvious over Kang in view of Tencor, and further in view of Rusnica and Eryurek

165. Claim 5 depends from base Claim 1 via intervening Claims 3 and 4. I address Claim 1 in Paragraphs 80-130, Claim 3 in Paragraph 141-149, and Claim 4 in Paragraphs 156-164. Claim 5 recites the additional limitation: "comprising a signal tower and a buzzer as the signal indicators, wherein sound of the buzzer is recognized depending on a lighting state of the signal tower." This is the same limitation recited in Claims 6-8, discussed in Paragraphs 150-155.

166. The prior art teaches the additional limitations of Claim 5 for the reasons in Paragraphs 150-155, and it would have been obvious to arrive at the claimed combination for the reasons in Paragraphs 110-112, 126-129, and 161-163.

167. Claim 5 is obvious over Kang in view of Tencor, and further in view of Rusnica and Eryurek.

XII. GROUND 3: CLAIM 9 IS OBVIOUS OVER TENCOR

1. Preamble

168. The preamble recites "a substrate processing apparatus comprising a signal tower and a buzzer as a plurality of signal indicators for indicating a running state."

169. Paragraphs 103-109 explain that Tencor discloses a substrate processing apparatus (a Long Scan Profiler for substrates) comprising a signal tower ("tower lights") and a buzzer ("tower voice") as a plurality of signal indicators for indicating a running state ("a tool's status").

170. Tencor satisfies the preamble.

2. Limitation 9[a]

171. Limitation 9[a] recites "a display unit displaying operation conditions that are set independently and in advance corresponding to the signal tower and the buzzer."

172. Tencor satisfies Limitation 9[a].

173. Paragraphs 103-109 also explain the Tencor discloses a display unit (a video monitor, which displays the Signal Light Tower Configuration Editor Utility window). The Signal Light Tower Configuration Editor Utility window displays "Profiler States." *Supra* Paragraph 105 (Figure 12-3). The Profiler States in Tencor are operation conditions because they are predetermined conditions for operating the signal indicators (the tower lights and the tower voice) based on the running states of the semiconductor processing apparatus (the Tencor apparatus). Stated another way, IF a Profiler State is satisfied (for example, when the Tencor apparatus transitions to a GEM Align state), THEN an associated signal indicator (the tower lights and/or the tower voice) will instructed to operate as specified by the Signal Tower Behavior set in the Signal Light Tower Configuration Editor Utility window.

174. Each of the operation conditions (the Profiler States) in Tencor are set independently in advance of being displayed in the Signal Light Tower Configuration Editor Utility window. For example, all Profiler States have "factory default settings," Ex. 1005 (Tencor) §§12.2.3, 12.2.7, and all Profiler States can be

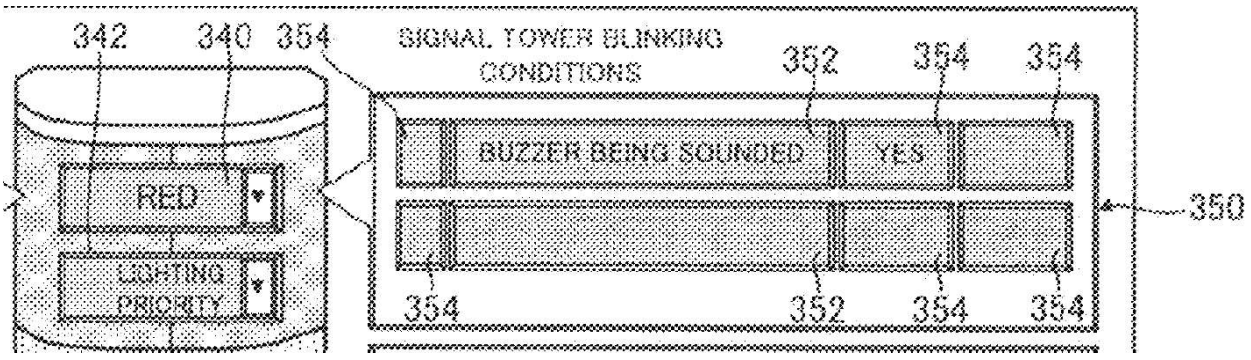
independently customized by a user and later reviewed or customized further. *Id.* §12.2.7.

