

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GODBERSEN-SMITH CONSTRUCTION COMPANY  
d/b/a GOMACO CORPORATION  
Petitioner

v.

GUNTERT & ZIMMERMAN CONST. DIV., INC.,  
Patent Owner

Case IPR2021-00235  
Patent No. 10,196,101

EXPERT DECLARATION OF WILLIAM SINGHOSE IN SUPPORT OF  
PETITION FOR INTER PARTES REVIEW

## TABLE OF CONTENTS

I.	INTRODUCTION AND SUMMARY OF OPINIONS.....	1
II.	SUMMARY OF OPINIONS.....	1
III.	BACKGROUND AND QUALIFICATIONS.....	2
IV.	MATERIALS CONSIDERED.....	6
V.	LEGAL STANDARDS .....	7
A.	Claim Construction .....	7
B.	Level of Ordinary Skill .....	8
C.	Obviousness.....	8
D.	Priority.....	11
VI.	BACKGROUND ON FEEDBACK LOOPS .....	11
VII.	THE '101 PATENT.....	15
A.	Overview of the '101 Patent.....	15
B.	Prosecution History .....	17
C.	Effective Filing Date .....	18
VIII.	CLAIM CONSTRUCTION .....	26
IX.	ANALYSIS OF PETITION GROUNDS.....	27
A.	Ground 1: Guntert in view of Dorsett Renders Claims 4-7 and 15-19 Obvious .....	27
1.	Summary of Guntert .....	27
2.	Summary of Dorsett.....	28
3.	Rationale for Combining Guntert and Dorsett.....	32

4.	Claim 1 .....	39
5.	Claim 3: “The paving machine of claim 1, wherein one or more of the power drives comprise first and second diametrically opposed helical worm drives engaging and driving a ring gear disposed between them.” .....	50
6.	Claim 4: .....	51
7.	Claim 5: “The paving machine of claim 4, wherein the desired orientation is alignment of the crawler tracks along a paving direction.” .....	60
8.	Claim 6: “The paving machine of claim 4, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly.” .....	61
9.	Claim 7: “The paving machine of claim 4, wherein the processor, the power drive, and the first transducer, and the second transducer from each swing leg assembly form a feedback loop for maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame.” .....	62
10.	Claim 11 .....	64
11.	Claim 14 .....	71
12.	Claim 15 .....	76
13.	Claim 16: “The paving machine of claim 15, wherein the desired orientation is alignment of the crawler tracks along a paving direction.” .....	81
14.	Claim 17: “The paving machine of claim 15, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly.” .....	81

15. Claim 18: “The paving machine of claim 15, wherein the second transducers and the hydraulic actuators form a feedback loop for maintaining an orientation of the swing leg assembly independently of angular inclinations of the swing leg relative to the module frame.” .....82
16. Claim 19: “The paving machine of claim 18, wherein the feedback loop further includes the first transducers and the power drive for further maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame.” .....83

## **I. INTRODUCTION AND SUMMARY OF OPINIONS**

1. I, William Singhose, have been retained as an independent expert by Gomaco Corporation (“Petitioner” or “Gomaco”) in connection with an inter partes review of U.S. Patent No. 10,196,101 (the “’101 patent”) (Ex. 1001). I have prepared this declaration in connection with Gomaco’s Petition for Inter Partes Review.

2. Specifically, this document contains my opinions about the technology claimed in claims 1-19 of the ’101 patent (the “Challenged Claims”) and the grounds against these claims that have been asserted by Gomaco. I was not asked to provide any opinions that are not expressed herein.

## **II. SUMMARY OF OPINIONS**

3. This declaration considers the Challenged Claims of the ’101 patent. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for these opinions and conclusions. I believe the statements contained in this declaration to be true and correct to the best of my knowledge. In forming my opinions, I have assumed that the priority date for claims 1-3 and 8-14 of the ’101 patent is March 26, 2010, which I am told is the filing date of a provisional patent application to which the ’101 patent claims priority. My opinions would not change if I assumed a later effective filing date for claims 1-3 and 8-14 of the ’101 patent. In forming my opinions, I have assumed that the priority date for claims 4-7

and 15-19 of the '101 patent is of June 20, 2018, which is the filing date of the '101 patent. My opinions would not change, however, if claims 4-7 and 15-19 of the '101 patent were entitled to a priority date of June 14, 2017, the filing date of the U.S. Patent No. 9,908,571, which is a patent issued from a continuation-in-part application to which the '101 patent claims priority.

4. Based on my experience, knowledge of the art at the time of the applicable priority date, analysis of Petitioner's asserted grounds and references, and the understanding a person of ordinary skill in the art would have had of the claims in light of the specification as of the applicable priority date, it is my opinion that the Challenged Claims of the '101 patent would have been obvious over the asserted grounds.

5. I am being compensated for my time at the rate of \$600 per hour. This compensation is in no way contingent upon the nature of my findings, the presentation of my findings in testimony, or the outcome of this proceeding.

### **III. BACKGROUND AND QUALIFICATIONS**

6. I believe that I am well qualified to serve as a technical expert in this matter based upon my educational and work experience.

7. A copy of my curriculum vitae is attached as Appendix A to this declaration.

8. I am a Professor of Mechanical Engineering at the Georgia Institute of Technology (“Georgia Tech”). I received a B.S. in Mechanical Engineering from the Massachusetts Institute of Technology (“MIT”) in 1990. I then received an M.S. in Mechanical Engineering from Stanford University in 1992. Finally, I received a Ph.D. in Mechanical Engineering from MIT in 1997. After receiving my Ph.D., I was a postdoctoral researcher at MIT before becoming a professor at Georgia Tech.

9. Based on my work experience, described in my curriculum vitae and in more detail below, I am knowledgeable about the subject matter of the ’101 patent, the related prior art, and the Accused Products. Specifically, my qualifications as an expert in the fields of heavy machinery, automation, control systems, and product design stem from my prior work experience, as well as my experience as a Professor in the Woodruff School of Mechanical Engineering at Georgia Tech performing research, teaching, working, and consulting. I have several patents and dozens of publications that are directed toward understanding and improving heavy machinery and associated control systems.

10. In my current position at Georgia Tech, I teach courses in mechanical design, system dynamics, controls, and rehabilitation engineering. I also lead teams of professors, post-docs, graduate students, and undergraduate students that conduct research in mechanical design, dynamics, controls, automation, robotics,

spacecraft, human-machine interfaces, and rehabilitation engineering. During my more than 20 years at Georgia Tech, I have also had visiting appointments at MIT, Stanford, the Polytechnic University of Madrid, and the Tokyo Institute of Technology.

11. Throughout my upbringing, I was exposed to various types of construction equipment and heavy machinery. My mother was a truck driver and my father was an operator of various types of heavy machinery. Our family owned log trucks, road graders, excavators, bulldozers, front-end loaders, truck-mounted hoists, and tractors. I worked in road construction for more than two years at my family-owned road-construction company. I operated many types of road construction equipment, including paving machines, dump trucks, steam rollers, and compactors.

12. I also worked one summer as a lab technician at Riverside Cement Company. My job responsibilities included preparing various types of concrete mixtures and testing their mechanical properties under various conditions and over extended periods of time. These activities required me to operate forklifts, cement pumps, sand sifters, flat-bed trucks, climatic test chambers, and compression testing machines.

13. Throughout my engineering career, I have worked with heavy machinery and large automated systems. Before starting my teaching career at

Georgia Tech, I worked as a full-time mechanical engineer for several companies, including Walt Disney World, Apple Computers, Inc., and Convolve, Inc.

14. In my role at Walt Disney World, I designed and developed a number of structures and components for the parks' rides, including, but not limited to, operational control procedures for the Body Wars simulators. These simulators are rooms that hold about 40 people at a time. The entire rooms, and the guests seated within, are automatically manipulated through a series of preprogrammed motions using six large linear hydraulic cylinders. The machines were equipped with numerous transducers that enabled accurate feedback control of the power drives.

15. For Convolve, Inc., I analyzed the dynamics of automated robots, satellites, and NASA high-altitude balloons. I also developed automated control systems for manufacturing machines, large-scale coordinate measuring machines, and laser interferometer sensors. One of my Convolve projects required the development and installation of a system to control a crane at the Savannah River Nuclear facility. The crane was a large overhead bridge structure that moved barrels of nuclear waste. The system we developed reduced the unwanted pendulum swing of the barrels.

16. Throughout my years at Georgia Tech, I have worked as an engineering consultant or research partner for numerous companies. For example, I worked with Boeing for several years to improve the safety of their overhead

bridge cranes. The crane controllers that I developed have been deployed at multiple Boeing manufacturing facilities. One of the Boeing cranes I operated included four large rotary slew drives that enabled the controlled rotation of very large aircraft components. I have also worked on several projects involving boom cranes that travel on crawler tracks.

17. In addition to my engineering experience as a professor and an engineer, I have commercialized technology developed in my research group at Georgia Tech by founding two companies: CAMotion Cranes and InVekTek. CAMotion Cranes designs and installs crane control systems that decrease payload swing, automatically avoid obstacles, and improve crane safety. These improvements are achieved through sensor systems and control methods that my research group developed, patented, and deployed. CAMotion Cranes was acquired by PAR Systems in 2013. InVekTek develops and commercializes control systems for robotic and industrial material-handling systems. The control systems are embedded in motor drives to reduce unwanted machine motion.

#### **IV. MATERIALS CONSIDERED**

18. In forming my opinions, I have analyzed the materials listed in Appendix A. My opinions are based on my experience, knowledge of the relevant art, the documents identified in Appendix A, and the documents discussed in this declaration.

## **V. LEGAL STANDARDS**

19. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents submitted in this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the Challenged Claims.

### **A. Claim Construction**

20. I have been instructed that the terms appearing in the '101 patent should be interpreted in view of the claim language itself, the specification, the prosecution history of the patent, and any relevant extrinsic evidence. The words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art at the time of the invention, which I have assumed here is June 20, 2018, but my claim construction opinions would not change if the claims were entitled to another priority date between March 26, 2010 (the filing date of the original provisional application) and June 20, 2018. While claim limitations cannot be read in from the specification, the specification is the single best guide to the meaning of a disputed term. I have followed these principles in reviewing the claims of the '101 patent and forming the opinions set forth in this declaration.

**B. Level of Ordinary Skill**

21. I understand a person of ordinary skill in the art is determined by considering among other issues (i) the type of problems encountered in the art; (ii) prior art solutions to those problems; (iii) rapidity with which innovations are made; (iv) sophistication of the technology; and (v) educational level of active workers in the field.

22. In my opinion, a person of ordinary skill in the art (“POSITA”) pertinent to the ’101 patent would have had at least a four-year degree in mechanical engineering or a closely related field and at least two years of experience designing, developing, or operating heavy machinery, including their components and control systems. Additional education could substitute for professional experience and significant work experience—such as working with, servicing, or operating heavy machinery in the field—could substitute for formal education.

23. I was at least a POSITA as of March 26, 2010, the filing date of the original provisional application, and June 20, 2018, the date which I understand the challenged claims are entitled to priority.

**C. Obviousness**

24. I have been told that under 35 U.S.C. § 103, a patent claim may be obvious 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 having ordinary skill in the art to which said subject matter pertains.

25. I have been told that a proper obviousness analysis requires the following:

- a. Determining the scope and content of the prior art;
- b. Ascertaining the differences between the prior art and the claims at issue;
- c. Resolving the level of ordinary skill in the pertinent art; and
- d. Considering evidence of secondary indicia of non-obviousness (if available).

26. I have been told that the relevant time for considering whether a claim would have been obvious to a person of ordinary skill in the art is the time of invention. For my obviousness analysis, counsel for Petitioner instructed me to assume that the date of invention for the Challenged Claims is June 20, 2018, but my opinions would not change if the claims were entitled to another priority date between March 26, 2010 (the filing date of the original provisional application) and June 20, 2018, assuming the references I rely on remained prior art. My opinions would not change if I assumed a later date of invention.

27. I have been told that a reference may be modified or combined with other references or with a POSITA's own knowledge if the person would have found the modification or combination obvious. I have also been told that a person of ordinary skill in the art is presumed to know all the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

28. I have been told that whether a prior art reference renders a patent claim obvious is determined from the perspective of a person of ordinary skill in the art. I have also been told that, while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, and while a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually and may consider the inferences and creative steps a person of ordinary skill in the art would employ, as filtered through the knowledge of one skilled in the art, obviousness grounds cannot be sustained by mere conclusory statements and must include some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.

29. I have been told that there is no rigid rule that a reference or combination of references must contain a "teaching, suggestion, or motivation" to combine references. But I also have been told that the "teaching, suggestion, or

motivation” test can be used in establishing a rationale for combining elements of the prior art. I have also been told to be aware of distortions caused by hindsight bias, and that reading into the prior art the teachings of the invention at issue is improper.

**D. Priority**

30. I am told that the effective filing date of a claimed invention is the actual filing date of the patent unless the patentee can show entitlement to an earlier priority date by claiming priority to an application or a chain of applications, each of which provide written description of the claimed invention. I am told that, to satisfy the written description requirement, the disclosure of the prior application must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, the inventor was in possession of the invention. I am told that this standard is not met simply because a claimed invention is an obvious variant of that which is disclosed in the specification. I am told that, instead, a prior application itself must describe the claimed invention.

**VI. BACKGROUND ON FEEDBACK LOOPS**

31. The '101 patent states that its control system uses a “feedback loop,” but it provides few details regarding how its feedback loop is implemented. '101 patent, 12:41-44. Feedback loops, however, are well known and commonly used in the industry. For example, feedback loops are discussed at length in a textbook

titled “Introduction to Robotics Mechanics and Control” by John J. Craig (“Craig”; Ex. 1022).

32. Craig discusses feedback loops in the context of moving a robot manipulator that uses actuators to control the joints. Craig, 263. Craig explains that “[g]enerally, the only way to build a high-performance control system is to make use of feedback from joint sensors,” as indicated in the simple block diagram representation shown in Figure 9.1. Craig, 264. That diagram showing a feedback loop applied to joint control is reproduced below.

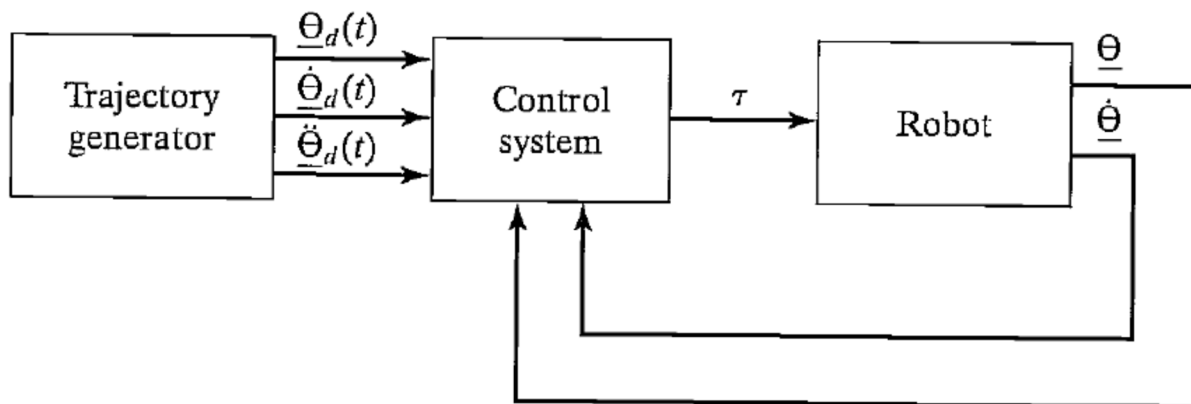


FIGURE 9.1: High-level block diagram of a robot-control system.

