

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Kubota North America Corporation,
Petitioner

IPR2025-00171
U.S. Patent No. 10,202,266

**DECLARATION OF STEVEN ALAN VELINSKY, PHD, PE
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW**

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I, Steven Velinsky, do hereby declare as follows:

I. INTRODUCTION

1. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been asked by Kubota North America Corporation (“Kubota”) to provide my expert opinion connection with the *Inter Partes* Review of U.S. Patent No. **10,202,266** (“’266 Patent”) concerning whether the ’266 Patent is unpatentable over certain prior art. This declaration is a statement of my opinions on issues relating to the patentability of Claims 1-16 and 19-28, which are all claims of the ’266 Patent (“the Challenged Claims”). As I explain more fully below, it is my opinion that all the Challenged Claims would have been obvious to a person of ordinary skill in the art (“POSITA”) at the time of the alleged invention.

3. I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony. I have no other financial interest in this proceeding.

4. I have reviewed and considered the following documents in connection with my analysis of the ’266 Patent:

- a) U.S. Patent No. **10,202,266** (the '266 Patent) (EX1001);
- b) relevant portions of the prosecution history of the '266 Patent (“’266 File History”), EX1002, EX1029
- c) KR 10-1041996 (“KR996”) listing inventor Jo Bunggu (EX1005) stemming from Korean Application 10-2009-0033050, which was published as 10-1041996 on June 16, 2011;
- d) U.S. Patent No. 6,832,659 (“Bares”) (EX1010), filed October 30, 2002 and issued December 21, 2004.
- e) U.S. Patent No. 3,586,195 (“Beltrami”) listing inventor Osmano Beltrami (EX1008); filed December 23, 1968; issued June 22, 1971.

5. In forming the opinions expressed below, I have considered:

- a) the documents listed above;
- b) the relevant legal standards, including the standard for obviousness, and any additional authoritative documents as cited in the body of this declaration; and
- c) my own knowledge and experience based upon my work in the field of mechanical engineering and earth-moving equipment as described below, as well as the following materials including:

EX1006	JP 2004 017705 (“JP705”)
EX1009	U.S. Patent No. 6,695,568 (“Bares ’568”)
EX1011	JPH 11140900 to Komatsu (“Komatsu”)
EX1012	U.S. Patent No. 6,474,933 (“Hoechst”)
EX1013	U.S. Patent Application Publication No. 2008/0197588 to Azure (“Azure”)
EX1014	Korean Patent No. 10-1023528 including original Korean language document, certified translation, and certification
EX1015	SAE International J2752 JUN2010 (“SAE J2752”), Surface Vehicle Recommended Practice, Personal Protection – Compact Tool Carriers
EX1016	International Organization for Standardization (ISO) 6165 (2012)
EX1017	International Organization for Standardization (ISO) 3457 (2003)
EX1021	U.S. Patent Application Publication No. 2007/0128012 A1 (“Yamada”)
EX1022	U.S. Patent No. 8,545,163 (“Yasuda”)
EX1023	N. Sclater, et al., Mechanisms and Mechanical Devices Sourcebook, Fourth Edition, Table of Contents, Chapter 1, Chapter 5
EX1024	N. Nariman-Zadeh, et al., “Pareto optimal synthesis of four-bar mechanisms for path generation,” 26 March 2008
EX1025	Four-Bar Coupler-Point Curves, Chapter 6
EX1026	H Nolle, Linkage Coupler Curve Synthesis: A Historical Review – II. Developments after 1875*, 7 July 1973
EX1027	Wen-Tzong Lee, et al., “Developments in quantitative dimensional synthesis (1970-present): four-bar path and function generation” 2017

EX1028	Theory of Machines and Mechanisms, Shigley, J.E. and Uicker, J.J. Jr., McGraw Hill, 1980, Table of Contents, Chapter 1
EX1032	U.S. Patent Publication Appl. 2010/0168933 (“Rorabaugh”)
EX1033	U.S. Patent Publication Appl. 2009/0116943 (“Valere”)
EX1035	U.S. Patent No. 3,828,873 (“Oestmann”)

6. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. My Curriculum Vitae (CV) is attached as EX1036. This exhibit also includes a list of my publications.

8. I earned a Ph.D. in Theoretical & Applied Mechanics from the University of Illinois at Urbana-Champaign in 1981. I earned a Bachelor of Science degree in Mechanical Engineering, State University of New York at Buffalo in 1977, and a Master of Science degree, also in Mechanical Engineering from University of Illinois at Urbana-Champaign, in 1979. After finishing my Ph.D. degree, I worked as an engineer for approximately two years in a government laboratory and in industry. I am also a Registered Professional Engineer, State of California.

9. Since 1989, I have been Faculty Member (Associate Professor, Professor, Distinguished Professor, Distinguished Professor Emeritus) in the

Department of Mechanical & Aerospace Engineering, University of California, Davis. Prior to UC Davis, I was a Faculty Member in the Department of Mechanical Engineering at the University of Wisconsin-Madison.

10. I was the Director of the Advanced Highway Maintenance & Construction Technology Research Center of Department of Mechanical & Aerospace Engineering, at University of California, Davis from September 1991 to September 2016. In this research center, we applied advanced automation and mechatronics technologies to the design and development of automated highway maintenance and construction machines. These machines have been developed to address a wide variety of highway tasks including, for example, the dispensing and retrieval of highway cones, sealing of pavement cracks, collection of roadway debris, landscape maintenance, graffiti removal and plowing of snow, and involve the use of mechanisms to allow the tasks to be performed. Our typical projects involved detailed design, fabrication of the prototype equipment and qualification testing of the machines in actual highway operations.

11. I have received numerous awards and honors for my work in mechanical engineering. My recognition for the design of specific machines includes: the 1996 American Society of Mechanical Engineers' Leonardo DaVinci award, the 2001 California Transportation Foundation's Tranny Award, the 2001 California State Department of Transportation's Excellence in Transportation

Award, and the 2002 California Transportation Foundation's Tranny Award.

Additional awards, honors and professional activities include: Fellow of the American Society of Mechanical Engineers (ASME), 2007 American Society of Mechanical Engineers' Machine Design Award for lifetime contributions to the mechanical design field, 2005 American Society of Mechanical Engineers' Robert E. Abbott Award for contributions to design engineering, Technical Editor of the international journal Mechanics Based Design of Structures and Machines, Chair of the Design Engineering Division of the American Society of Mechanical Engineers, and Vice President – Systems and Design of the American Society of Mechanical Engineers. I have also received the Society of Automotive Engineers' Ralph R. Teetor Award.

12. My areas of specialization are in the general area of mechanical systems analysis and design, and I have extensive experience in the design and development of devices and machinery for various applications including but not limited to vehicles, robots, and vehicle-based automated equipment. Moreover, I have been involved in the detailed analysis of many machines, machine elements, and mechanisms including, but not limited to, the ball screw mechanism, roller screw mechanism, and differential and planar mechanisms.

13. I taught courses in mechanical engineering in the general area of mechanical systems analysis and design at both the undergraduate and graduate

levels. For example, I taught a course on design and dynamics of machinery, which primarily involved the design and analysis of mechanisms. At the graduate level, I developed courses in advanced mechanical design and on the design and dynamics of road vehicles, both of which taught methods of mechanism analysis. I also taught the capstone mechanical engineering senior design project course for about 20 years and have thus advised well over 100 senior design projects, virtually all of which have involved the design and analysis of mechanisms.

14. I regularly advised students on research projects in my area of expertise. In this role, I regularly served as an advisor to Ph.D. and master's degree candidates, and postdoctoral researchers. I have also advised student groups involved in the design of vehicles for various Society of Automotive Engineers' competitions.

15. I note that the term "skid steer" means that the equipment or device changes direction by propelling the opposite sides of the machine at different rates, as opposed to actively turning the wheels for example. Another term for "skid steer" is "differential steer." I have expertise on these types of devices as my initial work on differentially steered, wheeled devices started in the early 1990's when we began developing differentially steered wheeled mobile robots for use in highway maintenance tasks.

16. I have also published extensively in the field of mechanical systems

design and analysis including those articles listed in EX1036.

III. LEVEL OF ORDINARY SKILL IN THE ART

17. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

18. I understand that the '266 Patent claims priority to February 20, 2015. My analysis reflects the views of a person of ordinary skill in the art ("POSITA") in the field of the '266 Patent as of February, 2015.

19. Here, a POSITA at the time of the claimed invention in February 2015 would have had a Bachelor of Science degree in Mechanical or Agricultural Engineering and two years of experience in the mechanical design of machines, or have had equivalent knowledge and experience. Lack of professional experience can be remedied by additional education, and vice versa. A person with less formal education but more experience, or more formal education but less experience, could have also met the relevant standard for POSITA. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the

knowledge that existed in the field as of the earliest proper priority date of the '266 Patent (*i.e.*, February 2015). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA prior to the earliest alleged priority date of the '266 Patent.

20. I met the definition of a POSITA in February 2015. I also had a greater knowledge and experience than a POSITA. In my work discussed above, including as a professor, I worked with graduate students and others who had the knowledge and experience of a POSITA in February 2015, and I am able to render opinions from the perspective of a POSITA based on my knowledge and experience.

IV. RELEVANT LEGAL STANDARDS

21. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '266 Patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

22. I understand that prior art to the '266 Patent includes patents and printed publications in the relevant art that predate the proper priority date of the alleged invention recited in the '266 Patent.

23. I have been informed by counsel that a patent claim is unpatentable as anticipated if each element of that claim is present either explicitly or inherently in

a single prior art reference. I have also been informed that, to be an inherent disclosure, the prior art reference must necessarily disclose the limitation, and the fact that the reference might possibly practice or contain a claimed limitation is insufficient to establish that the reference inherently teaches the limitation

24. I have been informed that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention 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 the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

25. I have been informed by counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e)

choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

26. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.