175. To summarize, Tencor discloses a display unit (a video monitor, which displays the Signal Light Tower Configuration Editor Utility window) displaying operation conditions (the Profiler States) that are set independently in advance (for example, by factory default or user customization).

3. Limitation 9[b]

176. Limitation 9[b] recites "wherein the display unit sets sound of the buzzer as the operation condition of the signal tower."

177. The only connection between a buzzer sound and a signal tower state appears in the upper right blinking condition input section 350 of Figure 8 and the associated upper right blinking states display section 360 of Figure 9.



178. This blinking operation condition 360 sets the condition that, IF the operation condition is satisfied because, "yes," the buzzer is being sounded, THEN the signal tower 308 (a signal indicator) will blink red, as instructed.

179. Tencor shows that there are many possible Profiler States, and it would have been obvious to modify the list box with one or more Profiler States corresponding with tower voice states based on Tencor's own teachings regarding operating the tower lights in response to an alarm state.

a. Teachings of Tencor

180. Tencor teaches that the tower lights behave differently depending on whether an error is set or cleared. Ex. 1005 (Tencor) §12.2.5. For example, Tencor states that a light state can be "Yellow, flashing" when an "alarm is not acknowledged and needs assistance …" and that the light state can be "Red, steady" when an "alarm has been acknowledged but not corrected." *Id.*

181. Tencor also teaches that the list box shows an incomplete list of all possible Profiler States because the list box has a scroll bar that allows a user to scroll through additional, undisplayed Profiler States. *Id.* at Figure 12-3 §12.2.1.

b. Motivation and expectation of success

182. From my experience working in the semiconductor industry, the noise level in a semiconductor fabrication facility can be overwhelming. There can be dozens of manufacturing apparatuses in proximity, each with a buzzer frequently demanding attention. I also know that unacknowledged buzzers can be particularly annoying or distracting to operators trying to work. While waiting for a process technician to resolve the condition that caused the buzzer, equipment operators frequently "clear" the buzzer while the signal light continues operating. I note that

the ’396 patent acknowledges that a “worker” can “manually stop[]” a continuously sounding buzzer. Ex. 1001 (’396 patent) at 15:39-43.

183. A person of ordinary skill in the art would have been motivated to modifying the list box to include Profiler States corresponding with tower voice states. The modification would have beneficially allowed a user to define a behavior for those Profiler States to escalate a condition of the tower lights, depending on whether a tower voice state had been cleared or acknowledged. The modification would have predictably allowed process technicians to recognize at a glance when an error condition exists needs to be resolved urgently, even though the tower voice is not operating because an equipment operator had cleared the tower voice before the process technician arrived.

184. Moreover, a person of ordinary skill in the art would have had a reasonable expectation of success in doing so. As noted above, Tencor already teaches that the behavior of the tower lights can be escalated depending on whether an error is set or cleared. Tencor states that a light state can be “Yellow, flashing” when an “alarm is not acknowledged and needs assistance …” and that the light state can be escalated to “Red, steady” when an “alarm has been acknowledged but not corrected.” Ex. 1005 (Tencor) §12.2.5.

185. By applying Tencor’s teaching of Profiler States that correspond with setting and clearing of an alarm, skilled artisans would have predictably modified the list box to include Profiler States corresponding with setting and clearing of the

tower voice. The modification would have allowed a user to escalate the behavior of the tower lights depending on whether the tower voice had been cleared or acknowledged. As noted above, Tencor already teaches that the behavior of the tower lights can be set depending on whether an error is set, acknowledged, or corrected. *Id.*

186. Therefore, Tencor teaches or at least suggests all elements of Claim 9, and based on these teachings and suggestions, it would have been obvious to modify Tencor to arrive at the claimed configuration.