*Id.*, 263, Fig. 9.1. Craig discloses that the diagram of Fig. 9.1 corresponds to a manipulator instrumented with sensors at each joint to measure the joint angle and that has an actuator at each joint to apply a torque on the neighboring link. Craig, 263. As shown in Fig. 9.1 above, the actual joint positions  $\underline{\Theta}$  measured by the joint

sensors are fed back to the controller, which also receives the desired or target joint positions  $\Theta_d$ .

33. Craig further explains that this feedback is used to compute any servo error by finding the difference between the desired and actual position. Craig, 264. Craig provides an equation for the difference between the target and actual joint positions as shown below in Equation (9.2).

$$\begin{aligned} E &= \Theta_d - \Theta, \\ \dot{E} &= \dot{\Theta}_d - \dot{\Theta}. \end{aligned} \tag{9.2}$$

*Id.*, Eq. (9.2). In equation 9.2, the error in the angular positions is represented by  $E$  and is determined as a difference between the desired angular positions  $\Theta_d$  and the actual angular positions  $\Theta$ . This “error” is nonzero when the structure that the control system wishes to move has not yet reached its *desired* position (i.e., there is a difference between the current position and the desired position). I also note that both  $\Theta_d$  and  $\Theta$  are vectors containing angular position values for each of the links of the manipulator. *See* Craig, 16 (stating that variables in uppercase represent vectors and lowercase variables are scalars). Thus, for a manipulator with two links,  $\Theta_d$  and  $\Theta$  would each include two values, one for each joint. Therefore, for a two-link manipulator, equation 9.2 represents two error values, each corresponding to an angular orientation of a respective link of the manipulator.

34. Craig explains that these types of control systems compute the amount of torque required, as a function of the servo error, such that the computed torque reduces the servo errors. Craig, 264. The control system disclosed by Craig is illustrated in an annotated version of Fig. 10.5 below in which at least the portion marked in red represents a controller.

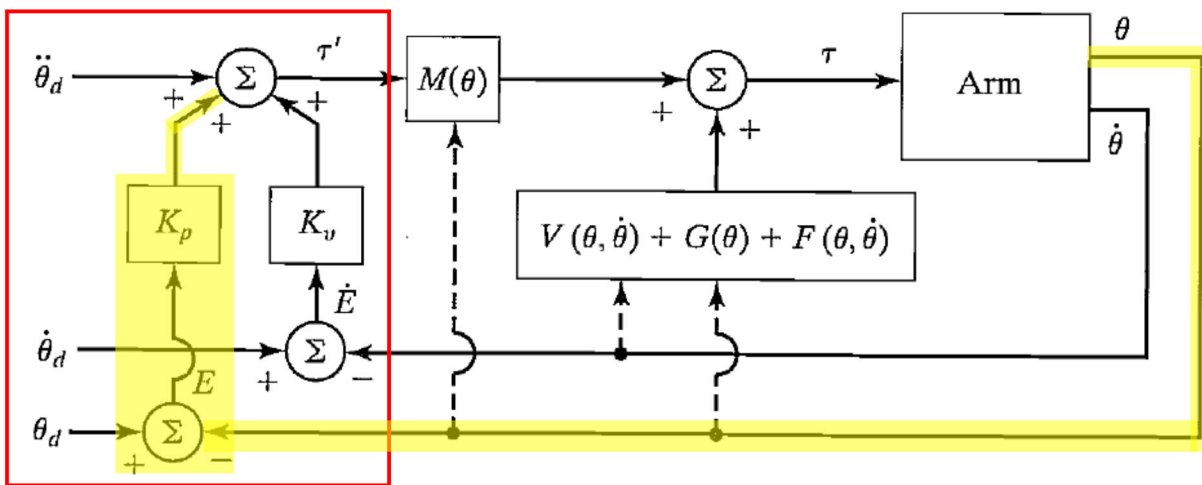


FIGURE 10.5: A model-based manipulator-control system.

*Id.*, 296, Fig. 10.5 (annotated). As illustrated in the figure by the highlighted portion of the feedback loop, the actual angular positions  $\theta$  is measured by a sensor. The actual positions  $\theta$  measured by a sensor is provided to the controller (marked in red). The controller also has the desired angular position  $\theta_d$ . The summation symbol,  $\Sigma$ , shows that the positive value of  $\theta_d$  (the desired angle) is summed with the negative value of  $\theta$  (the actual angle) to calculate the *error* in those values. *See id.*, Equation 10.16. That error is then used to drive the links to

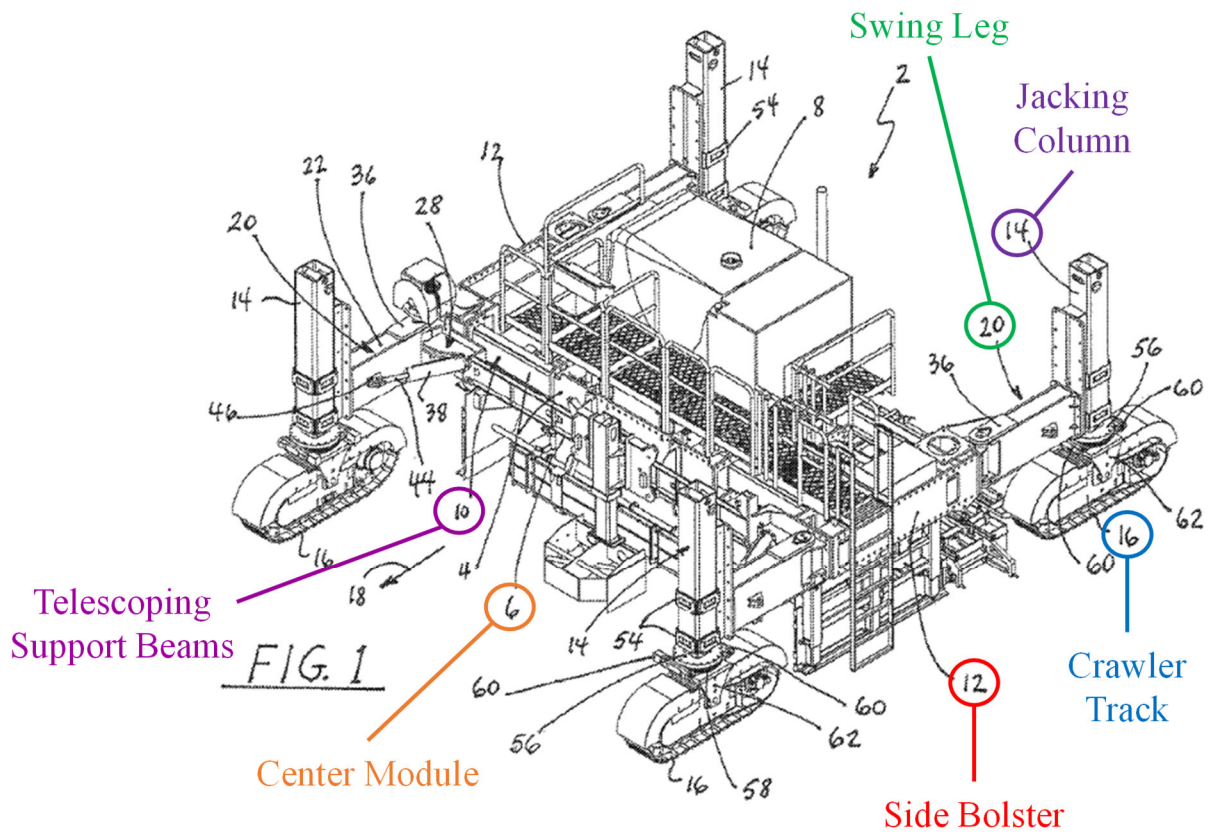
new positions, and the actual sensed positions of the links is *fed back* into the loop to continuously determine whether a difference exists between the desired positions and the current positions. If a difference exists, that is an error representative of how far the structure is from the desired destination. When the error is reduced to zero, the system knows the structure has reached the desired position.

35. While other aspects of feedback loops may differ (for example, additional variables such as the speed of the joint rotation,  $\dot{\theta}$ , may be used, as in the above), a consistent aspect of feedback loops is that they compare the current state of the structure being monitored with the desired state of that structure to determine if it has reached its destination.

## **VII. THE '101 PATENT**

### **A. Overview of the '101 Patent**

36. The '101 patent discloses a slipform paving machine. Ex. 1001, 1:25-26. The disclosed paving machine includes a center module, bolsters attached to telescoping support beams that move laterally, swing legs attached to the bolsters, jacking columns attached to the free end of the swing legs, and crawler tracks. *Id.*, 8:55-61, 9:28-35. These features are depicted below in Fig. 1.



*Id.*, Fig. 1 (annotated). The crawler tracks “are mounted to” and rotate relative to the jacking columns. *Id.*, 8:63-66. Each jacking column includes two hollow tubes (outer 48 and inner 50) that telescope relative to each other in response to an internal hydraulic actuator that extends and retracts, which raises and lowers the machine. *Id.*, 8:61-63, 11:18-37.

37. The swing leg is fixed to the jacking column on one end, and pivotally connected to a forward or aft end of a bolster on the other end, allowing the swing leg to pivot horizontally. *Id.*, 9:28-35. When the swing leg pivots, it swings the jacking column and crawler track to various positions. *Id.*, 10:50-67. Every feature

described above predates the '101 patent, as the specification admits. *Id.*, 1:25-5:58 (describing features mentioned above as “conventional” and “well known”).

38. Regarding the '101 patent's purported invention, the specification discloses an actuator that pivots the swing leg and a power drive that rotates the crawler track. *Id.*, 6:14-16, 6:33-35. Angular position transducers provide outputs to a processor, which uses those signals to control rotation of the crawler track as the swing leg pivots. *Id.*, 6:17-25. Given this design, “no matter what the swing leg angle is, the crawler track stays straight ahead in the paving direction and position.” *Id.*, 6:26-28. The specification states that the “crawler track positions can be relocated when the machine is walked forward or backward” or, alternatively, “when the machine is stationary” after “lifting each crawler track (one at a time) off the ground.” *Id.*, 6:50-58.

#### **B. Prosecution History**

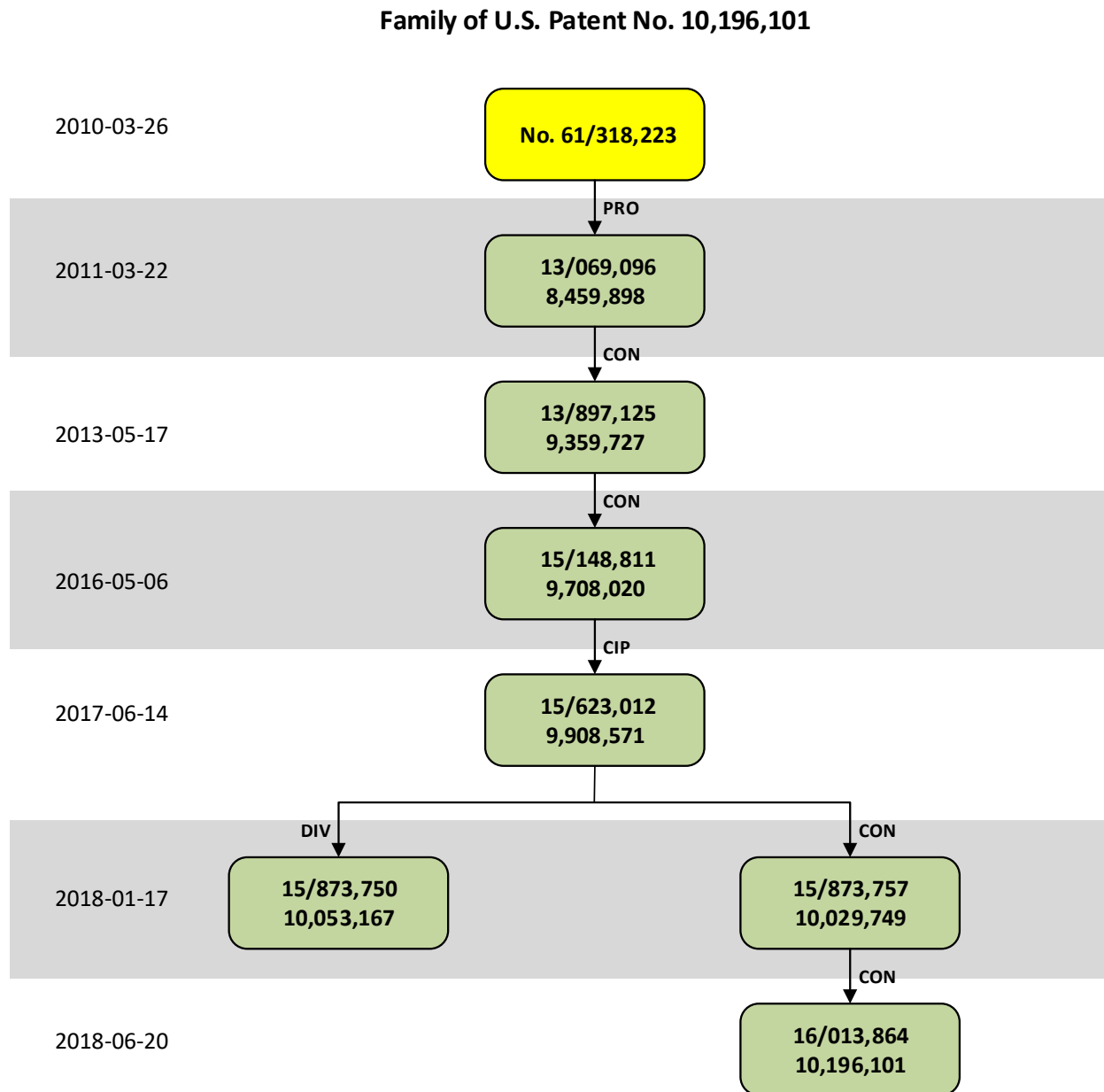
39. The '101 patent was filed as a continuation application in a chain of several applications that include a continuation-in-part of U.S. Patent No. 9,708,020. During prosecution, the Examiner issued a double patenting rejection. Ex. 1004, 44, 46-47. The claims were then allowed after the applicant filed a terminal disclaimer to overcome the rejection. *Id.*, 28, 7.

**C. Effective Filing Date**

40. In my opinion, Claims 4-7 and 15-19 of the '101 patent are entitled to an effective filing date of June 20, 2018, the filing date of the '101 patent. I am told that the effective filing date of a claimed invention is the actual filing date of the patent unless the patentee can show entitlement to an earlier priority date by claiming priority to an application or a chain of applications, each of which provide written description of the claimed invention. I am told that, to satisfy the written description requirement, the disclosure of the prior application must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, the inventor was in possession of the invention. I am told that this standard is not met simply because a claimed invention is an obvious variant of that which is disclosed in the specification. I am told that, instead, a prior application itself must describe the claimed invention.

41. The '101 patent issued from an application that is a continuation of U.S. Application No. 15/873,757 (now U.S. Patent 10,029,749), which in turn is a continuation of U.S. Application No. 15/623,012 that was filed on June 14, 2017, and issued as U.S. Patent No. 9,908,571 (Ex. 1030). The '571 patent originated from a continuation-in-part application that added new matter related to additional slipform paver configurations, including eleven new figures (Ex. 1001, Figs. 9-

13E) and several pages of description (*id.*, 15:53-22:36). Below is a chart showing the family of the '101 patent.



42. Claim 4 recites “storing the first signal and second signal from each swing leg assembly and thereby updating the respective stored first signal and the respective stored second signal for each respective swing leg assembly” and

“calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively, for each respective swing leg assembly.” Ex. 1001, Claim 4. Claim 15 similarly recites “storing the first signal and second signal from each swing leg assembly as the respective stored first signal and the respective stored second signal for each respective swing leg assembly” and “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively.” Ex. 1001, Claim 15. No application to which the ’101 patent claims priority provides written description for either of these limitations, where (1) the *sensor signals* are stored and (2) then used to calculate the differences between stored/desired and actual positions.