27. I am not aware of any allegations by the named inventor of the '266 Patent or any assignee of the '266 Patent that any secondary considerations are relevant to my obviousness analysis of any Challenged Claim of the '266 Patent. I have briefly reviewed the allegations by the assignee of the '266 Patent of certain

secondary considerations during earlier proceedings of at the U.S. Patent Office and find those allegations were directed to the obviousness of an alleged improvement of placing a four-bar mechanism disclosed on larger equipment *replacing* a two-bar mechanism disclosed on smaller equipment. This is not the framework of my obviousness analysis.

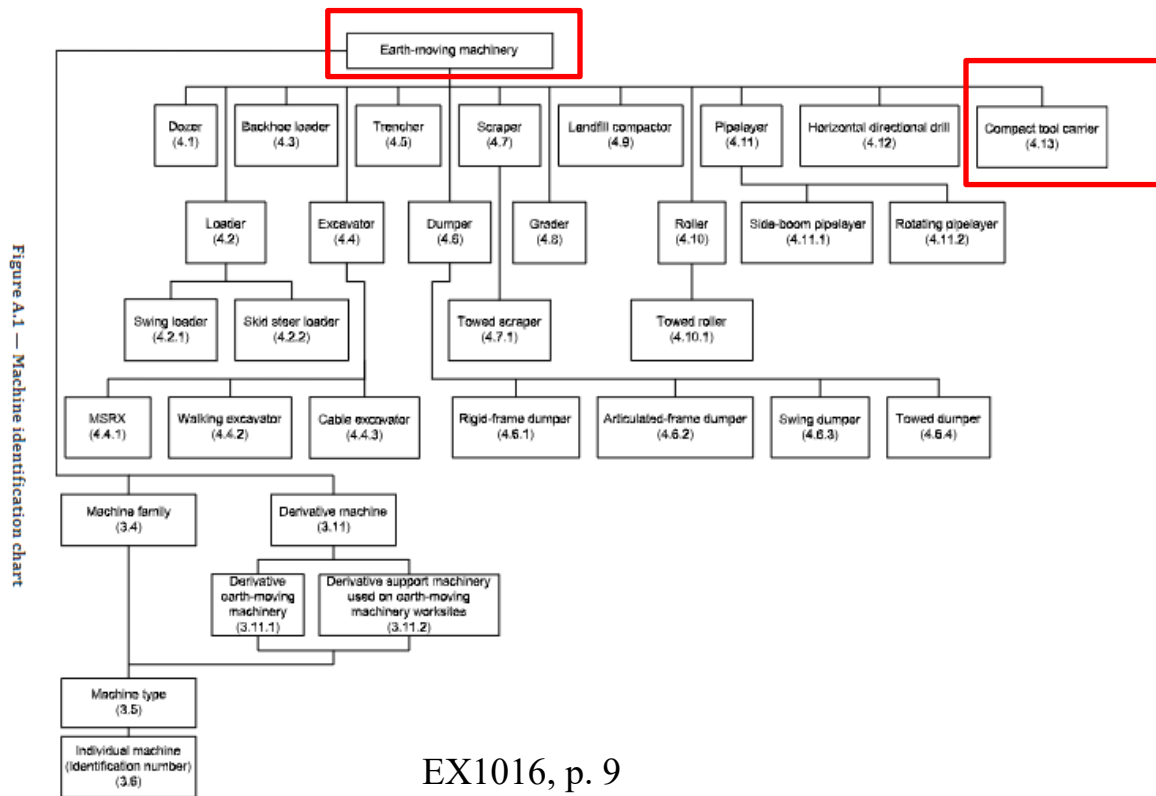
V. BACKGROUND TECHNOLOGY

28. In this section, I provide some background information relating to vehicle design including mechanisms such as different types of linkages. The concepts embodied in claims of the '266 Patent are not new as of the priority date and do not represent the combination of known elements that resulted in an unexpected and unanticipated result.

Machinery Type

29. As explained in the summary of the patent below, the '266 Patent is directed to a “compact tool carrier.” A compact tool carrier, as illustrated in the '266 Patent, may also be referred to as a compact utility loader (CUL) or a mini-skid steer. These machines are smaller (e.g., in comparison with ride-on skid steers) equipment that are suitable for tight spaces and maneuverability. Exemplary uses include construction, landscaping, and the like. International Standard Organization (ISO), a well-known, recognized source for information for a POSITA, put forth ISO 6165 standard, which defines different types of equipment

and is illustrative of compact tool carriers being one of those types:



EX1016, p. 9
(annotated)

30. The standard describes the class of machinery:

4.13

compact tool carrier

self-propelled crawler or wheeled machine having an *operating mass* (3.7) of less than 1 500 kg with a rigid frame, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable *equipment* (3.9) or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted *attachments* (3.10)

EX1016, p. 7. A POSITA would recognize the '266 Patent, like at least KR996

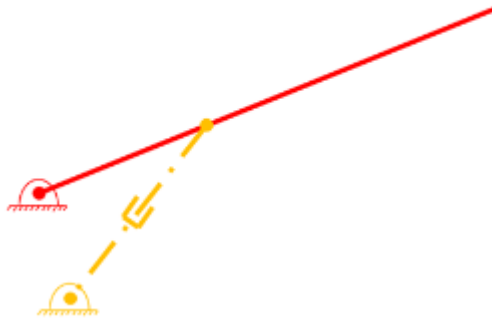
(EX1005), McIlwraith (EX1007), Bares '568 (EX1009), Bares (EX1010), Azure

(EX1013), and KR528 (EX1014) and others, are explicitly discussing this type of

machinery.¹

Loader Mechanism:

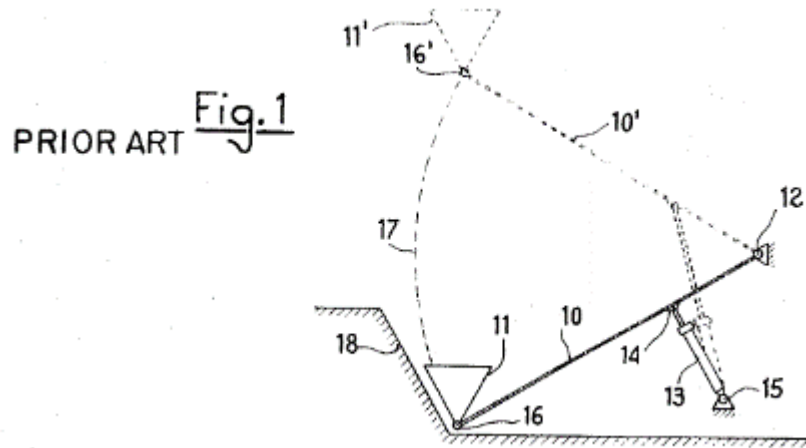
31. A loader or lift arm is attached to the carrier to provide for tools such as a bucket to perform the functionality of the equipment. One of the simplest well-known mechanisms providing motion for the loader arm is illustrated kinematically below. This may also be described as a two-bar or radial lift mechanism.



32. In the context of a loader, the orange illustrates an actuator (also referred to as a cylinder or jack) driving the mechanism and the red illustrates a lift arm. Beltrami at FIG. 1 describes such a system as prior art, which illustrates a jack 13 pivotally connected at 14 to the arm 10 and at 15 to the tracked vehicle

¹ JP705 (EX1006) and Beltrami (EX1008) are not limited to any type of machinery.

body. Beltrami (EX1008), 2:41-48.



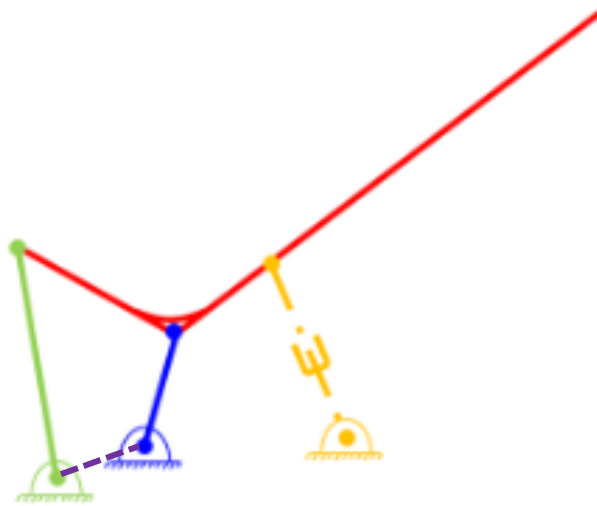
EX1008, FIG. 1

Bares '568 illustrates a similar system in its FIGS. 1, 3 with an assembly that includes an arm 24A attached at a pivot 21 to supports 22 with a cylinder 26 pivotally mounted the frame 12 and pivotally connected at pivot pins 30 to the arm 24. Bares '568 (EX1009), 2:49-2:15.

33. Another type of mechanism is a four-bar linkage, also called a four-bar mechanism or simply four-bar. Four-bars are, while slightly more complex than the two-bar mechanism, a very simple mechanism widely employed across various machines. Due to its wide use, this type of mechanism is introduced early in undergraduate mechanical engineering courses in which detailed methods of design and analysis are taught. *See, e.g., EX1028, Theory of Machines and*

Mechanisms, Shigley, J.E. and Uicker, J.J. Jr., McGraw Hill, 1980; EX1023, Mechanisms and Mechanical Devices. One four-bar mechanism is illustrated schematically below. Such a mechanism is depicted by 3 moving bars or links (also referred to here as linkages), those illustrated in green, red, and blue, and 1 stationary bar, an imaginary link shown in purple connecting the fixed pivot points. Note that the fixed pivot points would have no relative motion with the machine that supports the four-bar. The red link is typically referred to as the coupler. Based on the design of the mechanism (e.g., the lengths of the 4 links), the green and blue links may make a full rotation, referred to as a crank, or move back and forth through an angle in which they are referred to as rockers. Also, the input to the mechanism is typically a motor, which is attached to either the green or blue link, and/or an actuator, illustrated in orange, which can be connected to any of the three moving links. Generally, the actuator may be attached at any location on a link to drive the mechanism. Note that the actuator position is a design choice based on the working load of the mechanism and the force that the selected actuator can generate. The four-bar mechanism has a mobility equal to one, which means that it has one-degree-of-freedom and that only one input parameter (e.g., the position one of the moving links) is needed to place the mechanism in a particular position. Note that the figure below is a kinematic diagram of the mechanism for purposes of design and analysis. The pivot points connecting the adjacent links define the

links' kinematic lengths, but the actual link shapes are determined by the specific application. Thus, as illustrated, in this implementation, the red link, or coupler, is pivoted at the points attached to the green and blue links respectively and is approximately L-shaped as shown.