XIII. GROUND 4: OBVIOUSNESS OF CLAIM 10 OVER KANG IN VIEW OF TENCOR

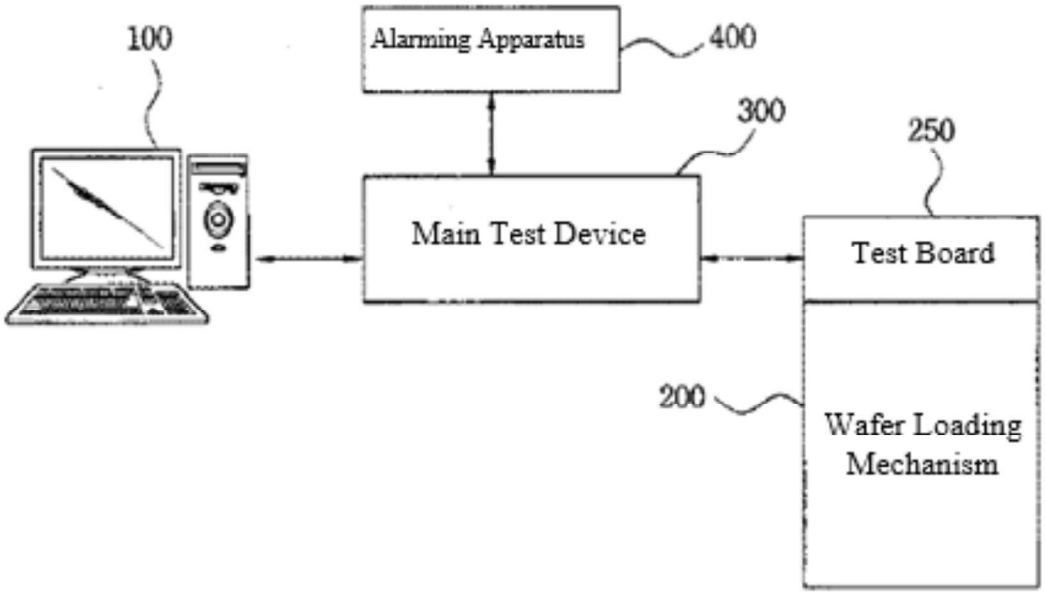
1. Preamble

187. The preamble recites a "substrate processing system comprising a substrate processing apparatus and a plurality of signal indicators indicating a running state and a host computer connected to the substrate processing apparatus via a communication line."

188. Kang describes a "wafer burn-in system." Ex. 1006 (Kang) at Abstract. Each tested wafer is a substrate, and therefore the wafer burn-in system is a substrate processing system.

189. Figure 1 of Kang, below, "is a block diagram showing the overall configuration of the general wafer burn-in system." *Id.* at 1.

Figure. 1



190. The wafer burn-in system of Figure 1 includes main test device (300). *Id.* at Figure 1. The main test device (300) "is the main component which performs and controls the overall test process in the wafer burn-in process …." *Id.* at 2 para.11. Accordingly, main test device (300) is a substrate processing apparatus.

191. The wafer burn-in system of Figure 1 also includes alarming apparatus (400). *Id.* at Figure 1. Alarming apparatus (400) "receives the test result" and "generates a prescribed alarm **informing the error state** of the wafer in accordance with the test result signal received so that the on-site operator can recognize this." *Id.* at 2 para.13. Kang shows a preferred embodiment of alarming apparatus (400) in Figure 3. *Id.* at 4 para.3. Figure 3, below, shows that the alarming apparatus includes display member (550) and buzzer (560). *See also id.* at 4 para.3, 2 para.13 (emphasis added).