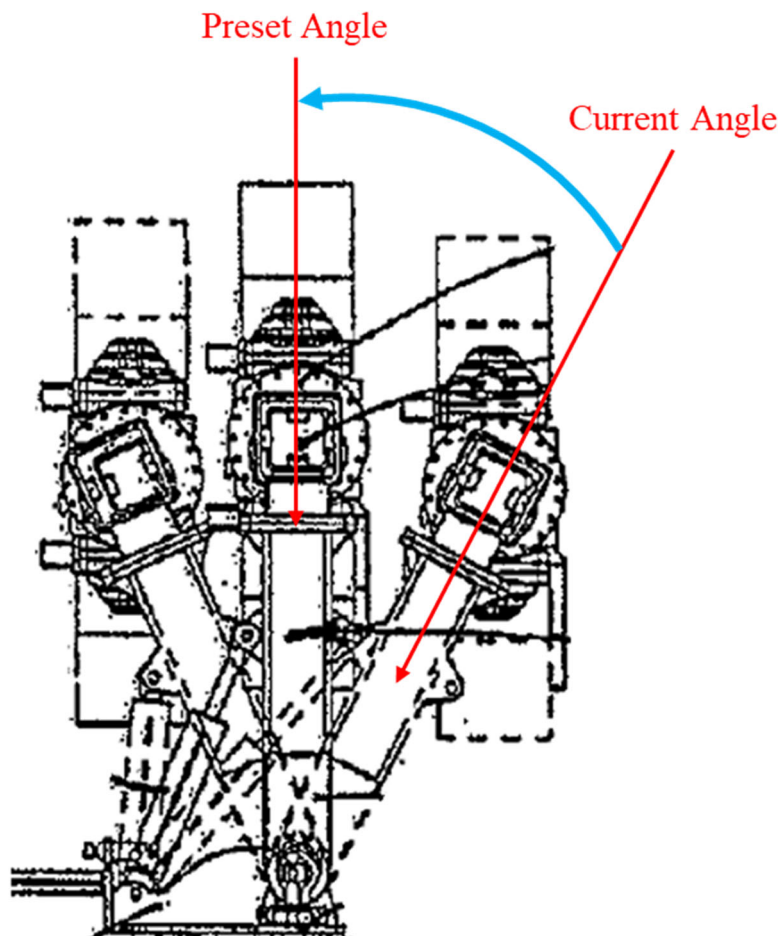
43. U.S. Patent Application Publication No. 2011/0236129 to Guntert et al. (“Guntert”; Ex. 1028), which is the publication of the first non-provisional application in the priority chain, does disclose a “feedback loop” formed from “[o]nboard computer or processor 82 and the associated transducers 70, 78” in which “the computer receives the angular position signal from swing leg transducer 78.” Guntert, ¶[0052]. However, it does not disclose the two limitations above.

44. In the context of the claims discussed above, the “first signal” is emitted by “a first angular position transducer” and indicates “an angular

orientation of the crawler track relative to the jacking column.” ’101 patent, Claim 1. The “second signal” is emitted by a “second angular position transducer” and indicates “an angular orientation of the swing leg relative to the module frame.” *Id.* Guntert discloses that these signals are used in conjunction with moving the swing leg and tracks.

45. For example, Guntert discloses that “onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. It continues, noting that “[i]f the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle.” *Id.* While Guntert does not disclose how the “second signal” is used in this operation, a POSITA would understand that the second signal is used to maintain the swing leg at a fixed preset angle. This can be illustrated using Guntert’s Figure 2 as an example. As shown below in that figure, there are three example swing leg positions shown, each of which has a different angle relative to the frame. In the case where the center swing leg is the “preset angle,” the mode of operation described in Guntert would attempt to move the swing leg to the “preset angle.” A POSITA would understand that the control system would accomplish this by using the preset angle and the current angle (which is emitted from the second angular position transducer). In particular, the system would monitor the current angle from the sensor to determine if it differs from the “preset angle.” If the system

identifies a difference between those two values, then the feedback loop will drive the swing leg toward the preset angle. As discussed in Section VI, this “difference” is often called an error value. As the swing leg is driven toward the preset angle (which is often referred to as a “desired” position), the system will continuously monitor whether there is still a difference or “error” between the current angle and the preset angle. When the angular position error is reduced to 0, the system knows it has reached its “desired” position (or preset angle) and it will cease moving the swing leg.



Guntert, Fig. 2 (annotated).

46. Guntert also discloses a similar process for the crawler tracks. In particular, it explains a scenario where the swing leg is relocated, after which “the crawler track will automatically go back to the straight-ahead position.” Guntert, ¶[0043]. As with the swing leg example shown above, a POSITA would understand that there is a “desired” angle of the crawler track to which the feedback loop drives the crawler track toward by monitoring the current position of the track, as identified by the first angular transducer.

47. While Guntert discloses these features of feedback control, it never discloses how the “preset” or “desired” values *are created* and thus does not disclose the portions of claims 4 and 15 identified above. In particular, it does not disclose storing the first and second signal (i.e., the values emitted from the transducers) and then using those stored values to compare to calculate the difference between the stored first/second signal and the current value from the transducers.

48. In the examples above, a POSITA would understand that there is a stored desired swing leg angle or track angle, but the claims are more specific than simply having a stored value. The claims recite how the stored values come into being. They require storing the “first and second signal” which are the signals emitted from the transducers. The claims then further require calculating the

difference between those stored transducer signals and the current transducer signals.

49. As discussed in Ground 1, a potential use of this type of technique would be to store a desirable configuration for future use. If an operator moved the swing leg and track to a desirable position that needed to be reused on occasion, then they could choose to memorize or store that configuration. The machine would read the current values from the sensors/transducers (the first and second signals) and store them in memory to remember the precise location of the track and swing leg. This would allow those positions to be recalled at a later time. In that case, if the swing leg had moved away from the saved position, the feedback loop would calculate the difference between the stored/memorized swing leg angle (first stored signal) and the current swing leg angle from the sensor (first signal). The system would then drive that error or difference toward zero until the current swing leg angle from the sensor (first signal) matched the stored/memorized swing leg angle. A similar process could also be used for the track angle.

50. Neither Guntert, nor any patent in the priority chain, however, discloses anything of the sort. In the examples discussed previously with the swing leg's "preset angle," the specification never discusses how that value is created and certainly does not disclose storing the current sensor value (the first signal) to set the value. In one of the few actual examples in the patent, it describes moving the

swing legs “90° from the paving direction 18 towards a position that is laterally outward of bolsters 12” so that it “can be transported by truck and trailer to a new location.” Guntert, ¶[0041]. The specification refers to this position for the swing legs and tracks as “the transport position” in which “the swing legs and crawlers are parallel to and extend past the respective lateral ends of the paving machine.” Guntert, ¶[0059]. While the patent describes this as a “preset” angle, there is no disclosure in the patent of the creation of this value or it being stored based on the first or second signal values. There is likewise no corresponding disclosure of “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively.” In another example, the specification describes the onboard computer “calculat[ing] by how much the angle of the crawler track has to be changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction.” Guntert, ¶[0052]. While, again, a POSITA would understand this process to involve a “desired” paving direction, Guntert never discloses how that value is created. And, again, there is no disclosure of a value corresponding to that orientation being stored based on the first or second signal values, and there is likewise no corresponding disclosure of

“calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively.”

51. The above-identified limitations appeared for the first time in claims submitted with the filing of U.S. Application No. 16/013,864 that issued as the '101 patent. Ex. 1004, 44, 46-47. Given the lack of disclosure of the above-identified claim limitations in any application preceding the '101 patent, these additions to the '101 patent are new matter. It is my understanding that claims of the '101 patent that include new matter are only entitled to a priority date associated with when the new matter was disclosed, which was June 20, 2018. Therefore, claims 4 and 15, as well as their dependent claims 5-7 and 16-19 are not entitled to an effective filing date earlier than June 20, 2018.<sup>1</sup>

## **VIII. CLAIM CONSTRUCTION**

52. I am told that claim construction is not necessary where there is no controversy as to the meaning of the terms with respect to the prior art. I am told

---

<sup>1</sup> I have also reviewed the '571 patent, and it also does not disclose the missing limitations for claims 4-7 and 15-19. But, even if it did, it would not impact my invalidity analysis described in this declaration, as Guntert and Dorsett are still prior art if those claims were entitled to priority as of June 14, 2017, the filing date of the '571 patent.

that in the district court, G&Z identified “feedback loop” for construction in the ’101 patent, and GOMACO identified the term “swing leg” for construction. Ex. 1021 (Joint Claim Construction Statement), 8. In particular, for “feedback loop” GOMACO asserted that “feedback loop” means “a circuit, device, or system in which a portion of the output is returned to the input,” and G&Z asserted that it means “a loop formed with the onboard computer/processor and the transducers.” *Id.* With respect to “swing leg,” Gomaco asserted that “swing leg” means “leg that is pivotal.” *Id.* G&Z argued that the term should have its “plain and ordinary meaning.” *Id.*

53. In my opinion, the prior art asserted in the petition grounds discloses an embodiment within the meaning of “swing leg” and “feedback loop” under either parties’ construction, as I discuss below. Therefore, it is my opinion that no explicit claim constructions are needed to apply the prior art to the challenged claims.

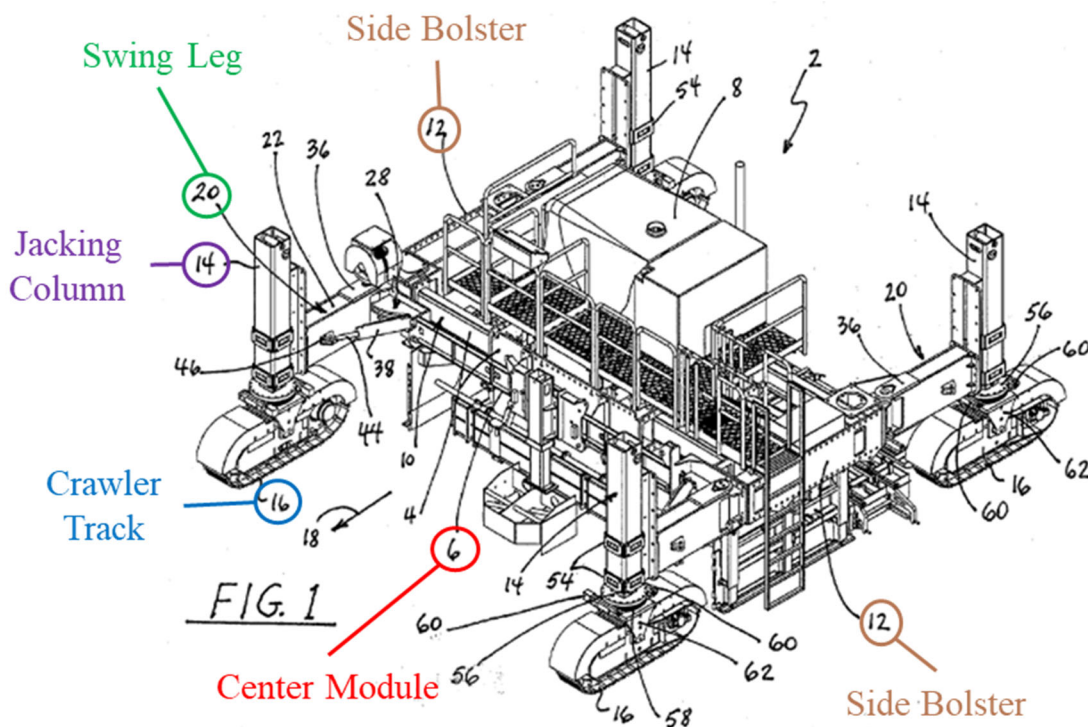
## **IX. ANALYSIS OF PETITION GROUNDS**

### **A. Ground 1: Guntert in view of Dorsett Renders Claims 4-7 and 15-19 Obvious**

#### **1. Summary of Guntert**

54. Guntert is the publication of the application that issued as U.S. Patent No. 8,459,898, to which the ’101 patent claims priority (but is not entitled to such

priority, *see* Section VII.C). Accordingly, its disclosure is similar to that of the '101 patent, though it lacks the disclosures at Ex. 1001, 15:54-22:36 and Figures 9-13E. For example, it discloses a slipform paver with a center module, a side bolster on each lateral side of the center module, a swing leg on each forward and aft end of the side bolsters, a jacking column and crawler track coupled to the free end of each swing leg. Guntert, ¶¶[0015], [0033], [0036].

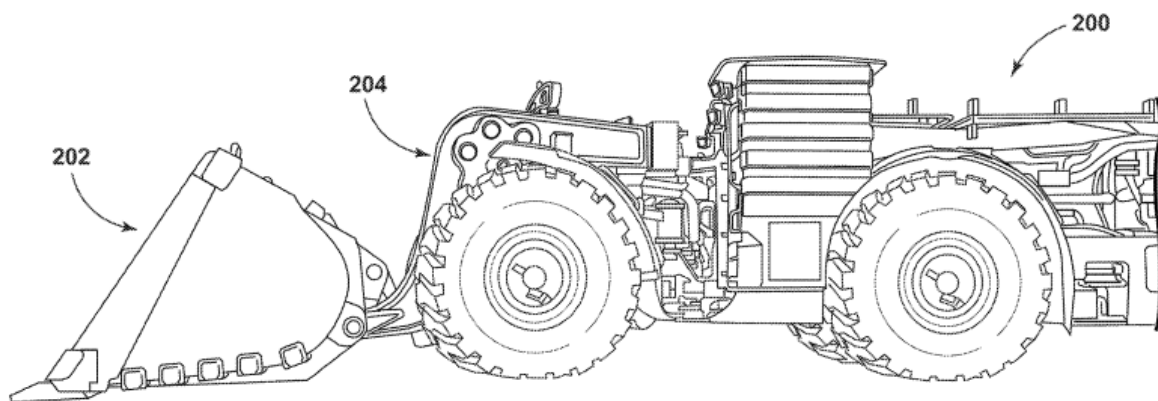


*Id.*, Fig. 1 (annotated).

## 2. Summary of Dorsett

55. U.S. Patent No. 9,873,318 to Dorsett ("Dorsett;" Ex. 1029) relates to heavy machinery equipment and specifically details implementation of certain

mining equipment such as a front end loader. Dorsett, Abstract, 1:14-37. Figure 21, reproduced below, shows a “load haul dump” that includes a bucket 202 supported by one or more arms 204. *Id.*, 4:17, 15:27-28.



**FIG. 22**

*Id.*, Fig. 22.

56. Dorsett explains that the bucket can be moved “using one or more actuators” to “chang[e] the position of the bucket 202, the arms 204, or both.” *Id.*, 15:30-34. The arms can be dropped low to lower the bucket, or the arms “may be used to fully raise the bucket.” *Id.*, 18:8-29. Similarly, the bucket may be moved by changing its “angle from a horizontal position.” *Id.*, 15:28-30; *see also id.*, 18:8-13

(referring to rolling the bucket), 16:9-12 (decreasing the angle of the bucket).

Dorsett also discloses monitoring the position of both the arms and the bucket using sensors. *Id.*, 16:41-45.