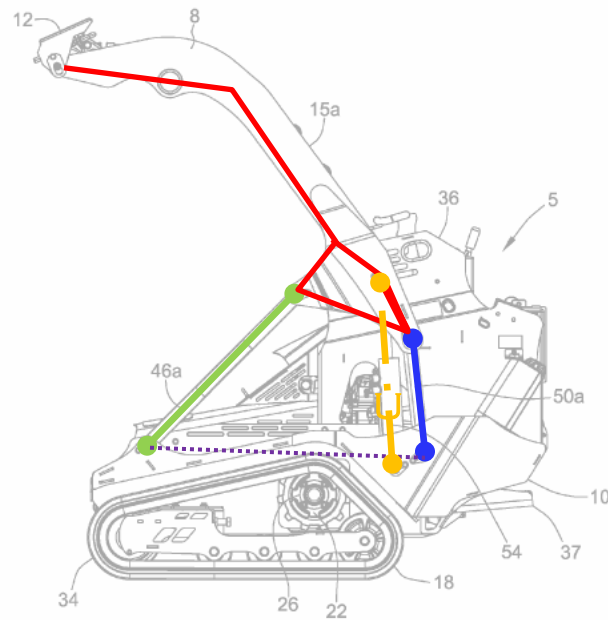
34. The four-bar mechanism is used for 3 different types of design cases: function generation, motion generation and path generation. For function generation, one link (e.g., either the green or blue link illustrated above) is defined as the “crank” and the other link (e.g., the other one of the green or blue link illustrated above) is defined as the “follower.” Function generation involves a prescribed relationship between the crank’s angular displacement and the follower’s angular displacement. Motion generation concerns the prescribed

position and orientation of the coupler. Path generation concerns the prescribed path of a point on the coupler, which is referred to as the coupler point.

35. Four-bar mechanisms are found in a tremendous number of machines – large and small. For a function generation example, the windshield wipers of an automobile are a crank-rocker type of four-bar in which a continuously rotating motor drives the crank and the follower has the wiper attached and rocks back and forth. An automobile's suspension is an example of a motion generation design in which the wheel and tire are prescribed to have a specific position and orientation through their motion relative to the vehicle's frame to maintain a generally vertical orientation and a generally constant track. The four-bar of the loader such as discussed below can be considered a path generation example as the motion is prescribed of a specific coupler point, the pivot point of the tool attachment plate. The four-bar is perhaps the most widely studied mechanism in history. The initial formal design and analysis methods date back to the 1800's and there have been hundreds of publications since the 1970's on four-bar path and function generation. *See, for example, EX1026, Linkage Coupler Curve Synthesis: A Historical Review-II. Developments after 1875, Nolle, H., Mechanism and Machine Theory, Vol. 9 pp. 325-348 (1974); EX1027, Lee, W.-T. and Russell, K., Inverse Problems in Science and Engineering, Developments in quantitative dimensional synthesis (1970–present): four-bar path and function generation, 1280-1304.*

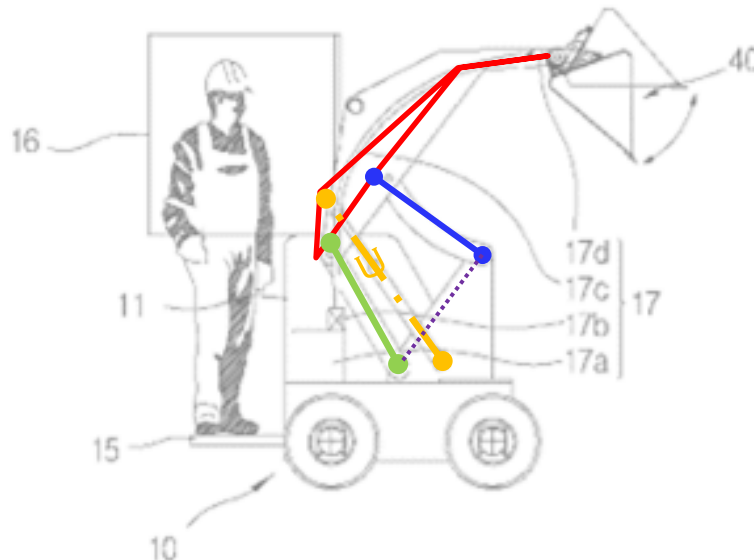
36. When designing a mechanism such as a four-bar mechanism for an application, one may approach the design by providing known link dimensions and calculating the output motion, which is referred to as a kinematic analysis. Or conversely, in a dimensional synthesis, the link dimensions may be calculated to achieve a prescribed output motion. The link dimensions include link lengths, link positions and joint (pivot point) coordinates. *See, e.g.*, EX1024, Pareto optimal synthesis for four-bar mechanisms for path generation, 2008; EX1028, p. 4; EX1023, p. 117.

37. In the context of a loader, a four-bar mechanism is implemented by a cylinder (orange) driving the mechanism, a lift arm (red) provides a coupler, the links (blue and green) (also referred to as linkages) providing the bars (follower/crank), and the frame of the loader providing the stationary fourth bar (purple) extending between the links. The '266 Patent loader arm is an example of a four-bar mechanism. In this design, the actuator is connected to the coupler (lift arm). A kinematic diagram designating the four-bar mechanism is overlaid on '266 Patent's FIG. 3:



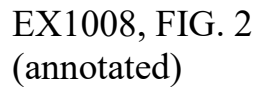
EX1001, FIG. 3
(annotated)

38. Similarly, the loader of KR996 (EX1005) is an example of a four-bar. Again, a kinematic diagram designating the four-bar is overlaid on KR996's Fig.



KR996 (EX1005), FIG. 21
(annotated)

39. Including in the context of its Fig. 2, Beltrami also illustrates a four-bar. In this case, the actuator is not directly connected to the coupler (lift arm), but is connected to one of the other links. Beltrami is an example of a Watt-style four-bar mechanism, which produces approximately straight-line motion. See, e.g., EX1025, p. 150; EX1023, p. 7.

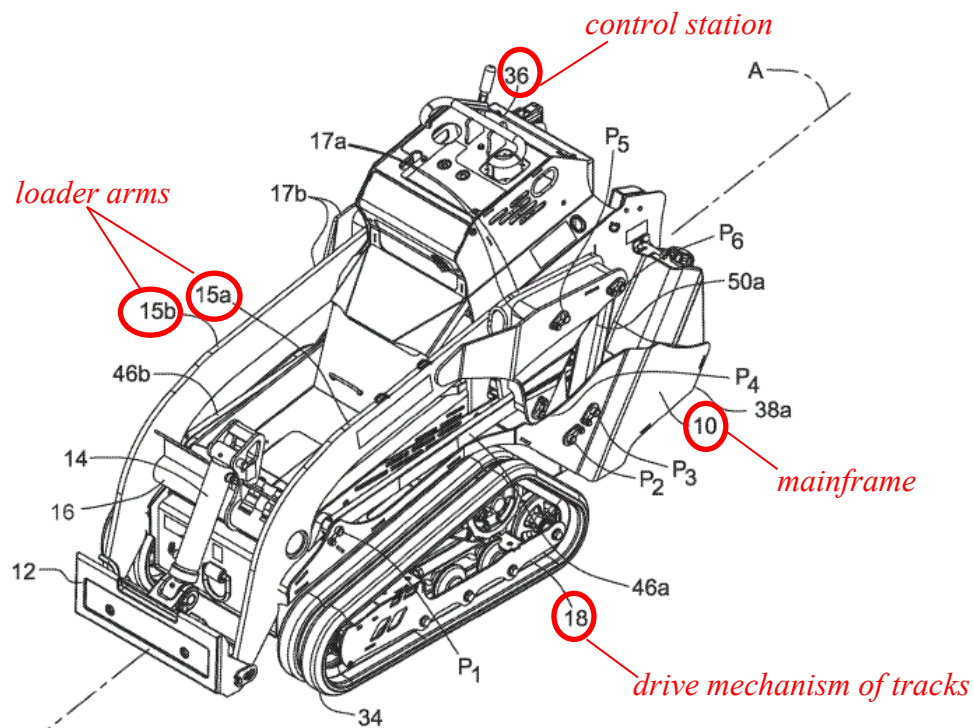


VI. OVERVIEW OF THE '266 PATENT

41. The '266 Patent relates to a compact tool carrier having a loader (with two loader arms) designed for operation by an operator standing at the rear of the carrier. EX1001, 1:21-25. In its background, the '266 Patent asserts such compact