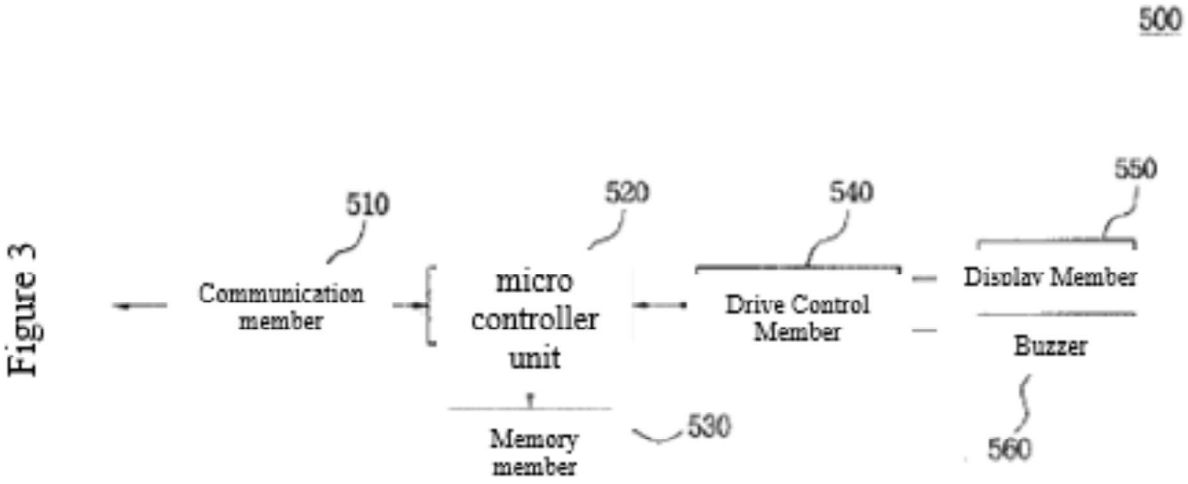


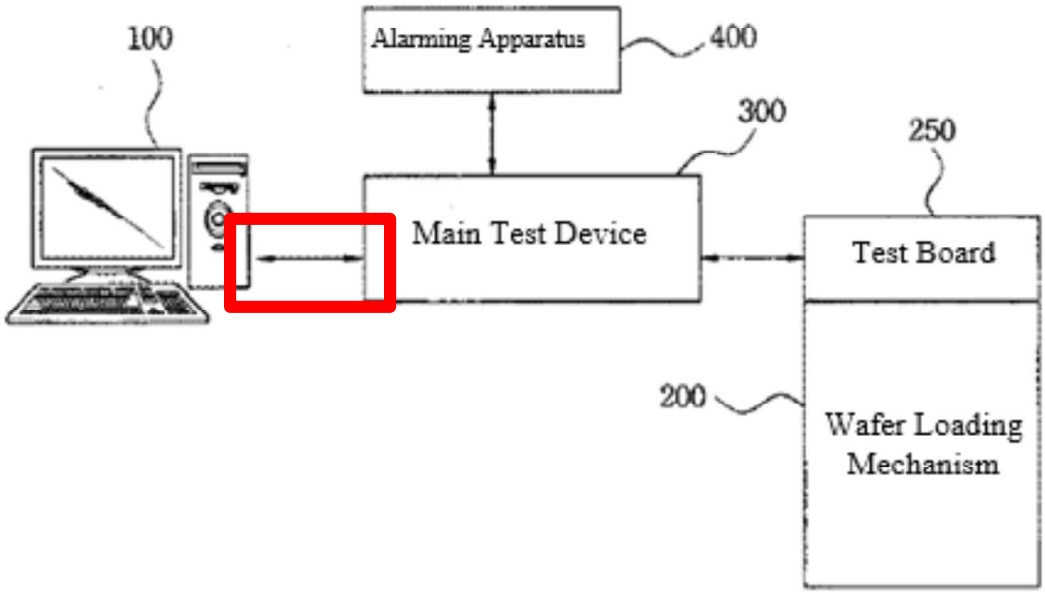
Figure 3

192. Display member (550) and buzzer (560) are a plurality of signal indicators indicating a running state. The alarming apparatus (400) "generates an alarm corresponding to the state of an error through the display member (550) and the buzzer (560) …." *Id.* at 4 para.10. Kang states that "it is going to be possible at the field performing the wafer burn-in process to **identify the error state of the wafers being tested** through the operational status of the lamp, which is a component of the alarming apparatus (400), or whether or not the buzzer tone has been generated." *Id.* at 2 para.13 (emphasis added). Therefore, display member (550) and buzzer (560) are a plurality of signal indicators that provide visual and audible signals to a user indicating the "error state of the wafers being tested," which is a running state of the apparatus because it is a state of a process (wafer testing) running in the burn-in system.

193. Figure 1 shows that the wafer burn-in system also includes a workstation (100). *Id.* at Figure 1. The workstation (100) "is a means to control the

implementation of the wafer burn-in process by entering the conditions and commands for the implementation of the wafer burn-in process and thus providing them to the main test device (300) … and monitor the progress of the process according to this." *Id.* at 2 para.8. Workstation (100) is a host computer because it hosts the entry of conditions and commands for implementing the wafer burn-in process. Figure 1 shows that workstation (100) is connected to main test device (300) by a communication line, highlighted by the red box annotation below.

Figure. 1



194. To summarize, Kang discloses a substrate processing system (the wafer burn-in system shown in Figure 1) comprising a substrate processing apparatus (main test device (300)) and a plurality of signal indicators (display member (550) and buzzer (560) of the alarming apparatus (400)) indicating a running state ("error state of the wafers being tested") and a host computer (workstation (100)) connected

to the substrate processing apparatus (main test device (300)) via a communication line (as shown in Figure 1).