57. Dorsett explains that its machine has “an automatic return-to-dig functionality.” *Id.*, 15:41-43. When commanded by the operator, the machine’s controller can “automatically control[] the one or more actuators associated with the bucket 202 to reposition the bucket 202 to a predetermined dig position (for example, a predetermined height, a predetermined angle, or the combination thereof.” *Id.*, 15:55-62. Dorsett further explains that the “operator may manually adjust the predetermined dig position (for example, the predetermined height, the predetermined angle, or the combination thereof) to suit the operator’s preference or the operating environment.” *Id.*, 16:31-35. To do this, the operator “signals when the bucket 202 is in a desired dig position.” *Id.*, 16:35-36. The controller then “saves the current position of the bucket 202 (for example, the current height, the current angle, or the combination thereof).” *Id.*, 16:39-41. It explains that the controller can “determine the current position based on data collected by one or more sensors communicating with the controller 150.” *Id.*, 16:41-45.

58. If commanded by the operator, the “stored position information” may be “recalled and applied” to move the bucket to the stored position. *Id.*, 16:45-47. To move the bucket, the controller will access the stored dig position in memory

and “compare the stored predetermined dig position to a current position of the bucket.” *Id.*, 15:63-67. “When the positions differ, the controller 150 may control the one or more actuators to change the current position of the bucket to match the stored predetermined dig position.” *Id.*, 17:2-5. “For example, when the current height of the bucket 202 is greater than the height included in the predetermined dig position, the controller 150 may control the one or more actuators to lower the bucket 202.” *Id.*, 17:5-9. “Similarly, when the current angle of the bucket 202 is greater than the angle included in the predetermined dig position, the controller 150 may control the one or more actuators to decrease the angle of the bucket 202.” *Id.*, 17:9-12.

59. Throughout this process, “the controller 150 may repeatedly compare a current position of the bucket 202 to the stored predetermined dig position while moving the bucket 202 until the positions align.” *Id.*, 17:13-16. “Alternatively or in addition, the controller 150 may initially compare a current position of the bucket 202 to the stored predetermined dig position and determine an amount of movement necessary to bring the bucket 202 in align with the stored predetermined dig position.” *Id.*, 17:16-21. In “either configuration, the controller 150 translates a difference between the current position and the stored position into one or a series of commands to the one or more actuators simulating commands received from an operator control.” *Id.*, 17:23-27.

60. Dorsett explains that, by automating this process, this “allows the operator to concentrate on driving the LHD 200 without having to also perform multiple joystick movements to return the bucket 202 to a dig position.” *Id.*, 17:25-30.

### **3. Rationale for Combining Guntert and Dorsett**

61. Dorsett and Guntert are analogous art to the '101 patent, as they are in same field of endeavor and are reasonably pertinent to the particular problem the inventor was trying to solve. With respect to Guntert, it mirrors portions of the '101 patent and relates to slipform paving and addresses the very same problem by having nearly the same disclosure. Like the '101 patent, Guntert aims to automate the manual process of moving the swing leg and tracks of a slipform paver. *See* Guntert, generally. Both Dorsett and the '101 patent concern construction machinery. The '101 patent relates to slipform paving machines and Dorsett relates to heavy machinery such as a front end loader or a load haul dump. Dorsett, Abstract, 1:14-37, 2:34, 4:17.

62. Dorsett, Guntert, and the '101 patent are also concerned with control systems for similar mechanisms used on work machines. Guntert and the '101 patent disclose a swing leg (or swing arm) that pivots relative to the frame. '101 patent, 6:14-20; Guntert, ¶[0016]. Similarly, Dorsett discloses arms 204 that pivot on the front of the machine frame. Dorsett, 15:30-34, 18:8-29, Fig. 21. Guntert and

the '101 patent also discuss crawler tracks positioned near the end of the swing legs (below a jacking column) that can rotate. *See* '101 patent Fig. 1; Guntert, Fig.

1. Dorsett also discloses a bucket at the end of the arms that can be rotated or rolled relative to the arms. Dorsett, 15:28-30, 18:8-13, 16:9-12. And in Guntert and the '101 patent, both the swing leg and crawler track are repositioned using hydraulic actuators. '101 patent, 10:8-11, 11:38-59; Guntert, ¶¶[0040], [0045].

Dorsett, likewise, discloses that the arms and bucket are also repositioned using actuators. Dorsett, 15:30-34. Guntert and the '101 patent also disclose monitoring the position of both the swing leg and crawler track using transducers (sensors).

'101 patent, 12:4-34; Guntert, ¶¶[[0047]-[0050]. Dorsett also discloses monitoring the position of both the arms and the bucket using sensors the controller can “determine the current position based on data collected by one or more sensors communicating with the controller 150.” Dorsett, 16:41-45.

63. Dorsett and the '101 patent also address similar problems. The '101 patent includes a control system for pivoting its swing leg and also controlling the rotation of its track. '101 patent, 10:8-11, 11:38-59. It states that conventional methods of positioning the swing legs and actuators involved “a process that is time-consuming, costly, and results in a prolonged unproductive downtime for the machine.” *Id.*, 4:65-67. And it argues that its solution “eliminated” the “common need to manually move the swing legs with jacking columns and crawler tracks

into the outboard position . . . which significantly reduces the time required to ready the machine for transport and/or for maneuvering the machine at the work site.” *Id.*, 7:20-26. Dorsett eliminated similar hardships as the ’101 patent—by automating the positioning of construction machine components. Indeed, by using Dorsett’s memorization and recall feature, the reference recognizes that it “allows the operator to concentrate on [other issues] without having to also perform multiple” manual adjustments. Dorsett, 17:25-30. Thus, both references are aimed at reducing time-consuming, costly, and potentially error-prone manual adjustments.

64. As Guntert’s disclosure largely parallels the ’101 patent, the similarities discussed above would have also motivated a POSITA to combine Dorsett and Guntert. One of ordinary skill in the art would have found it obvious to combine Dorsett with Guntert, as they disclose similar features and address similar problems, as discussed above.

65. As discussed previously, Guntert (like the ’101 patent) aims to automate the manual process of moving its swing leg and tracks, reducing the time required to maneuver the machine. Guntert, ¶[0019]. Guntert discloses automatically pivoting the machine’s swing legs to a “preset angle.” *Id.*, ¶[0017]. It discloses similar functionality for a track’s angle. *Id.*, ¶[0043]. Guntert does not however, indicate how that preset angle is established or provide the operator any

flexibility in establishing the desired positions. Thus, using Guntert, an operator would be severely limited, as its machine provides no ability for an operator to define unique configurations for the swing leg and track to which they can automatically return. Thus, an operator who wanted to return to a unique configuration would be forced to do so manually, which can be time consuming and may lead to errors.

66. Dorsett solved this problem by permitting a user to configure the positions of its arms and bucket based on the current position sensor readings and automate movement to those positions. In particular, Dorsett discloses “an automatic return-to-dig functionality.” Dorsett, 15:41-43. This feature allows the machine’s controller to “automatically control[] the one or more actuators associated with the bucket 202 to reposition the bucket 202 to a predetermined dig position (for example, a predetermined height, a predetermined angle, or the combination thereof.” *Id.*, 15:55-62. Importantly, Dorsett also provides the operator with the ability to configure the locations of the return functionality. It discloses that “operator may manually adjust the predetermined dig position (for example, the predetermined height, the predetermined angle, or the combination thereof) to suit the operator’s preference or the operating environment.” *Id.*, 16:31-35. To do this, the operator “signals when the bucket 202 is in a desired dig position.” *Id.*, 16:35-36. The controller then “saves the current position of the

bucket 202 (for example, the current height, the current angle, or the combination thereof).” *Id.*, 16:39-41. It explains that the controller can “determine the current position based on data collected by one or more sensors communicating with the controller 150.” *Id.*, 16:41-45. Dorsett also provides multiple such customizable positions, such as via its “return to carry” positions. *Id.*, 16:60-17:10. Thus, for a unique position that the operator finds desirable, Dorsett allows the operator to save that position using sensor data and automatically return to it at a later time. Like Guntert and the ’101 patent’s aim to reduce time-consuming manual adjustments, Dorsett similarly recognizes that this feature saves time and effort by the operator. *Id.*, 17:25-30 (noting that the feature “allows the operator to concentrate on driving the LHD 200 without having to also perform multiple joystick movements to return the bucket 202 to a dig position”).

67. A POSITA would have recognized that this sensor-based memorization and return feature would be beneficial and equally applicable to the Guntert paver. Indeed, just like Dorsett, Guntert monitors two position signals related to its monitored structural members (a swing leg pivot signal and a track rotation signal). Guntert, ¶¶[0047]-[0050]. A POSITA would have understood that, just like Dorsett, those signals in Guntert could be stored to memorize any particular location of the swing leg and crawler track. Indeed, Guntert already discloses moving to preset angles of the track and swing leg. *Id.*, ¶¶[0017], [0043].

Guntert lacks any teaching, however, that would allow a user to store those angles using sensor readings and later return to the stored configuration. In light of Dorsett's teachings, and in addition to Guntert's preset angles, it would have been obvious to also allow a user to store the current sensor readings for the track and swing leg angles and to use those values as the "desired" angles when returning to a desired configuration.

68. This would have benefited the operator by allowing the operator the ability to configure any number of chosen positions. Indeed, as explained by Dorsett, such a feature would allow the operator to use values that "suit the operator's preference or the operating environment." Dorsett, 16:31-35. A POSITA would recognize the benefit this would provide the operator of Guntert's machine, as it would allow an operator to choose a desired swing leg position (via the swing leg angle) and desired track heading (via the track rotation angle) and easily return to the desired configuration for a job without needing to worry about potential errors due to manual movement. Nor would an operator need to memorize a proper configuration for the job at hand if it was one that differed from the normal paving configurations. Other situations where this feature would be beneficial include when a particular configuration is required by a job, but an obstacle requires moving the track to a new position temporarily until the obstacle is cleared. Dorsett's memorization and return feature would allow an operator to save the

current configuration, move the swing leg to avoid an obstacle, and quickly and easily return to the memorized position when it was safe to do so. Similarly, when a unique job requiring a particular configuration is completed over several days, Dorsett's return feature would allow an operator to save the unique configuration and easily return to the memorized position on subsequent days. Finally, if circumstances of a job would benefit from a new configuration, then the operator could position the swing leg and track in the new position and save the new configuration to update the saved position for future recall.

69. Implementing Dorsett's memorization-and-return feature on the Guntert paver would have constituted nothing more than a combination of well-known prior art elements according to known methods to yield predictable results. Indeed, Guntert's position memorization and recall feature was well known. *See, e.g.,* U.S. Patent No. 7,797,860 to Schoenmaker ("Schoenmaker"; Ex. 1023) at 18:14-28 (disclosing that an "operator may establish or program a preset position via the user interface" and later "return to position."). In my opinion, a POSITA would also have had a reasonable expectation of success. The storage of sensor position values and moving to those positions would have functioned in the same predictable manner on a Guntert paver as they did in Dorsett. Thus, in my opinion, a POSITA would have recognized that Dorsett's memorization and return feature

would both be beneficial to a Guntert paver and would function as expected when implemented on the Guntert machine.

**4. Claim 1**

70. Claims 4-7 depend from claim 1. Therefore, below, I first demonstrate how Guntert alone discloses all the elements of claim 1.

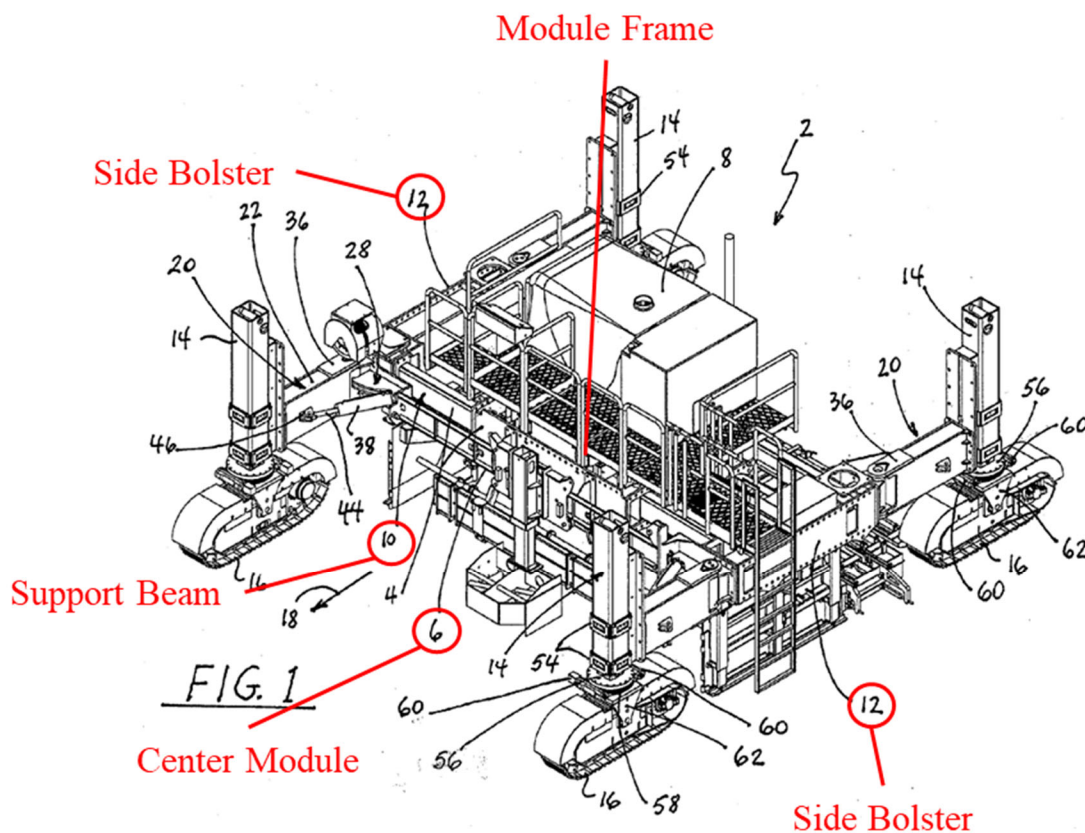
- a. [1a]: “A paving machine configured to move in a paving direction for spreading, leveling and finishing concrete into a form having a generally upwardly exposed, finished concrete surface and terminating in lateral concrete sides, the paving machine comprising:”**

71. Guntert discloses this element. Guntert discloses a paving machine “configured to move in a paving direction for spreading, leveling and finishing concrete into a form having a generally upwardly exposed, finished concrete surface and terminating in lateral concrete sides.” Guntert, Abstract; *see also id.*, ¶¶[0002]-[0003], [0035], Claim 1. Guntert discloses that “sideforms mounted on each side of the slipform paving kit shape and confine the sides of the slab during the slipform paving process.” *Id.*, ¶[0003].