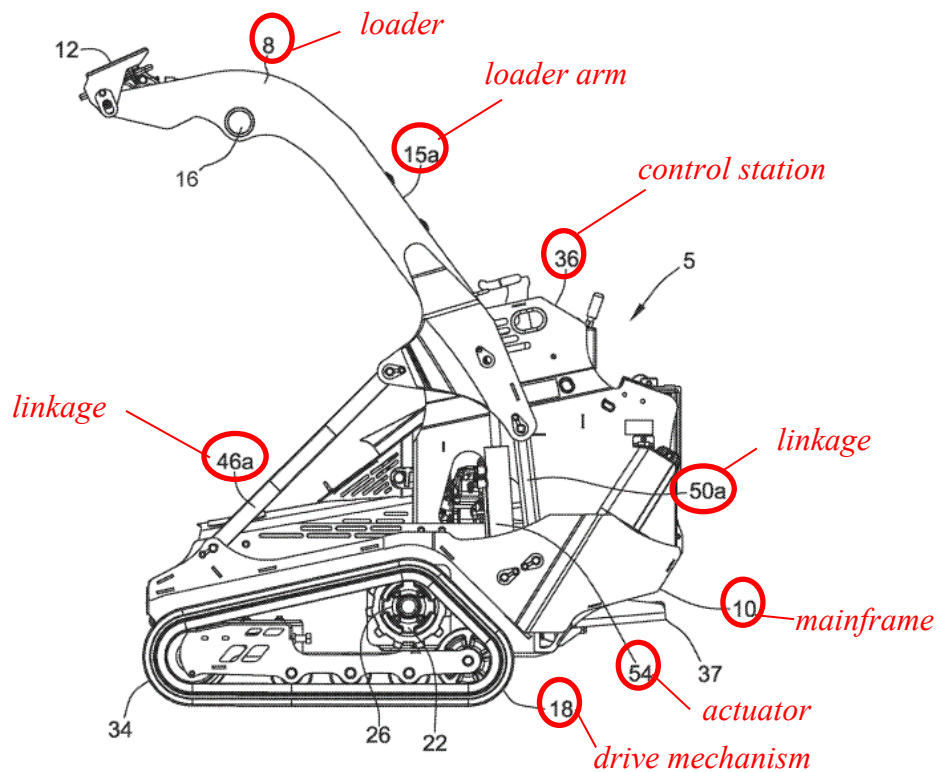
tool carriers “may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position.” ’266 Patent (EX1001), 1:36-40. A tool such as a bucket or auger may be provided as a front-mounted attachment. ’266 Patent (EX1001), 1:33-35.

42. FIGS. 1 and 3 are illustrative of a compact tool carrier 5 including a loader 8 having loader arms 15a, 15b and mainframe 10. ’266 Patent (EX1001), 2:46-56. A drive mechanism 18 may include tracks 34 (as shown) or wheels and control station 36 provides operator controls for propelling and raising/lowering the loader 8. ’266 Patent (EX1001), 3:21-4:11.



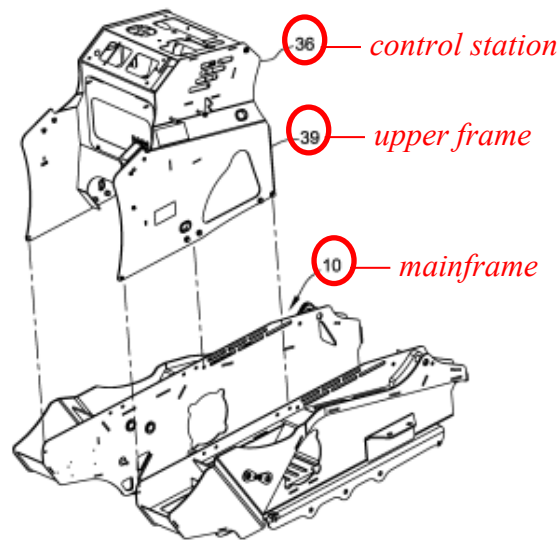
EX1001, FIG. 1
(annotated)

43. The first loader arm *15a* is pivotally connected to a first side *38a* of the mainframe 10 and the second loader arm *15b* is pivotally connected to a second side of the mainframe 10. '266 Patent (EX1001), 4:21-24. Each loader arm is attached to a respective side of the mainframe by linkages 46a/50a and an actuator 54. '266 Patent (EX1001), 4:24-54. This configuration is a four-bar mechanism, which I discuss above, providing a path generation of the motion of the tool attachment plate 12. FIG. 1 above is illustrative of the carrier with the loader in a down position; FIG. 3 below is illustrative the loader in a raised position. '266 Patent (EX1001), 2:28-33.



EX1001, FIG. 3
(annotated)

FIG. 7 is a perspective view of a mainframe 10 and an upper frame 39, which has a control station 36 attached to the upper frame 39. EX001, 3:64-66.



EX1001, FIG. 7
(annotated)

VII. PROSECUTION HISTORY OF THE '266 PATENT

44. I have briefly reviewed the prosecution history of the '266 Patent.

A. Original Prosecution

45. By preliminary amendment, applicant added specification text to the specification introducing the term “barrier guard” indicating support by the incorporation by reference of industry standard SAE J2752 (EX1015). EX1002, pp. 120-122.

[0024] <u>As stated in SAE J2752, incorporated herein by reference, the machine structure around the operator's area may be part of a barrier guard.</u> In the illustrated embodiment, the control station 36 is attached to an upper frame 39 (Fig. 7) that is attached and supported by the mainframe 10. <u>The upper frame 39 and mainframe 10 define the machine structure around the operator's area, wherein the perimeter of the machine structure, defined by the projection of the profile onto a vertical plane passing through the longitudinal axis, forms a barrier guard as shown in Figures 2 and 3.</u> In other embodiments, rather than being integrated as one unit in the compact tool carrier 5, the control station 36 is separate from '...[0026]...	
mainframe) of the carrier and is operated in such embodiments, the control station 36 may operate wirelessly to propel the carrier and lower the loader 8.	and the rear pivot point P₃. Similarly, the first arm 15a includes a forward pivot point P₄, a rear pivot point P₆, <u>positioned within the barrier guard of the perimeter of the machine structure as shown in Figures 2 and 3,</u> and a central pivot point P₅ between the forward pivot point P₄ and the rear pivot point P₆. The compact tool carrier 5 includes a

EX1002, pp. 121-122

46. In a first action the Examiner rejected some claims over (U.S. Patent No. 3,074,572, “Ulinski”) in view of Bares ’568 (EX1009) or Ulinski alone, while indicating allowable subject matter. EX1002, pp. 52-54. In response, Applicant incorporated the allowable matter, illustrated by prosecution claim 23, which issued as claim 19:

23. (Currently amended) A loader apparatus for standing or walk-behind operator control and comprising:

a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard;

a control station having operator controls toward a rear of the loader apparatus;

an actuator pivotally attached to the mainframe;

a front linkage pivotally attached to the mainframe;

a rear linkage pivotally attached to the mainframe; and

a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position, the front linkage being pivotally attached to the loader at a front linkage pivot point, the rear linkage being pivotally attached to the loader at a rear linkage pivot point, wherein: [[,]]

in the down position, the front linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and

as the loader travels from the down position to the vertically raised position, the rear linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard.

EX1002, pp. 41-42

47. A Notice of Allowance subsequently issued and did not include a reason for allowance. EX1002, pp. 3-7.

B. Reexamination Proceeding

48. The claims went through a series of rejections (and several newly introduced claims were ultimately canceled by Patent Owner), but independent claim 1 was confirmed and independent claims 7, 14, 19, and 25 were amended to include no seat or recite the pivot point attachments (and their locations) and found

patentable.

49. During the reexamination, a priority dispute arose for claims reciting a “barrier guard.” Patent Owner contended priority was fully supported by the ’266 Patent’s FIGS. 2 and 3 as annotated in that proceeding by Patent Owner:

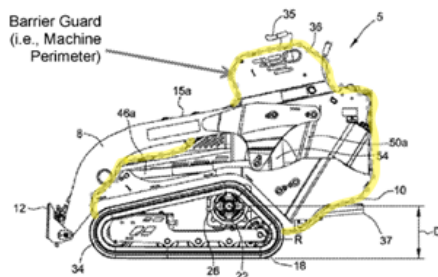


FIG. 2

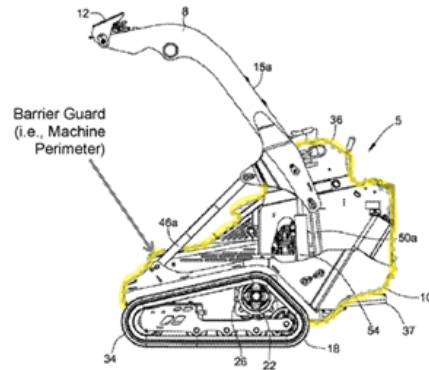


FIG. 3

EX1029, p. 242
(annotation in original, highlighting added)

50. The Examiner continued to find a lack of support for certain limitations related to the barrier guard and the pivot point locations (including those similar to claims 19 and 25), but did not reject others. EX1029, pp. 29-30.

51. Claims were also rejected over a framework of modifying a compact loader apparatus to replace its radial lift with a vertical lift disclosed on a larger skid

steer equipment. EX1029, pp. 336-338. The Examiner withdrew the rejection based on Patent Owner's evidence of the development process and statements of Toro, third party requester, with respect to placing a vertical lift on a compact loader; and the rejection was withdrawn. EX1002, pp. 146-152. Patent Owner also overcame a rejection based on modifying larger, operator seated in a cab equipment to provide an operator platform based, at least in part, on specific statements in the reference (i.e., a "stated goal of increasing the length of the actuator") taught away from the combination. EX1029, p. 142. Amendments to claims included "does not include an operator's seat" and the configuration of the pivot points with respect to the rotational axis. EX1029, pp. 11-20.

VIII. EFFECTIVE PRIORITY DATE OF THE '266 PATENT

52. I have been told to assume that the '266 Patent is entitled to a priority date of February 20, 2015. I have not undertaken a priority date analysis for the purposes of this declaration.

IX. CLAIM CONSTRUCTION

53. It is my understanding that in order to properly evaluate the '266 Patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would have been understood by one of ordinary skill in

the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term. For the purposes of this declaration, it is my opinion that the claim terms should be given their plain and ordinary meaning.

X. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims

54. This declaration is directed to claims 1-16 and 19-28 of the '266 Patent.

B. Statutory grounds for challenges

Grounds	Claims	Basis
#1	1-7, 10-13, and 28	35 U.S.C. §§102/103 over KR996
#2	8-9	35 U.S.C. §103 over KR996 and Bares
#3	14-16, 19-27	35 U.S.C. §103 over KR996, Bares, and Beltrami

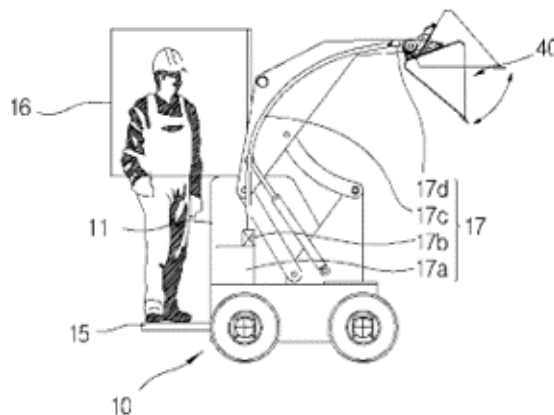
C. Ground 1

1. KR996 (EX1005)

55. KR996 is entitled “Environmentally Friendly Construction Equipment for Building Deconstruction Work.” KR996 (EX1005), (54).² KR996 describes construction equipment that “can enter narrow buildings and carry out dismantling work inside the building” and “effectively perform difficult tasks in narrow spaces,

² Citations are to the English translation of KR996. EX1005.

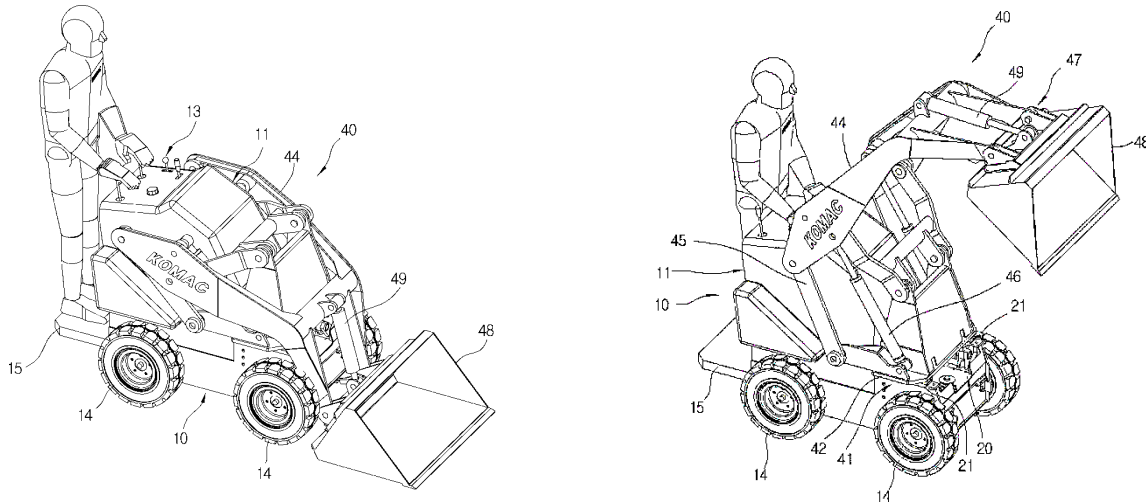
allowing for efficient operations such as building interior demolition, road maintenance, snow removal, and towing.” KR996 (EX1005), [0001]-[0002]. In particular, KR996 provides a vehicle 10 to which, interchangeably, a loader unit 40 or an arm unit 60 is attached. KR996 (EX1005), [0041], Figs. 1-13, 21 illustrating the loader unit 40 and Figs. 14-20, 22 illustrating the arm unit 60. Fig. 21, reproduced below, illustrates a side view of the vehicle with the loader unit 40. KR996 (EX1005), [0113]-[0114].



KR996 (EX1005), Fig. 21

56. The vehicle 10 includes a control unit 13 for operating of the vehicle including the installed unit (here the loader unit 40) by an operator positioned on a folding safety step 15 at the rear of the vehicle. KR996 (EX1005), [0042], [0049], [0072], Figs. 8-9. The loader 40 includes a boom 44 connected to the loader support of the vehicle by intermediary parts—a link 45, a link (unlabeled), and a

boom cylinder 46. *Id.* Fig. 8 and Fig. 9 are illustrative of the loader in lowered and raised positions, respectively.



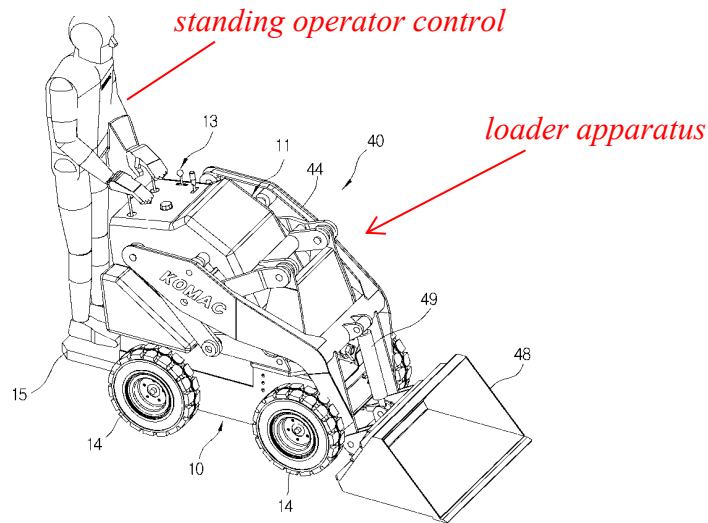
KR996 (EX1005), Fig. 8 (portion), Fig. 9

2. Claim 1

[1.0] A loader apparatus configured for standing operator control and comprising:

57. KR996 discloses this limitation.

58. KR996 describes a self-propelled (operator ride-on) vehicle (*a loader apparatus*) capable of carrying interchangeable equipment for building deconstruction work providing maneuverability in small spaces and having the functionality of a mini skid loader with an attachment of a bucket to a loader unit 40. KR996 (EX1005), Abstract, [0001]-[0013]. KR996's apparatus is *configured for standing operator control* from safety step 15.



**EX1005, Fig. 8 (portion)
(annotated)**

See also, KR996 (EX1005), [0044] (“foldable safety step ... allowing the operator to board”), [0049]. This is the same configuration for operation control as provided in the ’266 Patent. EX1001, 3:39-41 (“As used herein, ‘**standing operation**’ generally refers to operation in which the operator **stands on a platform** attached to the compact tool carrier[.]”)

59. The KR996 vehicle has the same configuration as described in the ’266 Patent (*see, e.g.*, Fig. 1). And a POSITA would recognize that the KR996 vehicle, like the ’266 Patent vehicle, falls under compact tool carrier as defined by ISO 6165 as being earth-moving machinery that is a “compact tool carrier [a] self-propelled crawler or wheeled machine ...having either a pedestrian operating

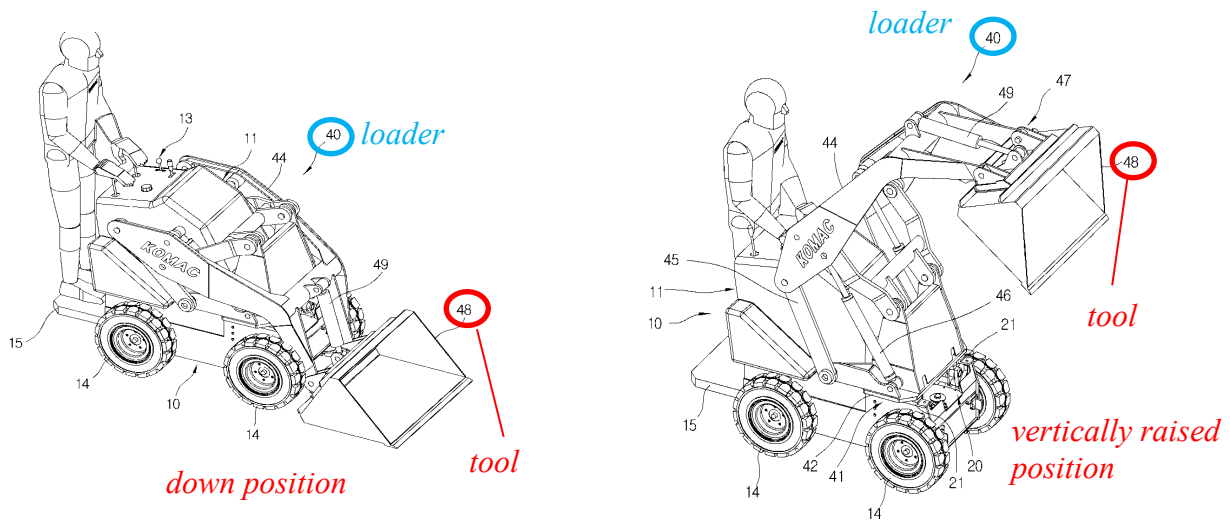
position or a standing operator platform at the rear of the machine and either front-mounted interchangeable equipment (3.9) or lift arms with an attachment bracket capable of coupling to interchangeable, front-mounted attachments (3.10).” ISO 6165 (EX1016), pp. 7, 9.

60. Thus, KR996 discloses equipment that provides the *loader apparatus*.

[1.1] a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;

61. KR996 teaches this element.

62. KR996 provides a *loader* including loader unit 40, which is *moveable between a down position* (e.g., Fig. 8) *and a vertically raised position* (e.g., Figs. 7, 9). KR996 (EX1005), (57), [0016], [0036], [0040], [0054], [0131], Figs. 7-9. The loader unit 40 (*loader*) of KR996 is *adapted to carry* a bucket 48 (*tool*), which is attached the boom 44 (arm) of the *loader*. KR996 (EX1005), claim 1, [0054], [0074], Figs. 8-9, 21. This is just as *tool* is described in the '266 Patent. '266 Patent (EX1001), 1:28-31 (“tools such as buckets, augers...and the like.”)