195. Kang satisfies the preamble.

2. Limitation 10[a]

196. Limitation 10[a] recites: "wherein; the display unit displays, in the case where the signal indicators operate under instructions from the host computer, all of operation causes of the signal indicators."

197. Limitation 10[a] introduces "**the display unit**." I have been instructed to address Claim 10 as if it were written "wherein **a display unit** displays, in the case where the signal indicators operate under instructions from the host computer, all of operation causes of the signal indicators …" because "the display unit" lacks an antecedent.

198. "Operation causes" correspond to operation conditions that are displayed, regardless of whether they are satisfied by a running state *Supra* Paragraphs 51-56, 65-68.

199. Kang's "overall configuration of the general wafer burn-in system" in Figure 1 includes a display unit embodied in workstation (100) and the display means (monitor) of main test device (300). Ex. 1006 (Kang) at Figure 1.

200. Kang discloses that the signal indicators (display member (550) and buzzer (560)) always operate under instructions from the host computer (workstation (100)). Specifically, Kang discloses that an operator uses workstation

(100) to set up the "operating conditions" for generating an alarm using workstation (100). *Id.* at 2 para.8, 3 para.10, 4 paras. 4, 8, 10, 12.

201. Kang also discloses that, while display member (550) and buzzer (560) are operating because of a detected error state, the "detected error state can be **displayed in the form of a message** …." *Id.* at Abstract (emphasis added); *see also id.* at 3 para.2, 4 para.10. The "micro controller (520) generates an error state message corresponding to the state and type of the error detected at the step (S507) described above … and the main test device (300)…displays this error state message on the display means (monitor) so the operator can check it (Step S517)." *Id.* at 5 para.1.

202. The messages correspond to the signal indicators: "As a result, the alarming apparatus of the present invention (500) configured as described above receives the test result signal provided by the main test device, detects the state and type of error of all wafers, and **generates an alarm corresponding to the state of an error through the display member (550) and the buzzer (560)** in accordance with the conditions for the generation of an alarm set up in advance by the operator. In addition, it **generates a message for the detected error state** and sends it to the main test device (300) to have it displayed." *Id.* at 4 para.10 (emphasis added).

203. The messages represent "operation causes" because they are operation conditions (operating conditions based on detected error state messages) that are displayed. Kang displays them when the associated error states occur, but "operation

causes" are satisfied whether or not the associated running state occurs. Kang displays all such error messages.

204. To summarize, Kang discloses that the signal indicators (display member (550) and buzzer (560) of alarming apparatus (400)) always operate under instructions (to set up the operating conditions) from the host computer (workstation (100)). Kang also discloses that display unit displays (embodied in workstation (100) and the display means (monitor) of main test device (300)), in the case (it is always the case) where the signal indicators (display member (550) and/or buzzer (560)) operate under instructions (to set up the operating conditions) from the host computer (workstation (100)), all of operation causes (error messages) of the signal indicators.

3. Limitation 10[b]

205. Limitation 10[b] recites: "[wherein; the display unit] displays the instructions from the host computer with a different color."

206. The claimed configuration would have been obvious in view of Tencor, which teaches an apparatus including an appropriate video monitor and user interface.