- b. [1b]: “a module frame;”**

72. Guntert discloses this element. Guntert discloses “main tractor frame 4” (“module frame”) that includes a center module 6, telescoping male support beams 10 that “extend outwardly in a lateral direction,” and side bolsters 12 that

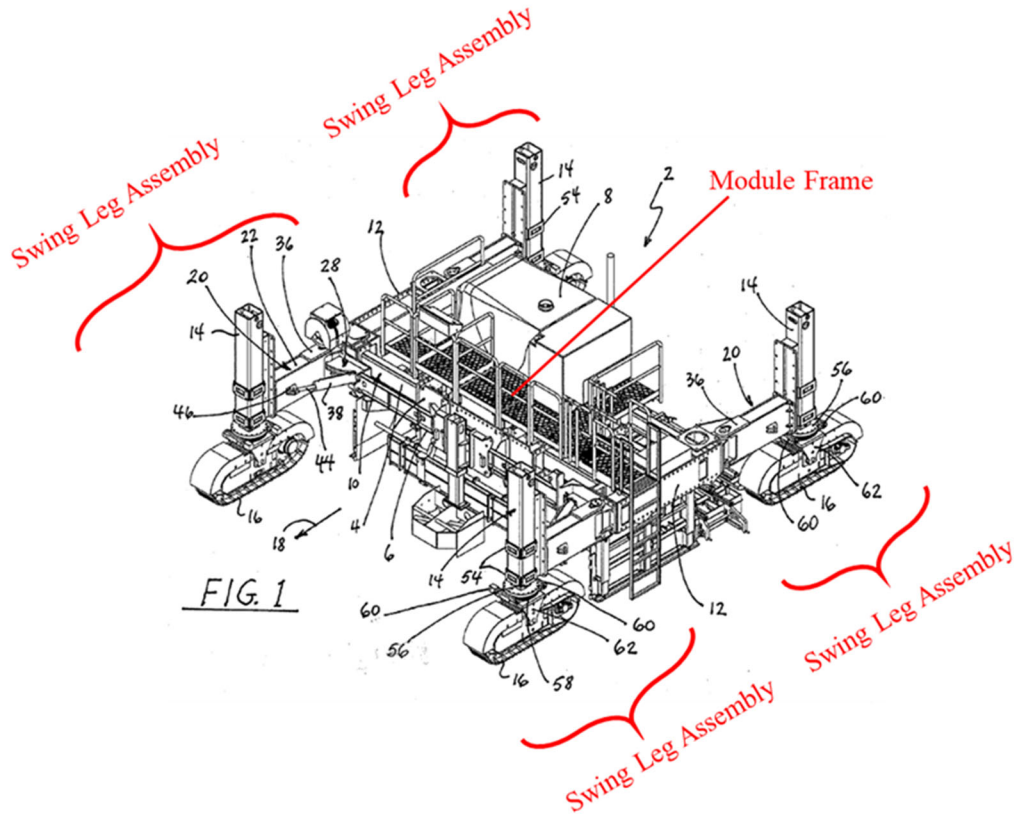
“are secured to the respective outboard ends of the support beams.” Guntert, ¶[0033]; *see id.*, ¶[0005] (disclosing that tractor frames “typically are extendable/retractable in the lateral direction to change the widths of the tractor frame”). The module frame, including the center module, support beams, and side bolsters, is shown in the annotated version of Figure 1 provided below.



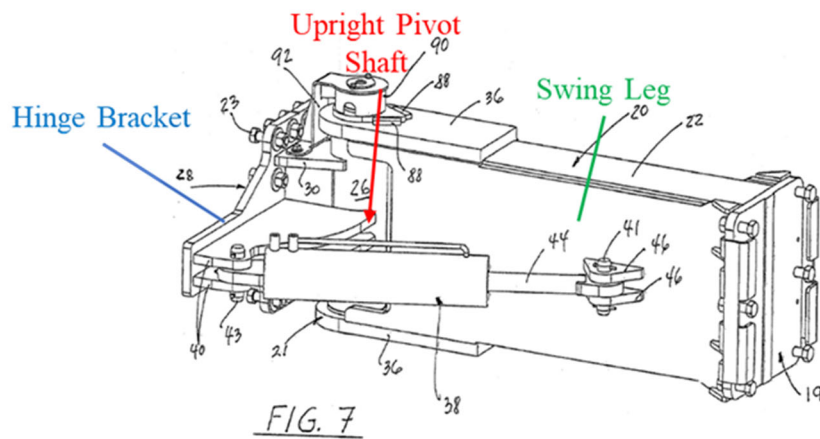
*Id.*, Fig. 1 (annotated).

- c. **[1c]: “two or more swing leg assemblies mechanically coupled to the module frame, each swing leg assembly comprising:”**

73. Guntert discloses four swing assemblies. Specifically, Guntert discloses “each crawler 16 and the associated jacking column 14 are mounted to a free end 19 (shown in FIG. 7) of a bolster swing leg 20.” Guntert, ¶[0036]. “[E]ach bolster swing leg is pivotally mounted on a hinge bracket that is secured to the front (or aft) ends of the side bolsters of the paving machine” (“two or more swing leg assemblies mechanically coupled to the module frame”). *Id.*, ¶[0015]. Guntert explains that the swing leg is pivotal about a vertically oriented pivot shaft 24. Guntert, ¶[0036]. As illustrated in Figs. 1 and 7, below, Guntert’s paving machine includes four swing leg assemblies, each of which is mechanically coupled to the module frame at a side bolsters 12 via the hinge bracket and includes a jacking column 14, crawler track 16, and a swing leg 20.



Guntert, Fig. 1 (annotated).



Id., Fig. 7 (annotated).

d. [1d]: “a swing leg;”

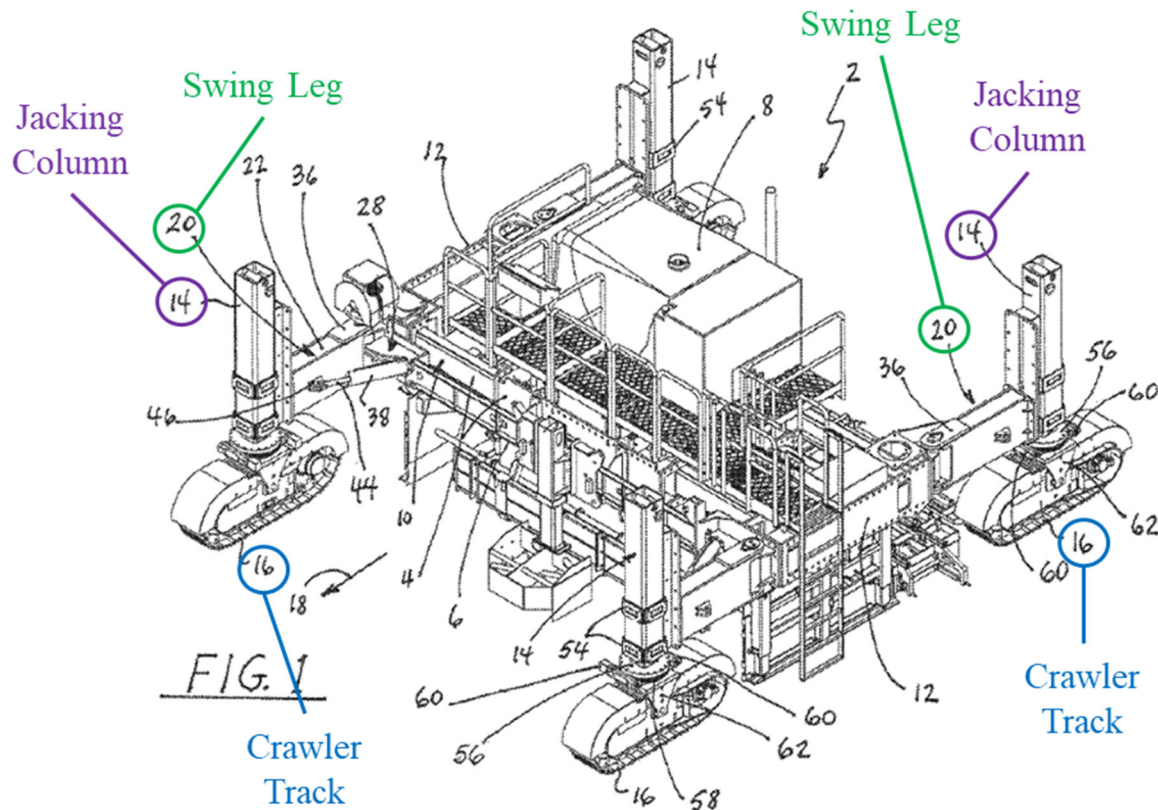
[11e]: “a crawler track;”

[11f]: “an upright jacking column secured to the swing leg, having a rotary connection between the jacking column and the crawler track permitting relative rotational movements of the crawler track with regard to the jacking column about a first upright axis;”

[11i]: “a power drive unit arranged to translate relative rotational movements between the jacking column and the crawler track;”

74. Guntert discloses these elements. Guntert discloses four swing legs, four crawler tracks, and four upright jacking columns. With respect to the jacking columns, Guntert states that “[u]pright jacking columns 14 are mounted in the vicinity of respective front and aft ends of the bolsters, and crawlers 16 are conventionally secured to the lower ends of the jacking columns.” Guntert, ¶[0033] (“an upright jacking column”).

75. Guntert further discloses that “each crawler 16 and the associated jacking column 14 are mounted to a free end 19 (shown in FIG. 7) of a bolster swing leg 20.” Guntert, ¶[0036] (“a swing leg”), (“a crawler track”), (“an upright jacking column secured to the swing leg”). This configuration is shown below.



Guntert, Fig. 1 (annotated).

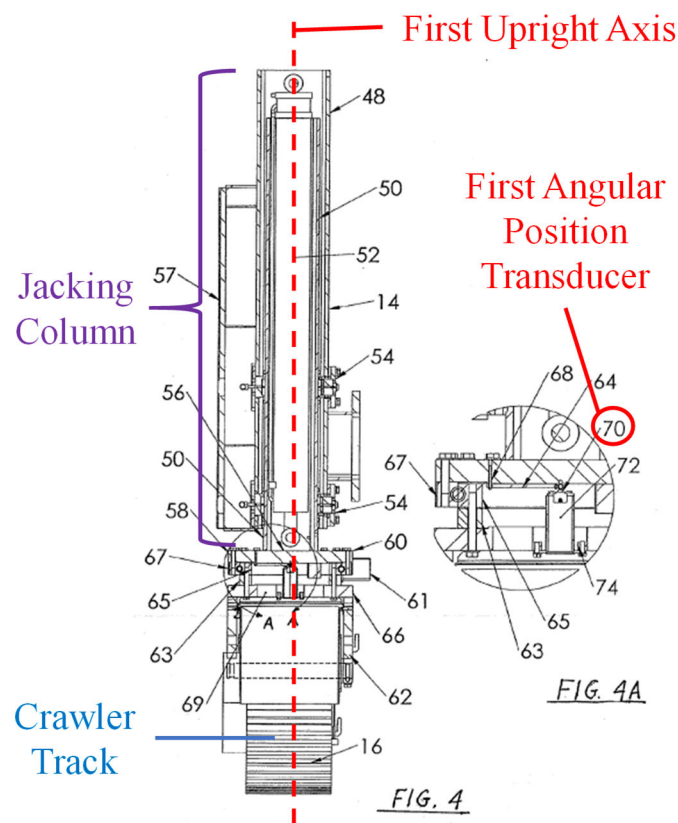
76. Guntert's jacking columns are "hydraulically powered for raising and lowering of the paving machine relative to the crawlers on the ground" and are mounted to the free end 19 of a swing leg 20. Guntert, ¶¶[0033], [0036]. "The crawlers are mounted to the lower ends of the jacking columns, and they are rotatable relative to the jacking columns about vertical axes" ("an upright jacking column secured to the swing leg, having a rotary connection between the jacking column and the crawler track permitting relative rotational movements of the crawler track with regard to the jacking column about a first upright axis").

Guntert, ¶[0033]; *see also id.*, ¶[0020] (“a connection between the jacking column and the crawler track permits rotational movements of the crawler track and the jacking column about an upright axis”). A “rotary actuator (slew gear)” is employed “as the power drive between the crawler track and the jacking column” to rotate the crawlers “about the vertical jacking column axis” (“a power drive unit arranged to translate relative rotational movements between the jacking column and the crawler track”). *Id.*, ¶¶[0019], [0045], [0052], [0057].

- e. **[1g]: “a first angular position transducer configured to emit a first signal which is indicative of an angular orientation of the crawler track relative to the jacking column;”**

77. Guntert discloses a first angular position transducer emitting a first position signal which is indicative of an angular orientation of the crawler track relative to the first jacking column. Guntert, Claim 2, ¶¶[0046]-[0047], Fig. 4. For example, Guntert discloses “[a]n angular position transducer or sensor 70 is arranged inside an upwardly open can 72 (provided to protect the sensor) that is disposed within an opening 69 in the transverse portion 66 of yoke 62.” *Id.*, ¶[0046]. “The transducer cooperates with a trigger pin 68 extending downwardly from the under side of plate 56 and a suitable actuator arm that turns the transducer.” *Id.* The transducer 70 “generates a signal that indicates the angular position of yoke 62 relative to jacking column 14 and any changes in the angular

position due to rotational movements of the yoke.” *Id.*, ¶[0047]. The position of yoke 62 is indicative of the angular orientation of the first crawler track relative to the first jacking column. Figures 4 and 4A, reproduced below in annotated form, depict the arrangement of the jacking column, angular position transducer, and crawler track.

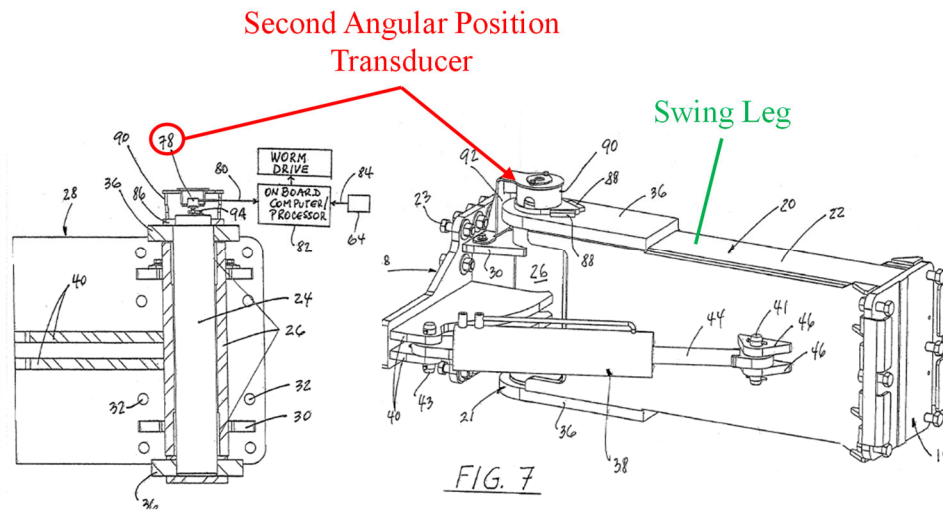


Guntert, Figs. 4-4A (annotated).

- f. [1h]: “a second angular position transducer configured to emit a second signal which is indicative

**of an angular orientation of the swing leg relative to the module frame; and”**

78. Guntert discloses a second angular position transducer emitting a second signal which is indicative of the angular orientation of the first swing leg relative to the module frame. Guntert, Claim 2, ¶¶[0048]-[0050] (“angular position transducer 78 to generate an angular position signal which reflects the angular inclination between the pivot shaft and the hinge bracket, and which changes when the bolster swing leg 20 changes its angular position relative to the hinge bracket 28, and therewith also relative to bolster 12 and tractor frame 4.”). The angular position transducer 78 is mounted inside a protective can 90 that is bolted to the hinge bracket. Guntert, ¶[0049]. Guntert discloses that the hinge bracket is secured to respective end surfaces 34 of side bolsters 12. Guntert, ¶[0037]. Guntert also discloses that the male support beams 10 extend from frame 4 and that side bolsters 12 are secured to the support beams. Guntert, ¶[0033]. Thus, because the hinge bracket is itself attached to the frame, the second signal which is indicative of an angular orientation of the swing leg relative to the hinge bracket is also indicative of an angular orientation of the swing leg relative to the module frame.



Guntert, Figs. 5, 7 (annotated).

- g. [1j]: “a processor operable to receive the first and second signals from each swing leg assembly and configured to generate and emit a control signal for instructing the power drive of each swing leg assembly, and thereby rotationally move each respective crawler track relative to its respective jacking column.”