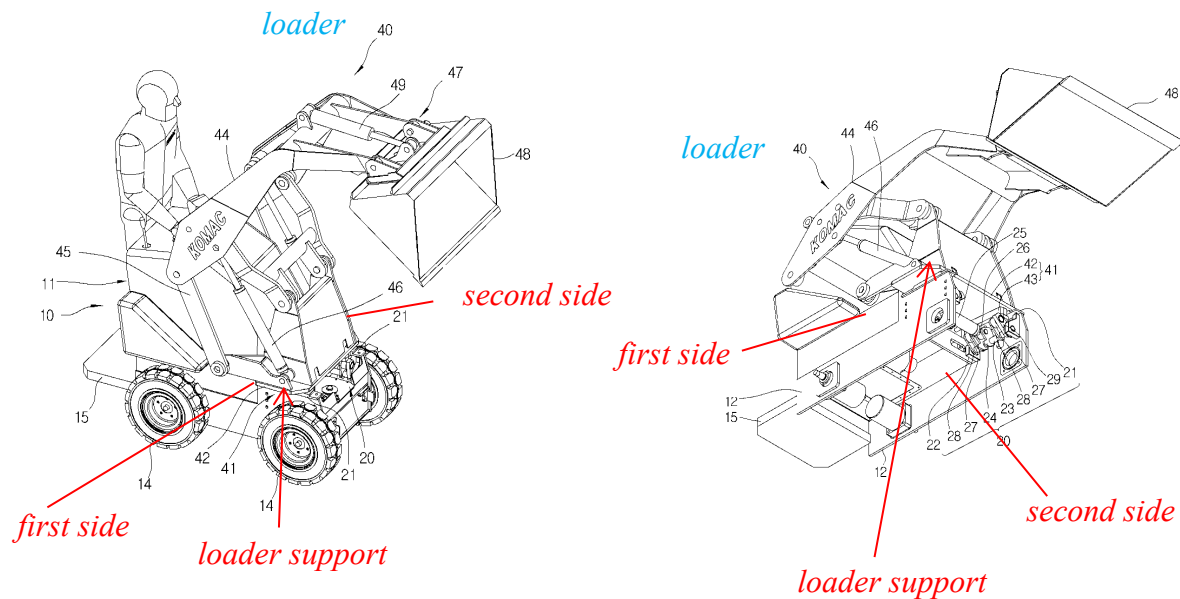
EX1005, Fig. 8 (portion) and Fig. 9 (annotated)

63. Thus, KR996 teaches [1.1].

[1.2] a loader support for supporting the loader, the loader support having a first side and a second side, the loader being free from direct attachment to the loader support;

64. KR996 teaches this element.

65. KR996's vehicle includes a *loader support for supporting the loader* and having respective *first* and *second sides*. KR996 (EX1005), Figs. 8-10.

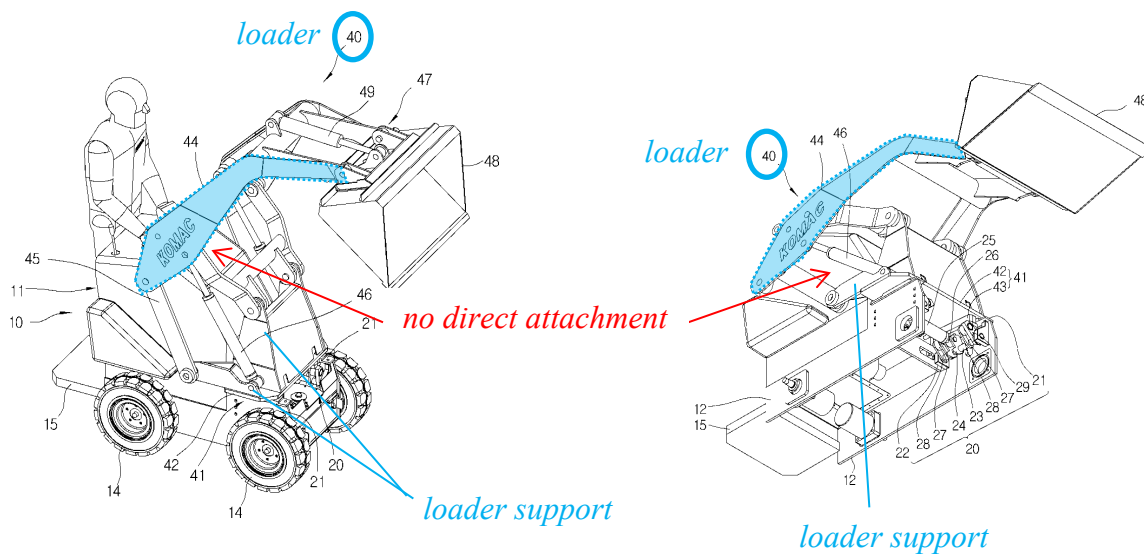


**EX1005, Figs. 9, 10
(annotated)**

KR996's loader support is *for supporting the loader* as the loader unit 40 and its boom 44, the arm of the loader, is attached to it by way of the linkages and an actuator as discussed below. KR996's loader support includes brackets to which the boom cylinder 48, link 45 attach to, portion of the lower frame where the forward link attaches, and/or other components that for a weight-bearing structure to support the loader and other features such as control station, drive mechanism, and other features (e.g., body 11, side 12). *See also*, EX1005, Fig. 21. This is consistent with the '266 patent. *See* EX1001, 4:15-18 ("mainframe 10 includes brackets...through which various pivot linkages are attached"), FIG. 7

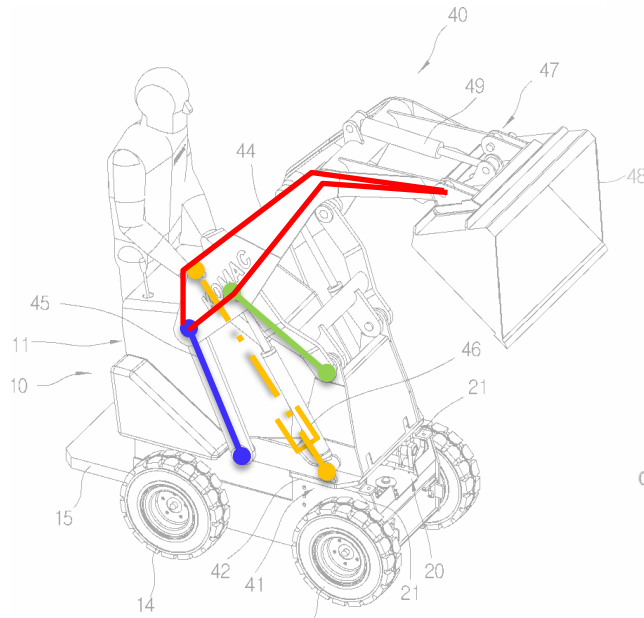
66. KR996 also illustrates its loader *being free from direct attachment to the loader support* as the loader unit 40 and its boom 44 are attached to the loader

support only through intermediary parts (links and a boom cylinder, discussed in detail in [1.3]-[1.5]). This is the same configuration as the '266 Patent, which attaches a loader arm to a frame through linkages and an actuator. '266 Patent (EX1001), FIG. 3, 4:21-43.

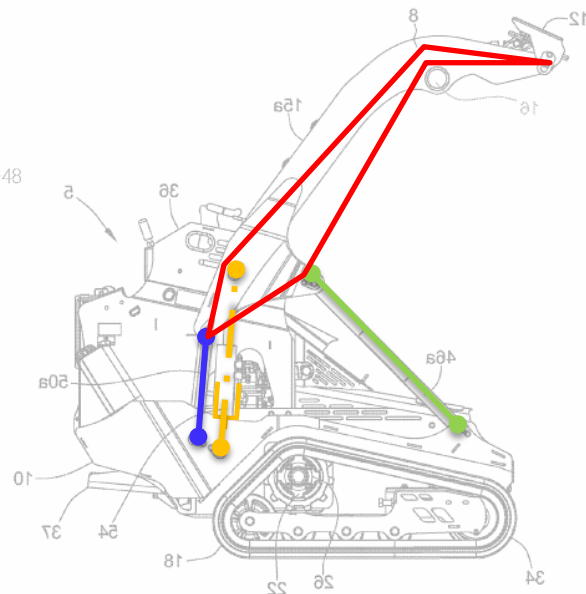


**EX1005, Figs. 9, 10
(annotated)**

67. Further, this is a feature of a four-bar mechanism. I have provided the below schematic view of the KR996 vehicle in comparison with a schematic view of the '266 Patent to illustrate they are similarly not directly attached. In particular, that each configuration is an assembly that includes a four-bar mechanism.



EX1005, Fig. 9
(annotated)



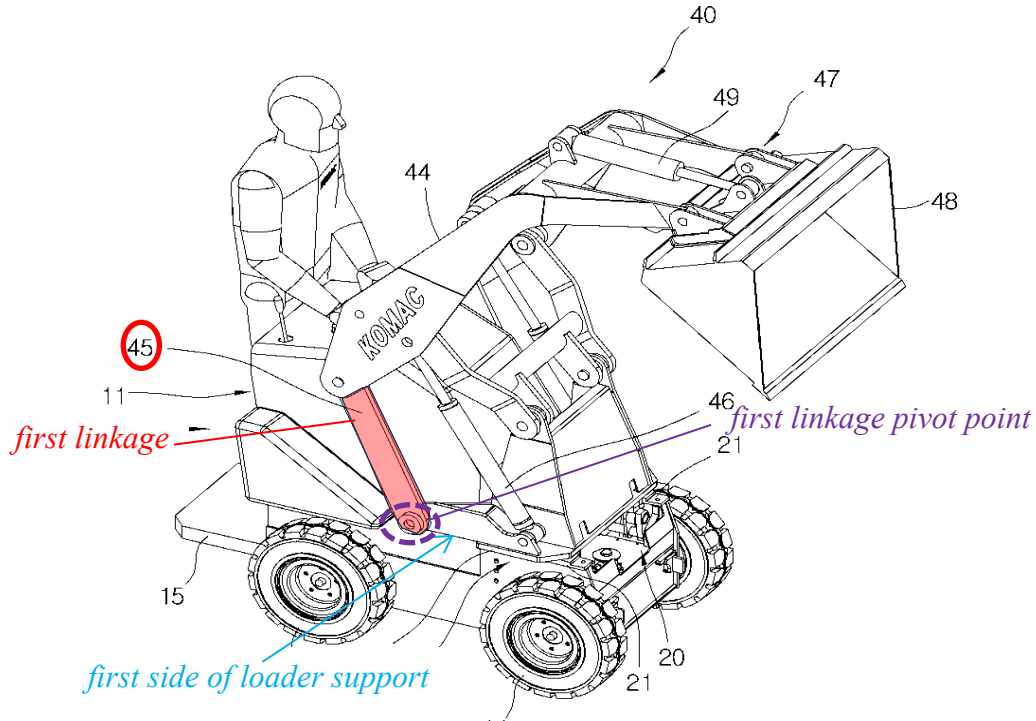
EX1001, Fig. 3
(annotated)