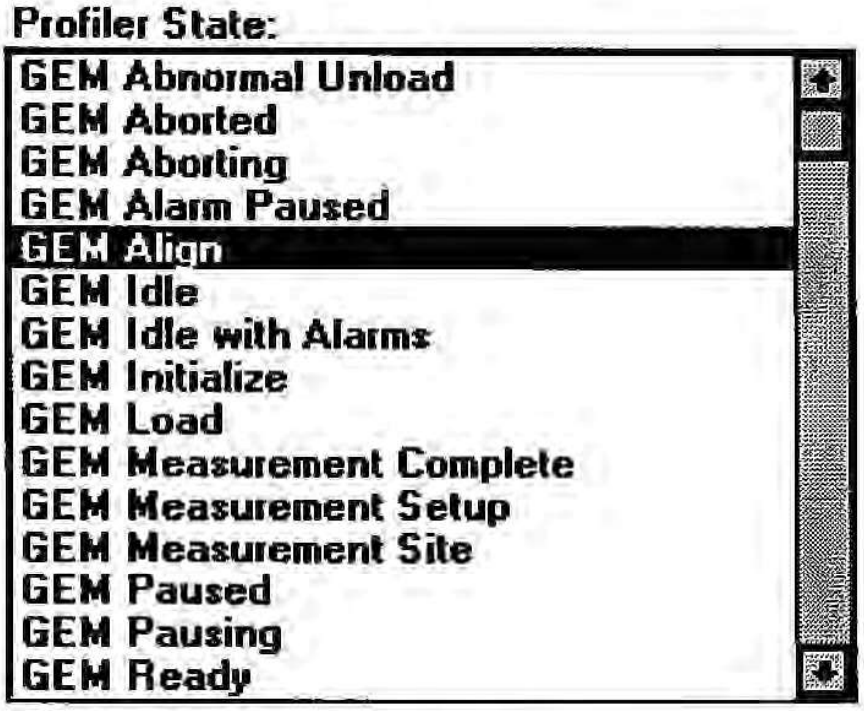
a. Teachings of Tencor

207. Paragraphs 103-109 explain that Tencor discloses a display unit (a video monitor, which displays the Signal Light Tower Configuration Editor Utility window).

208. Figure 12-3 of Tencor (*see Supra* Paragraph 105) illustrates Tencor's disclosure of a display unit displaying instructions from a host computer with a different color. Like all computers, the PC compatible processor of the Tencor apparatus translates input from a user (like mouse movement and clicks and keyboard entries) into corresponding actions on a video monitor. Ex. 1005 (Tencor) §§1.4, 1.7.2, 2.2-2.6, 3.1-3.6. The PC compatible processor is a host computer because it hosts the entry of conditions and commands to set up and operate the Tencor apparatus.

209. "The list box [in the green box] on the Signal Light Tower window contains a descriptive list (Figure 12-3). "You can edit the behavior of the signal tower for a particular state by **selecting that state from the list box**. At that point, the current behavior for that state is shown with two custom controls, one for the tower voice and one for the tower lights." *Id.* §12.2.7 (emphasis added).

210. When a user hovers a mouse icon over a Profiler State in the list box and clicks the mouse, the PC compatible processor translates the input selection and changes the Signal Light Tower Configuration Editor Utility window display. For example, the clicked Profiler State is shown with a black background and white letters, while the remaining equipment states are shown with a white background and black letters.



Id. at Figure 12-3 (excerpt) §12.2.1.

211. To summarize, Tencor teaches the display unit (the video monitor, which displays the Signal Light Tower Configuration Editor Utility window) displays the instructions (to edit the "current behavior" of a Profiler State) from the host computer (the PC compatible processor) with a different color (the clicked Profiler State, currently being edited, is shown with a different color than other possible Profiler States).

b. Motivation and expectation of success

212. Tencor teaches a display comparable to Kang's that displays operation conditions, and it would have been obvious to combine Kang and Tencor for the same reasons in Paragraphs 110-112.

213. To summarize once again, the combination of Kang and Tencor teaches the claim elements as follows

- a display unit (embodied in workstation (100) and the display means (monitor) of main test device (300)) as modified to include a computer-implemented interface like the Signal Light Tower Configuration Editor Utility window of Tencor);
- the signal indicators (display member (550) and buzzer (560) of Kang) operate under instructions (user instructions to set up operating conditions for a type or state of error in Kang, which correspond with Tencor's Profiler States) from the host computer (workstation (100) of Kang);
- the display unit displays all of operation causes of the signal indicators (the display unit embodied in workstation (100) and the display means (monitor) of main test device (300) displays all error messages); and
- the display unit displays the instructions from the host computer (to edit the "current behavior" of a Profiler State, which corresponds to the user instructions to set up operating conditions for a type or state of error in Kang) with a different color (white text on a black background vs. black text on a white background).

214. The combination of Kang and Tencor would have been obvious to provide an easy-to-use user interface for defining the operating conditions for the

types and states of errors (corresponding to Tencor's Profiler States) occurring during the burn-in process.

215. Accordingly, Kang and Tencor teach all limitations of Claim 10, and it would have been obvious to combine the reference teachings. Claim 10 is obvious over Kang in view of Tencor.

XIV. CONCLUSION

216. For the reasons described above, a person of ordinary skill in the art would have found Claims 1-10 of the '396 patent unpatentable.

217. I 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.

Dated: Nov. 30, 2018 By: Alexander Glew, Ph.D.

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Date: 2018.11.30 10:44:33 -08'00'