79. Guntert discloses this element. Guntert discloses that “[t]he output signal of the position transducer 78 is fed via lead 80 to an onboard computer 82 of the paving machine, or another suitable processor, which receives as its second input the output signal of position transducer 70 between jacking column 14 and crawler tracks 16 via a lead 84.” *Id.*, ¶[0051]; *see also id.*, ¶[0052]. Thus, Guntert discloses that its onboard computer receives both the first signal (from transducer 70) and second signal (from transducer 78).

80. Further, Guntert discloses:

When the angular position of the swing leg changes, the output signal from transducer 78 changes correspondingly. As a result of this orientational change of the swing leg, the angular orientation of the crawler tracks becomes angularly inclined relative to paving direction 18. Computer 82 calculates by how much the angle of the crawler track has to be changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction. The onboard computer then signals by how much worm gear drive 60 must rotationally adjust the orientation of yoke 62 and crawler tracks 16 to again align the crawler tracks with the paving direction. This process is repeated each time the angular position of the swing leg is changed, or when for other reasons the angular orientation of the crawler tracks becomes misaligned from the desired paving direction of the machine.

*Id.*, ¶[0052]. Thus, the processor emits a control signal such that the tracks rotationally move to remain oriented in the paving direction without having to stop operation of the machine or manually adjust the tracks and/or the swing legs. *Id.*, ¶[0052]-[0053].

81. Guntert further discloses “a processor receiving the first and second signals and emitting a control signal for activating the power drive and thereby rotationally moving the crawler tracks,” including the first crawler track, “relative to the associated jacking columns for keeping the crawler tracks oriented in the paving direction in response to changes of the first signal caused by pivotal motions of the swing leg about the pivot shaft.” Guntert, Claim 2. Thus, Guntert discloses a processor operable to receive the first and second signals from each swing leg assembly and configured to generate and emit a control signal for instructing the power drive of each swing leg assembly, and thereby rotationally move each respective crawler track relative to its respective jacking column.

**5. Claim 3: “The paving machine of claim 1, wherein one or more of the power drives comprise first and second diametrically opposed helical worm drives engaging and driving a ring gear disposed between them.”**

82. Claims 4-7 depend from claim 3. Therefore, below, I first demonstrate how Guntert alone discloses all the elements of claim 3.

83. As discussed above, Guntert discloses all the elements of claim 1 also included in claim 3. Guntert also discloses the additional elements of claim 3.

84. For example, Guntert discloses that “the power drive comprises a slew gear drive” (Guntert, claim 3) and that “the helical worm gear drive comprises first and second, diametrically opposed helical worm drives engaging and driving a ring

gear disposed between them” (Guntert, claim 4). Guntert also discloses that a “slew or worm gear drive or other rotary actuator 60 is bolted to a mounting plate 56 at the lower end of inner tube 50 of the jacking column.” Guntert, ¶[0045]. Guntert discloses that the “worm gear drive has a ring gear 58 that is driven by a pair of diametrically opposite, hydraulically activated helical worm drives 61 carried on a ring-shaped member 63” and that a yoke associated with a crawler track is attached to the ring gear. *Id.* Thus, Guntert discloses that its power drives includes first and second diametrically opposed helical worm drives engaging and driving a ring gear disposed between them.

**6. Claim 4:**

85. As discussed above, Guntert discloses all the elements of claim 3 also included in claim 4. As discussed below, Guntert in view of Dorsett discloses the additional elements of claim 4.

- a. **[4a]: “The paving machine of claim 3, wherein the processor configured to receive the first and second signals and to generate and emit the control signal for each swing leg assembly is further configured to have a stored first signal and a stored second signal for each respective swing leg assembly, further wherein the control signal is generated by”**

86. For the same reasons discussed with respect to limitation [1j], Guntert discloses a processor configured to receive the first and second signals and to

generate and emit a control signal for each swing leg assembly. *See* Section IX.A.4.g.

87. As discussed in Sections VII.C and IX.A.3, a POSITA would understand that Guntert discloses having a preset pivot value for pivoting the swing leg to a desired position and a preset rotation value for rotating the crawler track to a desired angle. Guntert, ¶¶[0017] (“onboard computer always maintains the swing leg angle at a fixed, preset angle. If the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle”), [0043] (“the crawler track will automatically go back to the straight-ahead position”). These values would correspond to the “fixed, preset angle” for the swing leg and to an angle corresponding to the “straight-ahead position” for the crawler track. These stored “fixed, preset angles” should not be confused with a stored first signal and stored second signal, however, as there is no disclosure of how the fixed angles are created.

88. As discussed in Section IX.A.3, Dorsett discloses that a user can configure the positions to which its arms and bucket automatically move based on the current monitored sensor readings. In particular, Dorsett’s “operator may manually adjust the predetermined dig position (for example, the predetermined height, the predetermined angle, or the combination thereof) to suit the operator’s preference or the operating environment.” Dorsett, 16:31-35. To do this, the

operator “signals when the bucket 202 is in a desired dig position.” *Id.*, 16:35-36. The controller then “saves the current position of the bucket 202 (for example, the current height, the current angle, or the combination thereof).” *Id.*, 16:39-41. It explains that the controller can “determine the current position based on data collected by one or more sensors communicating with the controller 150.” *Id.*, 16:41-45. Thus, for a unique position that the operator finds desirable, Dorsett allows the operator to save that position using sensor data. (“configured to have a stored first signal and a stored second signal”). The system can then automatically return to that saved position at a later time. *Id.*, 15:55-62.

89. For the reasons discussed in Section IX.A.3, it would have been obvious to also allow a user to store the current sensor readings for Guntert’s track and swing leg angles and to use those values as the “desired” angles when returning to a desired swing leg or track angle.

**b. [4b]: “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively, for each respective swing leg assembly”**

90. Limitation 4[b] recites “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals *respectively*” (emphasis added). Given the recitation of “respectively,” I have interpreted the recited “differences[s]” to mean (1) the difference between the first

signal and the first stored signal and (2) the difference between the second signal and the second stored signal. This limitation is rendered obvious by Guntert in view of Dorsett.

91. As discussed in Section VII.C, a POSITA would understand that Guntert discloses calculating the difference between a preset pivot value for pivoting the swing leg and a preset rotation value for rotating the crawler track to a desired angle. For example, Guntert discloses that an “onboard computer always maintains the swing leg angle at a fixed, preset angle. If the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle.” Guntert, ¶[0017]. As explained in Section VII.C, a POSITA would understand that this would involve determining the difference between the preset angle (where the machine desires the swing leg to be) and the second signal (where the swing leg currently is) (this is an “error” or “difference” where a non-zero difference indicates that the system is not yet at its desired position). The machine will continuously calculate this difference and move the swing leg to try to reduce it to zero (meaning the swing leg has reached its desired angle). This calculation, however, is performed by comparing the current second signal to a fixed preset value. In contrast, the claim requires calculating the difference between the current pivot sensor signal and a *stored pivot sensor* signal.

92. Likewise, for the crawler track, Guntert discloses that “the crawler track will automatically go back to the straight-ahead position.” Guntert, ¶[0043]. A POSITA would similarly understand that this compares the current rotation sensor signal to some preset value (e.g., a straight ahead angle), and that the system will calculate the difference until the “error” between those values is 0. This does not, however, disclose calculating the difference between the current rotation sensor signal and a *stored rotation sensor* signal, as required by the claims.

93. Dorsett discloses this limitation. As discussed with respect to limitation [4a] and in Section IX.A.3, Dorsett discloses storing values from sensors corresponding to positions for recall at a later time. *See* Dorsett, 16:31-45. The stored sensor signals can include at least two values for Dorsett’s bucket, including “the predetermined height” and “the predetermined angle.” *Id.*

94. When an operator wishes to recall the stored position, the system will “compare the stored predetermined dig position [(“stored first signal” and “stored second signal”)] to a current position of the bucket [(“first signal” and “second signal”)].” *Id.*, 15:63-67. Dorsett explains how this comparison calculates the *difference* between these values, noting that “[w]hen the positions *differ*, the controller 150 may control the one or more actuators to change the current position of the bucket to match the stored predetermined dig position.” *Id.*, 17:2-5 (emphasis added). It further explains that the controller 150 may repeatedly

compare a current position of the bucket 202 to the stored predetermined dig position while moving the bucket 202 until the positions align.” *Id.*, 17:13-16.

“Alternatively or in addition, the controller 150 may initially compare a current position of the bucket 202 to the stored predetermined dig position and determine an amount of movement necessary to bring the bucket 202 in align with the stored predetermined dig position.” *Id.*, 17:16-21. In “either configuration, the controller 150 translates a *difference between the current position and the stored position* into one or a series of commands to the one or more actuators simulating commands received from an operator control.” *Id.*, 17:23-27 (emphasis added). Thus, Dorsett discloses “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals, respectively.”

95. For the reasons discussed in Section IX.A.3, it would have been obvious to include Dorsett’s position memorization and recall feature on each of the swing leg assemblies of Guntert’s paver, so as to also allow Guntert to recall positions based on stored sensor data and to calculate the differences as discussed using the stored first signal and stored second signals.

**c. [4c]: “calculating the angle to reset each crawler track to its respective jacking column along a desired orientation for each respective swing leg assembly”**

96. Guntert discloses this element. For example, Guntert discloses: “Computer 82 calculates by how much the angle of the crawler track has to be

changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction.” Guntert, ¶[0052].

**d. [4d]: “determining the respective worm drive that operates each respective crawler track in each respective swing leg assembly;”**

97. Guntert discloses this feature. As discussed previously, Guntert discloses that “Computer 82 calculates by how much the angle of the crawler track has to be changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction.” Guntert, ¶[0052]. Guntert, however, discloses four crawler tracks with associated worm drives. *See id.*, Fig. 1, ¶[0045]. Thus, for Guntert to be able to instruct any one of them regarding their respective rotation, the control system must be able to determine the respective worm drive that operates each respective crawler track in each respective swing leg assembly. Indeed, Guntert explains that the process of “reset[ting] the crawler track” “is repeated each time the angular position of the swing leg is changed, or when for other reasons the angular orientation of the crawler tracks becomes misaligned from the desired paving direction of the machine.” *Id.*, ¶[0052]. And Guntert

discloses that this relocation process can occur “one swing leg/crawler track at a time.” *Id.*, ¶[0043]. For the processor to be able to instruct the crawler track that corresponds to the moved swing leg, a POSITA would have understood that the processor must determine the respective worm drive that operates each respective crawler track in each respective swing leg assembly as claimed.

- e. **[4e]: “calculating the rotation of each worm drive to align the respective crawler track along the desired orientation in each respective swing leg assembly; and;”**

98. Guntert discloses this element. For example, Guntert discloses that its “onboard computer then signals by how much worm gear drive 60 must rotationally adjust the orientation of yoke 62 and crawler tracks 16 to again align the crawler tracks with the paving direction.” Guntert, ¶[0052]. Thus, Guntert discloses that its computer determines the rotation of each worm drive required to align the respective crawler track along the desired orientation in each respective swing leg assembly.

- f. **[4f] “storing the first signal and second signal from each swing leg assembly and thereby updating the respective stored first signal and the respective stored second signal for each respective swing leg assembly;”**

99. Dorsett discloses this limitation. As discussed previously, Dorsett discloses that a user can configure the positions to which its components automatically move based on the current monitored sensor readings. In particular,

Dorsett's "operator may manually adjust the predetermined dig position (for example, the predetermined height, the predetermined angle, or the combination thereof) to suit the operator's preference or the operating environment." *Id.*, 16:31-35. To do this, the operator "signals when the bucket 202 is in a desired dig position." *Id.*, 16:35-36. The controller then "saves the current position of the bucket 202 (for example, the current height, the current angle, or the combination thereof)." *Id.*, 16:39-41. It explains that the controller can "determine the current position based on data collected by one or more sensors communicating with the controller 150." *Id.*, 16:41-45. Thus, for a unique position that the operator finds desirable, Dorsett allows the operator to save that position using sensor data. Dorsett also explains that the operator can reset the position to a default value. *Id.*, 16:56-59. And the operator would likewise be able to store any other position of their choosing. *Id.*, 16:39-41. Thus, Dorsett discloses "storing the first signal and second signal from each swing leg assembly and thereby updating the respective stored first signal."

100. As discussed in section IX.A.3, it would have been obvious to combine Guntert and Dorsett such that Dorsett's sensor position signals can be saved and updated in memory for each respective swing leg assembly to allow for later recall of the swing leg and track positions.

**7. Claim 5: “The paving machine of claim 4, wherein the desired orientation is alignment of the crawler tracks along a paving direction.”**

101. Guntert discloses this limitation. For example, Guntert discloses that when the angular orientation of the crawler tracks becomes angularly inclined relative to paving direction 18, the computer of Guntert’s paving machine calculates how much the angle of the crawler tracks has to be changed to align the crawler tracks with the paving direction. Guntert, ¶[0052] (“Computer 82 calculates by how much the angle of the crawler track has to be changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction”).

102. Additionally, it would have been obvious for a POSITA to store a desired track orientation (as described above regarding claim 4, Section IX.A.6) for each of the crawler tracks that aligns along the paving direction, as Guntert suggests that such a position is beneficial. *See* Guntert, Abstract (“keeps the crawler tracks oriented in the paving direction”), ¶[0016] (“the crawler track stays straight ahead in the paving direction and position”), ¶[0052] (“adjust the orientation of yoke 62 and crawler tracks 16 to again align the crawler tracks with

the paving direction”). Thus, Guntert in view of Dorsett discloses that the desired orientation can be alignment of the crawler tracks along a paving direction.

**8. Claim 6: “The paving machine of claim 4, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly.”**

103. Initially, I note that as discussed with respect to claim 5, Guntert discloses aligning each of the four crawler tracks of its paving machine with the paving direction. A POSITA would recognize that by doing so, Guntert discloses aligning the crawler track of one swing leg assembly with the crawler track of another swing leg assembly. *See also, e.g.,* Guntert, ¶[0043] (“adjusting the angular orientation of the crawler track by an amount that depends on or is a function of the angular displacement of the swing legs relative to the hinge bracket 28 so that the crawler tracks always remain in alignment with paving direction 18 of the paving machine.”); *see also id.*, ¶[0052] (“adjust the orientation of yoke 62 and crawler tracks 16 to again align the crawler tracks with the paving direction”). Thus, claim 6 is met for the same reasons discussed with respect to claim 5. *See* Section IX.A.7.

104. Furthermore, Guntert discloses “at least one additional crawler track being rotationally movable relative to the associated jacking column about an upright axis for directionally aligning the at least one additional crawler track with

the first and second crawler tracks.” Guntert, claim 7. Therefore, in my opinion, Guntert discloses claim 6.

9. **Claim 7: “The paving machine of claim 4, wherein the processor, the power drive, and the first transducer, and the second transducer from each swing leg assembly form a feedback loop for maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame.”**

105. Guntert discloses that “processor 82 and the associated transducers 70, 78 form a feedback loop in which the computer receives the angular position signal from swing leg transducer 78.” Guntert, ¶[0052]. As explained in Section IX.A.4.e, transducer 70 constitutes the first angular position transducer. As explained in Section IX.A.4.f, transducer 78 constitutes the second angular position transducer. Thus, Guntert discloses that its feedback loop includes the first and second transducers and a processor. Guntert also discloses that a “closed loop feedback system that connects the hydraulic actuator for the swing leg, the rotary power drive for the crawler, and the onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. Thus, the feedback loop also includes the power drive. Guntert explains:

When the angular position of the swing leg changes, the output signal from transducer 78 changes correspondingly. As a result of this orientational change of the swing leg, the angular orientation of the crawler

tracks becomes angularly inclined relative to paving direction 18. Computer 82 calculates by how much the angle of the crawler track has to be changed relative to the jacking column (which has also been angularly offset relative to the transport direction by the swivel motion of the swing leg) to reset the crawler track suspended from yoke 62 to the angular orientation of the desired paving direction. The onboard computer then signals by how much worm gear drive 60 must rotationally adjust the orientation of yoke 62 and crawler tracks 16 to again align the crawler tracks with the paving direction. This process is repeated each time the angular position of the swing leg is changed, or when for other reasons the angular orientation of the crawler tracks becomes misaligned from the desired paving direction of the machine.