68. Thus, [1.2b] is taught by KR996.

[1.3] a first linkage pivotally attached to the first side of the loader support at a first linkage pivot point;

69. KR996 teaches this element.

70. KR996 illustrates a link 45 (*first linkage*) pivotally attached to the first side of the loader support at a first linkage pivot point. KR996 (EX1005), Figs. 4-5, 7-10, 21, [0054] (“A boom (44) connected by a link (45)...”), [0134]. Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

71. There are pivot point connections, each a point of relative rotation between the linkage 45 and each of the boom 44 and the loader support as annotated above. The attachment at each end of the link and actuator discussed herein is pivotable as it is a joint that allows for rotary motion. See KR996, Figs. 8, 9. The pivot point between the linkage 45 and the loader support is a fixed or anchor pivot point; the pivot point between the link 45 and the boom 44 is a moving pivot point relative to the equipment as the loader 40 raises. These pivot point connections are standard in a four-bar mechanism. *See, e.g.*, EX1023, p. 6, EX1028, p. 21. That is, as described in paragraph 33, the four-bar mechanism

contains two fixed pivot points and an imaginary fixed linkage between them, and the other 3 bars and 2 pivot points move relative to the fixed pivots.

72. This is also confirmed by Beltrami, which also describes a similar mechanism for raising an arm as discussed below and discusses the connection between the linkage, which it refers to as connecting rod 23, and the loader support as being “pivot point 24.” Beltrami (EX1008), 3:12-22; FIG. 2; FIG. 3; 5:26-73

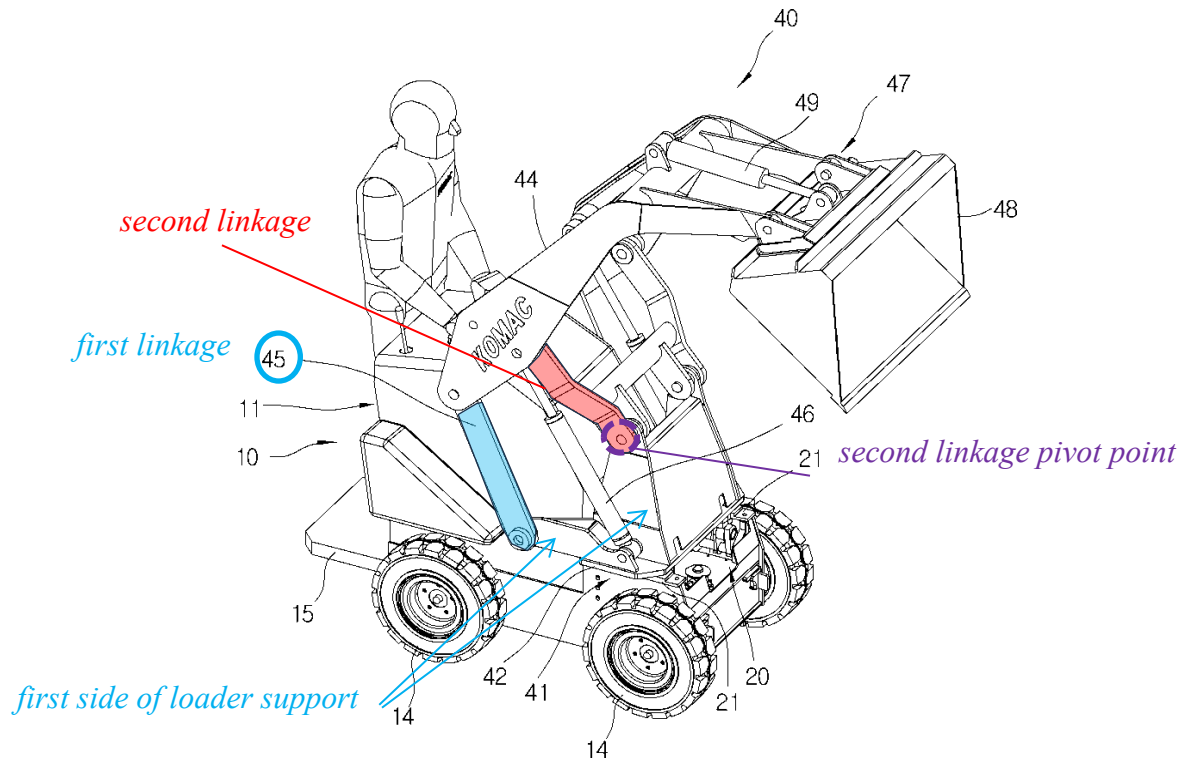
73. This is consistent with '266 Patent's disclosure of a loader linkage (e.g., a loader linkage 46a or 50a) pivotally attached to the first side of the loader support and pivotally attached to the loader arm. *See, e.g.,* '266 Patent (EX1001), FIG. 3, 4:4-28. The portion of the vehicle to which the link 45 is directly attached is part of the *loader support* as it supports the loader unit 40.

74. Thus, [1.3] is taught by KR996.

[1.4] *a second linkage pivotally attached to the first side of the loader support at a second linkage pivot point;*

75. KR996 teaches this element.

76. KR996 illustrates another link (*second linkage*) *pivotally attached to the first side of the loader support at a second linkage pivot point.* KR996 (EX1005), claim 1, [0054], [0134], Figs. 1-10.



**EX1005, Fig. 9
(annotated)**

77. There are pivot point connections, each a point of relative rotation between the linkage and each of the boom 44 and the loader support as annotated above. The attachment at each end of the link and actuator discussed herein is pivotable as it is a joint that allows for rotary motion. See KR996, Figs. 8, 9. The pivot point between the linkage 45 and the loader support is a fixed or anchor pivot point; the pivot point between the link 45 and the boom 44 is a moving pivot point relative to the equipment as the loader 40 raises. These pivot point connections are standard in a four-bar mechanism. *See, e.g.,* EX1023, p. 6, EX1028, p. 21. That is,

as described beginning in paragraph 33, the four-bar mechanism contains two fixed pivot points and an imaginary fixed linkage between them, and the other 3 bars and 2 pivot points move relative to the fixed pivots.

78. This is also confirmed by Beltrami, which also describes a similar mechanism for raising an arm as discussed below and discusses the connection between the linkage, which it refers to as connecting rod 23, and the mainframe as being “pivot point 24.” Beltrami (EX1008), 3:12-22; FIG. 2; FIG. 3; 5:26-73. This is consistent with ’266 Patent’s disclosure of a loader linkage (e.g., a loader linkage 46a, 50a) pivotally attached to the first side of the mainframe and pivotally attached to the loader arm.

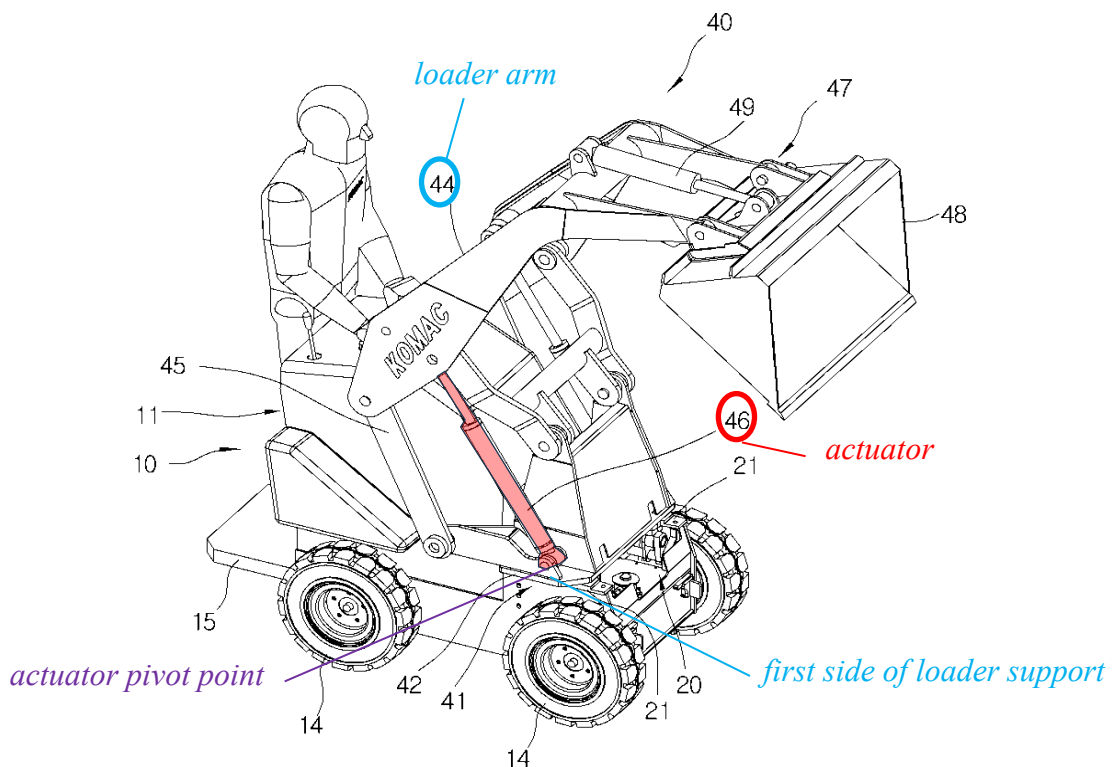
79. Thus, [1.4] is taught by KR996.