Guntert, ¶[0052].

106. Thus, Guntert discloses that the processor, the power drive, and the first transducer, and the second transducer from each swing leg assembly form a feedback loop for maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame.

**10. Claim 11**

107. Claims 15-19 depend from claim 11. Therefore, below, I first demonstrate how Guntert alone discloses all the elements of claim 11.

- a. **[11a]: “A paving machine configured to move in a paving direction for spreading, leveling and finishing concrete into a form having a generally upwardly exposed, finished concrete surface and terminating in lateral concrete sides, the paving machine comprising:”**

108. Limitation [11a] is identical to limitation [1a].

Claim Limitation [11a]	Claim Limitation [1a]
A paving machine configured to move in a paving direction for spreading, leveling and finishing concrete into a form having a generally upwardly exposed, finished concrete surface and terminating in lateral concrete sides, the paving machine comprising:	A paving machine configured to move in a paving direction for spreading, leveling and finishing concrete into a form having a generally upwardly exposed, finished concrete surface and terminating in lateral concrete sides, the paving machine comprising:

109. Thus, Guntert discloses limitation [11a] for the same reasons stated regarding limitation [1a]. *See* Section IX.A.4.a

- b. **[11b]: “a module frame;”**

110. Limitation [11b] is identical to limitation [1b].

Claim Limitation [11b]	Claim Limitation [1b]
a module frame;	a module frame;

111. Thus, Guntert discloses limitation [11b] for the reasons stated regarding limitation [1b]. *See* Section IX.A.4.b.

- c. **[11c]: “two or more swing leg assemblies having a pivotal connection to the module frame to allow for pivotal movements of the swing leg assemblies relative to the module frame, each swing leg assembly comprising:”**

112. Limitation [11c] includes recitations similar to those of limitation [1c]. This is shown in the bolded portions of the table below.

Claim Limitation [11c]	Claim Limitation [1c]
<b>two or more swing leg assemblies</b> having a pivotal connection to the module frame to allow for pivotal movements of the swing leg assemblies relative to the module frame, each swing leg assembly comprising:	<b>two or more swing leg assemblies</b> mechanically coupled to the module frame, each swing leg assembly comprising:

113. Guntert discloses limitation [11c] for the same reasons stated regarding limitation [1c]. *See* Section IX.A.4.c. Additionally, Guntert discloses that the “swing leg is typically formed as a box beam 22 and has another end 21 (shown in FIG. 7) that is pivotal about a vertically oriented pivot shaft 24 which extends through a bearing bushing 26 that is supported in its vertical orientation on a hinge bracket 28 with spaced-apart support webs 30.” Guntert, ¶[0030]; *see also* Figs. 1, 2, 7. Guntert discloses that the hinge bracket is secured to respective end surfaces 34 of side bolsters 12. Guntert, ¶[0037]. Guntert also discloses that the

male support beams 10 extend from frame 4 and that side bolsters 12 are secured to the support beams. Guntert, ¶[0033]. Thus, a POSITA would recognize that Guntert's swing leg assemblies have a pivotal connection to the frame to allow for pivotal movements of the swing leg assemblies relative to the module frame.

**d. [11d]: “a swing leg;”**

114. Limitation [11d] is identical to limitation [1d].

Claim Limitation [11d]	Claim Limitation [1d]
a swing leg;	a swing leg;

115. Thus, Guntert discloses limitation [11d] for the reasons stated regarding limitation [1d]. *See* Section IX.A.4.d.

**e. [11e]: “a crawler track;”**

116. Limitation [11e] is identical to limitation [1e].

Claim Limitation [11e]	Claim Limitation [1e]
a crawler track;	a crawler track;

117. Thus, Guntert discloses limitation [11e] for the reasons stated regarding limitation [1e]. *See* Section IX.A.4.d.

**f. [11f]: “an upright jacking column secured to the swing leg, having a rotary connection between the jacking column and the crawler track permitting relative rotational movements of the crawler track**

**with regard to the jacking column about a first upright axis;”**

118. Limitation [11f] is identical to limitation [1f].

Claim Limitation [11f]	Claim Limitation [1f]
an upright jacking column secured to the swing leg, having a rotary connection between the jacking column and the crawler track permitting relative rotational movements of the crawler track with regard to the jacking column about a first upright axis	an upright jacking column secured to the swing leg, having a rotary connection between the jacking column and the crawler track permitting relative rotational movements of the crawler track with regard to the jacking column about a first upright axis; and

119. Thus, Guntert disclose limitation [11f] for the reasons stated regarding limitation [1f]. *See* Section IX.A.4.d.

**g. [11g]: “a first angular position transducer configured to emit a first signal which is indicative of an angular orientation of the crawler track relative to the jacking column;”**

120. Limitation [11g] is identical to limitation [1g].

Claim Limitation [11g]	Claim Limitation [1g]
a first angular position transducer configured to emit a first signal which is indicative of an angular orientation of the crawler track relative to the jacking column;	a first angular position transducer configured to emit a first signal which is indicative of an angular orientation of the crawler track relative to the jacking column;

121. Thus, Gunter discloses limitation [11g] for the reasons stated regarding limitation [1g]. *See* Section IX.A.4.d.

- h. [11h]: “a second angular position transducer configured to emit a second signal which is indicative of an angular orientation of the swing leg relative to the module frame;”**

122. Limitation [11h] is identical to limitation [1h].

Claim Limitation [11h]	Claim Limitation [1h]
a second angular position transducer configured to emit a second signal which is indicative of an angular orientation of the swing leg relative to the module frame;	a second angular position transducer configured to emit a second signal which is indicative of an angular orientation of the swing leg relative to the module frame;

123. Thus, Guntert discloses limitation [11h] for the reasons stated regarding limitation [1h]. *See* Section IX.A.4.d.

- i. [11i]: “a power drive unit arranged to translate relative rotational movements between the jacking column and the crawler track;”**

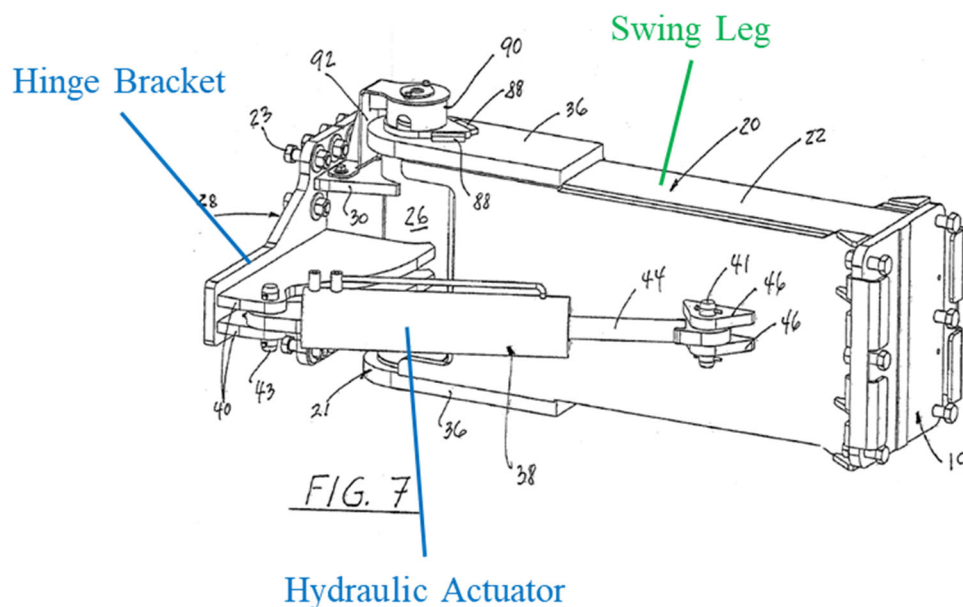
124. Limitation [11i] is substantially identical to limitation [1i].

Claim Limitation [11i]	Claim Limitation [1i]
a power drive unit arranged to translate relative rotational movements between the jacking column and the crawler track	a power drive unit arranged to translate relative rotational movements between the jacking column and the crawler track; and

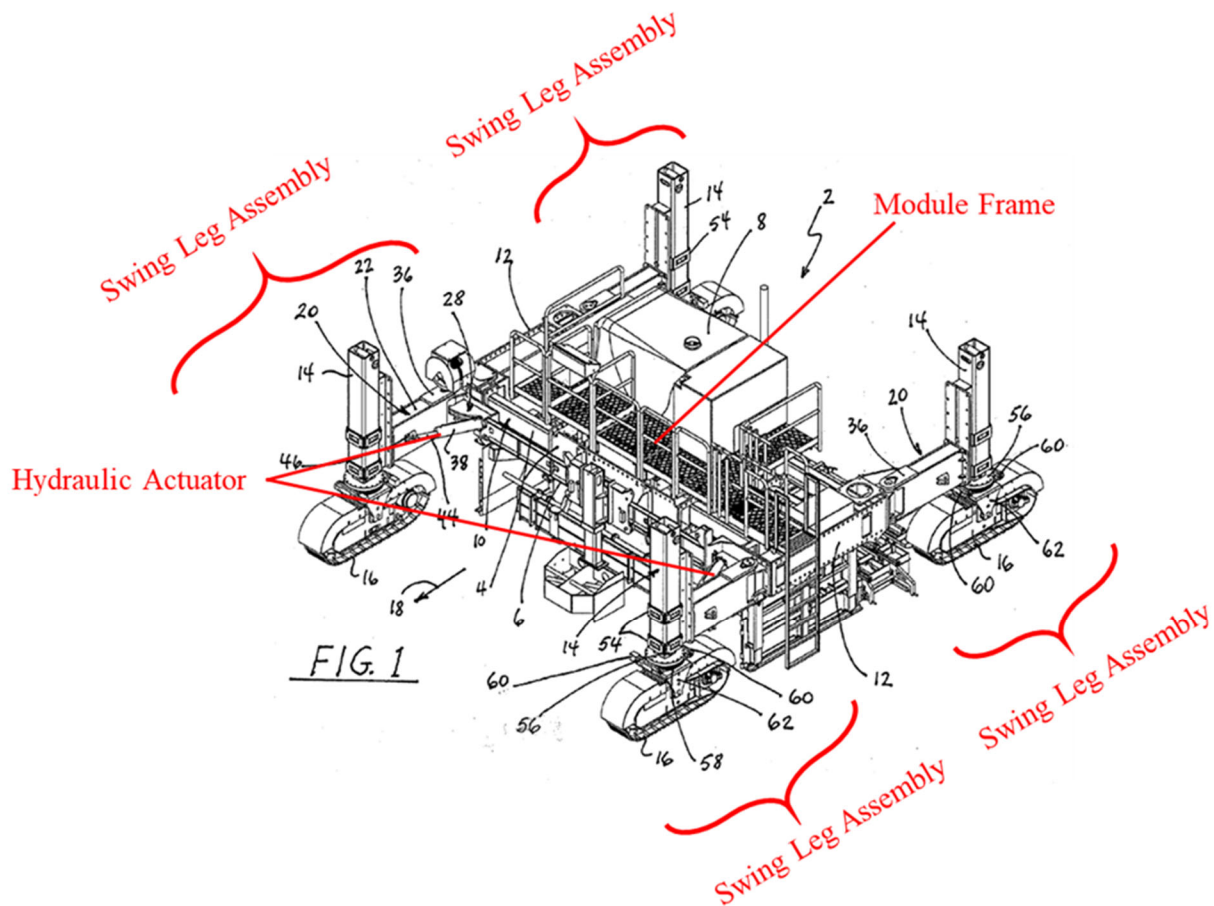
125. Thus, Guntert teaches limitation [11i] for the reasons stated regarding limitation [1i]. *See* Section IX.A.4.d.

- j. [11j] “a hydraulic actuator for each swing leg assembly, mounted between the module frame and each swing leg assembly; and”

126. Guntert discloses that a hydraulic actuator 38 is “pivotally pinned” to the hinge bracket and “can be energized to pivot bolster swing leg 20 in a horizontal plane.” Guntert, ¶[0040]. Guntert discloses that the hinge bracket is secured to respective end surfaces 34 of side bolsters 12. Guntert, ¶[0037]. Guntert also discloses that the male support beams 10 extend from frame 4 and that side bolsters 12 are secured to the support beams. Guntert, ¶[0033]. Thus, because the hinge bracket is itself attached to the frame, the hydraulic actuator is mounted between the module frame and each swing leg assembly. This arrangement is shown below.



Guntert, Fig. 7 (annotated). The positioning of Guntert's hydraulic actuator between the module frame and each swing assembly is also shown in Fig. 1, below.



*Id.*, Fig. 1 (annotated)

- k. [11k]: “a processor operable to receive the first and second signals from each swing leg assembly and configured to generate and emit a control signal for instructing the hydraulic actuator to actuate, thereby**

**pivotally moving each swing leg assembly in relation to the module frame.”**

127. Guntert discloses this element. Guntert discloses that “[t]he output signal of the position transducer 78 is fed via lead 80 to an onboard computer 82 of the paving machine, or another suitable processor, which receives as its second input the output signal of position transducer 70 between jacking column 14 and crawler tracks 16 via a lead 84.” *Id.*, ¶[0051]. Thus, Guntert discloses that its onboard computer receives both the first signal (from transducer 70) and second signal (from transducer 78). Guntert discloses that its onboard computer includes a processor 82. Guntert, ¶[0052]. Guntert also discloses that “the onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. Guntert explains that if the swing leg migrates away from a preset angle, then the swing leg hydraulic cylinder is actuated to maintain the preset angle. *Id.* Thus, Guntert discloses a processor operable to receive the first and second signals from each swing leg assembly and configured to generate and emit a control signal for instructing the hydraulic actuator to actuate, thereby pivotally moving each swing leg assembly in relation to the module frame.

**11. Claim 14**

128. As discussed in Section IX.A.10, Guntert discloses all elements of claim 11 also included in claim 14. Claims 15-19 depend from claim 14, therefore

claim 14 is presented below to establish unpatentability of claims 15-19. Guntert also discloses the additional elements of claim 14.

**a. [14a]: “wherein the second signal is a relative angle between the swing leg and the module frame of the respective swing leg assembly, and”**

129. As discussed in Section IX.A.4.f, Guntert discloses a second angular position transducer 78. Further, Guntert discloses a second angular position transducer “emitting a second signal which is indicative of the angular orientation of the swing leg relative to the associated hinge bracket.” Guntert, Claim 2, ¶¶[0048]-[0050]. As also discussed in Sections IX.A.4.d and IX.A.10.j, Guntert’s hinge bracket is mounted to the module frame. By emitting a signal indicative of a relative angle between the swing leg and the hinge bracket, therefore, Guntert’s second angular position transducer emits a signal indicative of a relative angle between the swing leg and the module frame.

**b. [14b]: “wherein the processor has a stored value for a preset angle of each respective swing leg assembly relative to a lateral side of the module frame”**

130. Guntert discloses that its swing legs can have a preset angle. For example, Guntert discloses that “the onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. A POSITA would understand that for the computer to maintain a fixed, preset angle, the angle must be a stored value to allow the feedback loop to determine whether there is a difference

between the sensor's current value of the swing leg and the "fixed, preset angle."

*See* Section VII.C.

131. Additionally, Guntert discloses that trigger pin 94 cooperates with angular position transducer 78 and "generate[s] an angular position signal which reflects the angular inclination between the pivot shaft and the hinge bracket, and therewith also relative to bolster 12 and tractor frame 4." Guntert, ¶[0050]. As discussed in Sections IX.A.4.d and IX.A.10.j, Guntert's hinge bracket is mounted to the module frame. Thus, by emitting a signal indicative of a relative angle between the swing leg and the hinge bracket, Guntert's transducer emits a signal indicative of a relative angle between the swing leg and the respective lateral side of the module frame. *See* Guntert ¶[0050]. Because the fixed, preset angle relates to the angle of the swing leg and is compared with the angle of the swing leg indicated by the signal from transducer 78 as discussed in Section VII.C, a POSITA would understand that the preset angle represents an angle relative to a lateral side of the module frame.

**c. [14c]: "the control signal generation comprising receiving the second signal from each swing leg assembly"**

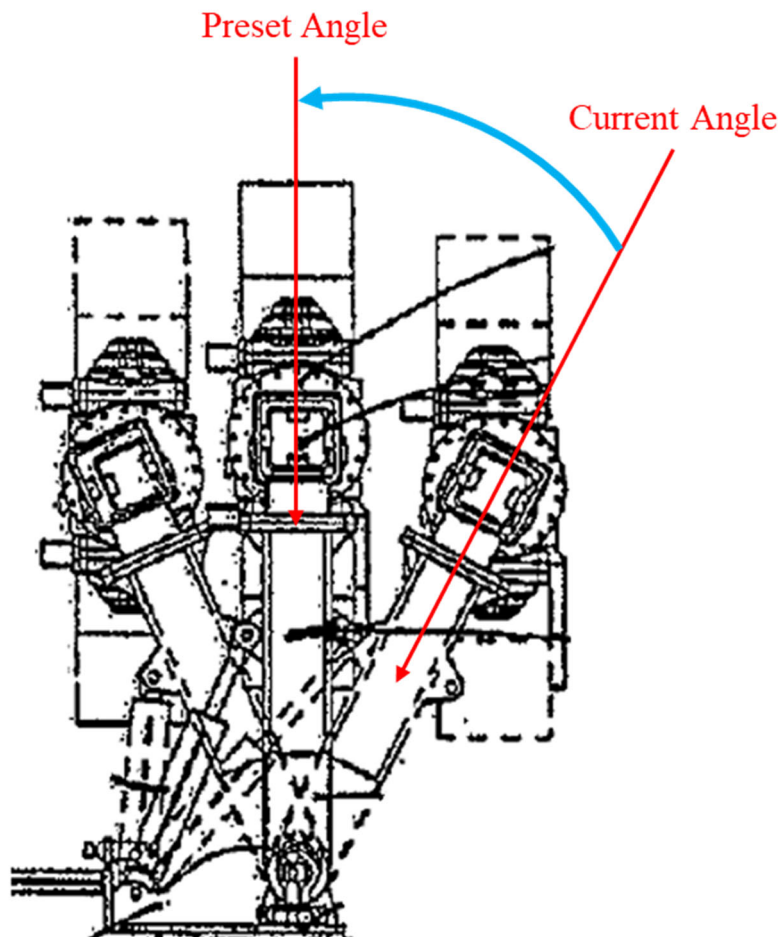
132. This element is similar to the recitations in claim limitations [11k] and [1j], requiring the processor to receive the second signals from each swing leg

assembly. For the same reasons discussed with respect to limitations [11k] and [1j], Guntert discloses this limitation. *See* Sections IX.A.4.g and IX.A.10.k,

d. **[14d]: “calculating the difference between the second signal and the preset angle for each respective swing leg assembly; and”**

**[14e]: “calculating the actuation of a hydraulic actuator to move the respective swing leg so the second signal and the preset angle of each respective swing leg are in alignment.”**

133. Guntert discloses this limitation. In particular, Guntert discloses that the “onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. It continues, noting that “[i]f the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle.” *Id.* As discussed previously, Guntert describes the second transducer (the second signal) as emitting a signal indicative of the current angle of the swing leg. Given this teaching, a POSITA would understand that the second signal is part of a feedback loop that is used to maintain the swing leg at a fixed preset angle. This can be illustrated using Guntert’s Figure 2 as an example. As shown below in that figure, there are three example swing leg positions, each of which has a different angle relative to the frame. In the case where the center swing leg is the “preset angle,” the mode of operation described in Guntert would attempt to move the swing leg to the “preset angle.”



Guntert, Fig. 2 (annotated).

134. A POSITA would understand that the control system would accomplish this by using the swing leg's preset angle and the current angle (which is emitted from the first angular position transducer). In particular, the system would calculate the difference between the current angle from the sensor and the "preset angle." ("calculating the difference between the second signal and the preset angle for each respective swing leg assembly"). If the system identifies a difference between those two values, then the feedback loop will calculate the

actuation to drive the swing leg toward the preset angle. *See* Guntert, ¶[0017] (“[i]f the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle.”) (“calculating the actuation of a hydraulic actuator to move the respective swing leg so the second signal and the preset angle of each respective swing leg are in alignment”). As discussed in Section VI, this “difference” is often called an error value. As the swing leg is driven toward the preset angle (which is often referred to as a “desired” position), the system will continuously monitor whether there is still a difference or “error” between the current angle and the preset angle. When the “error” is reduced to 0, the system knows it has reached its “desired” position (or preset angle) and it will cease moving the swing leg.

135. Based on these disclosures, a POSITA would understand that Guntert teaches limitations [14d] and [14e]

## **12. Claim 15**

136. Claim 15 depends from claim 14. Guntert and Dorsett disclose the additional elements of claim 15.

- a. [15a]: “The paving machine of claim 14, wherein the first signal is a relative angle between the crawler**

**track and the jacking column of the respective swing leg assembly, and”**

137. As discussed in Section IX.A.4.e, Guntert discloses a first angular position transducer 70. Further, Guntert discloses emitting a first position signal which is indicative of an angular orientation of the crawler track relative to the first associated jacking column. Guntert, Claim 2, ¶¶[0046]-[0047]. This limitation is additionally met for the same reasons discussed with respect to limitation [1g].

**b. [15b]: “wherein the processor has a stored first signal and a stored second signal for each respective swing leg assembly, the control signal generation further comprising”**

138. Limitation [15b] contains limitations that are substantively identical to those in limitation [4a] (shown in bold).

Claim Limitation [15b]	Claim Limitation [4a]
<b>wherein the processor has a stored first signal and a stored second signal for each respective swing leg assembly, the control signal generation</b> further comprising	The paving machine of claim 3, <b>wherein the processor</b> configured to receive the first and second signals and to generate and emit the control signal for each swing leg assembly is further configured to <b>have a stored first signal and a stored second signal for each respective swing leg assembly</b> , further wherein <b>the control signal is generated by</b>

139. Thus, for the same reasons discussed with respect to limitation [4a], Guntert in view of Dorsett renders limitation [15b] obvious.

**c. [15c]: “receiving the first signal and second signal from each swing leg assembly;”**

140. Limitation [15c] contains limitations that are substantively identical to those in limitation [1j] (shown in bold).

Claim Limitation [15c]	Claim Limitation [1j]
<b>receiving the first signal and second signal from each swing leg assembly</b>	a processor operable to <b>receiving the first signal and second signal from each swing leg assembly</b> and configured to generate and emit a control signal for instructing the power drive of each swing leg assembly, and thereby rotationally move each respective crawler track relative to its respective jacking column

141. Thus, for the same reasons discussed with respect to limitation [1j],  
Guntert in view of Dorsett renders limitation [15c] obvious.

**d. [15d]: “storing the first signal and second signal from each swing leg assembly as the respective stored first signal and the respective stored second signal for each respective swing leg assembly.”**

142. Limitation [15d] contains limitations that are substantively identical to those in limitation [4f] (shown in bold).

Claim Limitation [15d]	Claim Limitation [4f]
<b>storing the first signal and second signal from each swing leg assembly as the respective stored first signal and the respective stored second signal for each respective swing leg assembly</b>	<b>storing the first signal and second signal from each swing leg assembly</b> and thereby updating <b>the respective stored first signal and the respective stored second signal for each respective swing leg assembly</b>

143. Thus, for the same reasons discussed with respect to limitation [4f],  
Guntert in view of Dorsett renders limitation [15d] obvious.

- e. **[15e]: “calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively, for each respective swing leg assembly;”**

144. Limitation [15e] is identical to limitation [4b].

Claim Limitation [15e]	Claim Limitation [4b]
calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively, for each respective swing leg assembly	calculating the difference between the first signal and second signal, and the stored first signal and stored second signals respectively, for each respective swing leg assembly

145. Thus, for the same reasons discussed with respect to limitation [4b],  
Guntert in view of Dorsett renders limitation [15e] obvious.

- f. **[15f]: “calculating the angle to reset each crawler track to its respective jacking column along a desired orientation for each respective swing leg assembly;”**

146. Limitation [15f] is identical to limitation [4c].

Claim Limitation [15f]	Claim Limitation [4c]
calculating the angle to reset each crawler track to its respective jacking column along a desired orientation for each respective swing leg assembly	calculating the angle to reset each crawler track to its respective jacking column along a desired orientation for each respective swing leg assembly

147. Thus, for the same reasons discussed with respect to limitation [4c],  
Guntert in view of Dorsett renders limitation [15f] obvious.

- g. **[15g]: “determining the respective power drive that operates each respective crawler track in each respective swing leg assembly; and”**

148. Limitation [15g] is identical to limitation [4d], with the exception that limitation [15g] recites a “power drive” and limitation [4d] recites a “worm drive.”

Claim Limitation [15g]	Claim Limitation [4d]
<b>determining the respective power drive that operates each respective crawler track in each respective swing leg assembly</b>	<b>determining the respective worm drive that operates each respective crawler track in each respective swing leg assembly</b>

149. A “worm drive” is a “power drive,” therefore for the same reasons discussed with respect to limitation [4d], Guntert in view of Dorsett renders limitation [15g] obvious.

- h. **[15h]: “calculating the rotation of each power drive to align the respective crawler track along the desired orientation in each respective swing leg assembly.”**

150. Limitation [15h] is identical to limitation [4e], with the exception that limitation [15h] recites a “power drive” and limitation [4e] recites a “worm drive.”

Claim Limitation [15h]	Claim Limitation [4e]
<b>calculating the rotation of each power drive to align the respective crawler track along the desired orientation in each respective swing leg assembly</b>	<b>calculating the rotation of each worm drive to align the respective crawler track along the desired orientation in each respective swing leg assembly; and</b>

151. A “worm drive” is a “power drive,” therefore for the same reasons discussed with respect to limitation [4e], Guntert in view of Dorsett renders limitation [15h] obvious.

**13. Claim 16: “The paving machine of claim 15, wherein the desired orientation is alignment of the crawler tracks along a paving direction.”**

152. The limitations of claim 16 are identical to the limitation of claim 5.

Claim Limitation 16	Claim Limitation 5
The paving machine of claim 15, wherein the desired orientation is alignment of the crawler tracks along a paving direction	The paving machine of claim 4, wherein the desired orientation is alignment of the crawler tracks along a paving direction.

153. Thus, for the same reasons discussed with respect to claim 5, Guntert in view of Dorsett renders claim 16 obvious.

**14. Claim 17: “The paving machine of claim 15, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly.”**

154. The limitations of claim 17 are identical to the limitation of claim 6.

Claim Limitation 17	Claim Limitation 6
The paving machine of claim 15, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly	The paving machine of claim 4, wherein the desired orientation is alignment of the crawler track of one of the swing leg assemblies to the crawler track orientation of each other swing leg assembly

155. Thus, for the same reasons discussed with respect to claim 6, Guntert in view of Dorsett renders claim 17 obvious.

**15. Claim 18: “The paving machine of claim 15, wherein the second transducers and the hydraulic actuators form a feedback loop for maintaining an orientation of the swing leg assembly independently of angular inclinations of the swing leg relative to the module frame.”**

156. Guntert discloses the limitations of claim 18. For example, Guntert discloses that “processor 82 and the associated transducers 70, 78 form a feedback loop in which the computer receives the angular position signal from swing leg transducer 78.” Guntert, ¶[0052]. As explained in Section IX.A.4.f, transducer 78 constitutes the second angular position transducer. Thus, Guntert discloses that its feedback loop includes the second transducers. Guntert also discloses that a “closed loop feedback system that connects the hydraulic actuator for the swing leg, the rotary power drive for the crawler, and the onboard computer always maintains the swing leg angle at a fixed, preset angle.” Guntert, ¶[0017]. Guntert explains that “[i]f the swing leg migrates away from a preset angle, the swing leg hydraulic cylinder is actuated to maintain the preset angle.” *Id.* Thus, Guntert discloses that the second transducers and the hydraulic actuators form a feedback loop for maintaining an orientation of the swing leg assembly independently of angular inclinations of the swing leg relative to the module frame.

16. **Claim 19: “The paving machine of claim 18, wherein the feedback loop further includes the first transducers and the power drive for further maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame.”**

157. Claim 19 contains limitations that are substantively identical to those in claim 7 (shown in bold).

Claim 19	Claim 7
The paving machine of claim 18, wherein the <b>feedback loop further includes the first transducers and the power drive for further maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame</b>	The paving machine of claim 4, wherein the processor, <b>the power drive</b> , and the <b>first transducer</b> , and the second transducer from each swing leg assembly <b>form a feedback loop for maintaining an orientation of the crawler track independently of angular inclinations of the crawler track relative to the module frame</b>

158. Thus, for the same reasons discussed with respect to claim 7, Guntert in view of Dorsett renders claim 19 obvious.

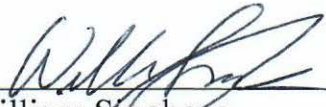
\* \* \*

159. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

160. I declare that all statements made herein of my 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 knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

161. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Date: November 24, 2020

By:   
William Singhose

## APPENDIX A: LIST OF MATERIALS CONSIDERED

Description
U.S. Patent No. 9,708,101
Prosecution History for U.S. Patent No. 9,708,101 (downloaded from PAIR)
John J. Craig, Introduction to Robotics Mechanics and Control (Pearson Education Inc.) (2005) (“Craig”)
U.S. Patent No. 7,797,860 to Schoenmaker (“Schoenmaker”)
U.S. Patent Application Publication No. 2011/0236129 to Guntert et al. (“Guntert”)
U.S. Patent No. 9,873,318 to Dorsett (“Dorsett”)
A History of Control Engineering 1930-1955
Modern Control Engineering, Ogata, 2002
U.S. Patent No. 8,123,053 to Elder et al. (“Elder”)
Dudley's Gear Handbook (1992)
Handbook of Practical Gear Design (1984)
U.S. Patent No. 9,708,020
U.S. Patent No. 10,029,749
U.S. Patent No. 9,908,571
U.S. Patent No. 10,053,167
Declaration of Kenneth Bryden, Ph.D., Guntert & Zimmerman Const. Div., Inc. v. GOMACO Corp., Case No. 5:20-cv-4007-CJW-KEM (N.D. Iowa) (July 7, 2101)
Corrected Declaration of Kenneth Bryden in Support of Plaintiff's Motion for Preliminary Injunction, Guntert & Zimmerman Const. Div., Inc. v. GOMACO Corp., Case No. 5:20-cv-4007-CJW-KEM (N.D. Iowa) (Aug. 5, 2101)
G&Z Infringement Contentions, Guntert & Zimmerman Const. Div., Inc. v. GOMACO Corp., Case No. 5:20-cv-4007-CJW-KEM (N.D. Iowa) (June 19, 2101)
Joint Claim Construction Statement, Guntert & Zimmerman Const. Div., Inc. v. GOMACO Corp., Case No. 5:20-cv-4007-CJW-KEM (N.D. Iowa) (Oct. 2, 2020)