[1.5] *an actuator pivotally attached to the first side of the loader support at an actuator pivot point;*

80. KR996 teaches this element.

81. KR996 describes a boom cylinder 46 (*actuator*) that drives the boom 44, which is the arm of the loader unit 40. KR996 (EX1005), [0054], *see also*, claim 1, [0134], Figs. 8-9, 21. The boom cylinder 46 (*actuator*) *is attached to the first side of the loader support at an actuator pivot point*. A POSITA would recognize a boom cylinder is an actuator cylinder, or simply actuator. See, e.g., Bares (EX1010) 2:66-3:1 (“The lift arm assembly 24 is raised and lowered with

extendible and retractable double acting hydraulic cylinders or actuators”). An actuator cylinder may be pneumatic, hydraulic, or electric. For example, the ’750 Patent, to which the ’266 Patent claims priority, describes an actuator 54 as a “hydraulic cylinder” as in claim 7; KR996 describes a “hydraulic cylinder” ([0003]). Fig. 9 below is illustrative:



**EX1005, Fig. 9
(annotated)**

82. There are pivot point connections – points of rotation within mechanical systems - between the actuator and the boom 44 and the loader support. The attachment at each end of the actuator highlighted above is pivotable as it is a joint that allows for rotary motion, which is shown by KR996’s Figs. 8-9.

The pivot point between the boom cylinder 46 and the loader support is a fixed or anchor pivot point; the pivot point between the actuator and the boom 44 is a moving pivot point relative to the loader support as the loader 40 raises. The boom cylinder drives the movement of the boom 44. See KR996 (EX1005), Figs. 8-9.

83. This is also confirmed by Beltrami, which also describes a similar mechanism for raising an arm as discussed below and discusses the connection between the actuator, which it refers to as, in one example, hydraulic jack 28, being “pivotally connected to the vehicle at 30.” Beltrami (EX1008), 3:16-21; FIG. 2; 4:20-25; FIG. 3; 5:25-50.

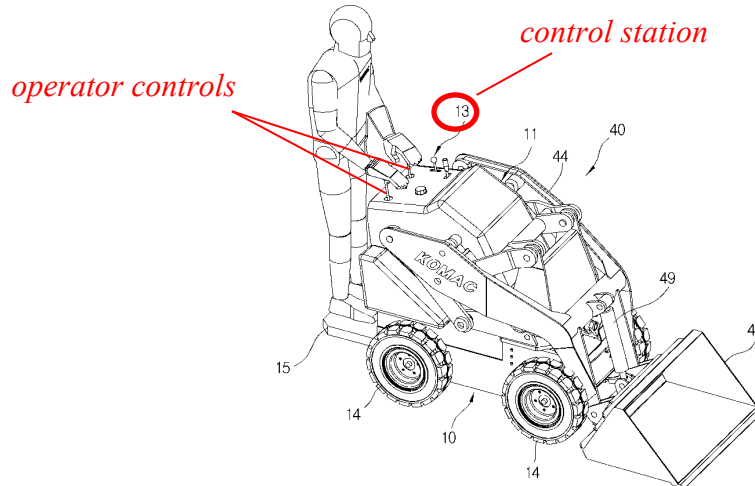
84. Thus, [1.5] is taught by KR996.

[1.6] *a control station having operator controls for propelling the loader apparatus forward and for raising and lowering the loader; and*

85. KR996 teaches this element.

86. KR996 describes a control unit 13 (*control station*) to “operate the equipment while the worker is on board at the rear.” KR996 (EX1005), [0042], Figs. 1, 8-9. The control unit 13 has *operator controls*. KR996 (EX1005), Figs. 1, 8-9, 21. The *operator controls* are for *propelling the compact tool carrier forward*, which is a standard movement of the equipment in operation. KR996 (EX1005), Abstract (“when the vehicle moves forward...”), [0016]-[0017], [0033] (“driving”), [0072]. The control unit 13 is also for *raising and lowering* the loader

unit 40 (*loader*) including the boom 44: “When the loader unit (40) is coupled to the vehicle (10), ... the control unit (13) of the vehicle (10) can be operated to **operate the loader unit (40).**” KR996 (EX1005), [0072].



**EX1005, Fig. 8 (portion)
(annotated)**

87. Thus, [1.6] is taught by KR996.

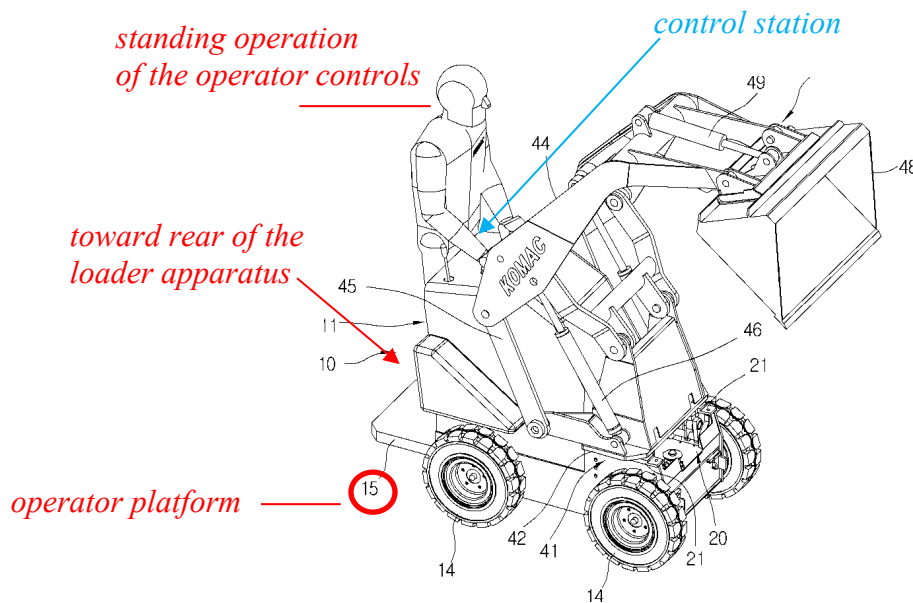
[1.7] *an operator platform for standing operation of the operator controls of the control station, the operator platform being located toward a rear of the loader apparatus such that the first linkage pivot point, second linkage pivot point, and the actuator pivot point are disposed forward of the operator platform, the first linkage pivot point, second linkage pivot point, and the actuator pivot point being disposed below the operator controls of the control station.*

88. KR996 teaches or renders obvious this element.

89. **First**, KR996 describes a safety step 15 (*operator platform*) for *standing operation of the operator controls* of the control unit 13 (*control station*).

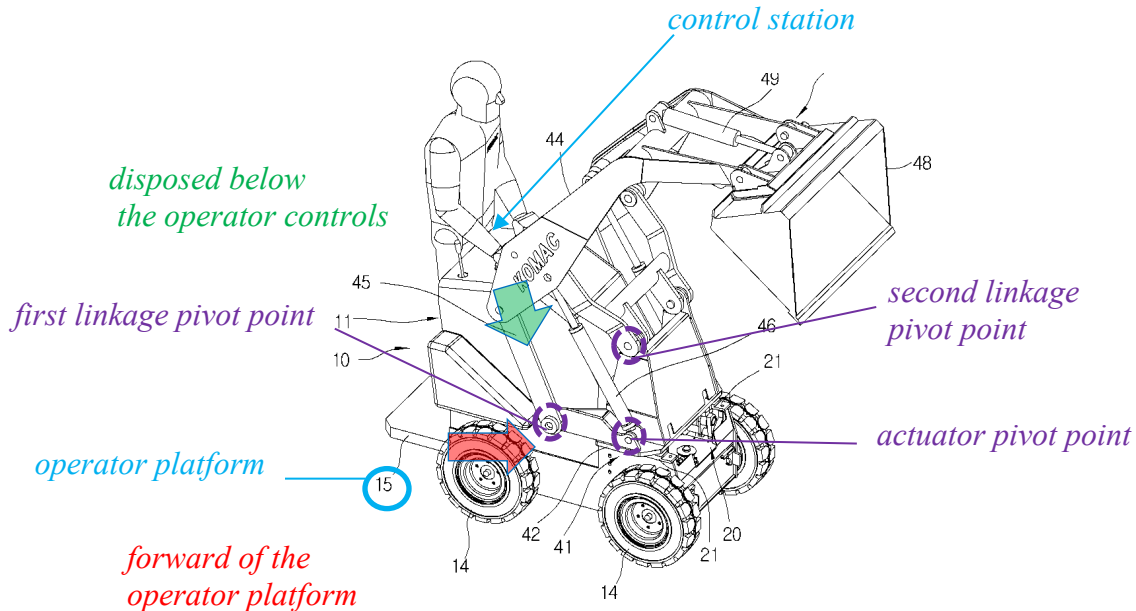
KR996 (EX1005), Figs. 1-14, 21, [0033] (“a **foldable safety step** is installed on

the lower rear part of the vehicle, allowing the **operator to board** and alight from the vehicle **when driving** and fold it towards the body of the vehicle when stopped.”), [0049], [0118]. The safety step 15 (*operator platform*) is located toward a rear of the vehicle (*loader apparatus*). Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

90. **Second**, each of the *first linkage pivot point*, *second linkage pivot point*, and *actuator pivot point* ([1.3]-[1.5]) are illustrated as *disposed forward* of the safety step 15 (*operator platform*). And these points are illustrated as being *below the operator controls* of the control unit 13 (*control station*). Fig. 9 is illustrative of each:



**EX1005, Fig. 9
(annotated)**

See also, EX1005, Figs. 8, 21. Thus, [1.7] is taught by KR996.

91. To the extent Patent Owner argues the figures of KR996 are insufficiently recognized as being to scale as to provide for the relative configuration of the pivot points/platform/controls, the configuration would have been obvious to implement in KR996's vehicle. First, simply viewing the figures of KR996 suggests to a POSITA to implement just this configuration. KR996 (EX1005), Figs. 8-9, 21. Second, placing attachment points with the loader support forward of the operator platform would have been recognized from KR996's describing the safety step 15 (*operator platform*) extending from the rear of the

main body 11, in other words, at extending from an end of the *loader support*.

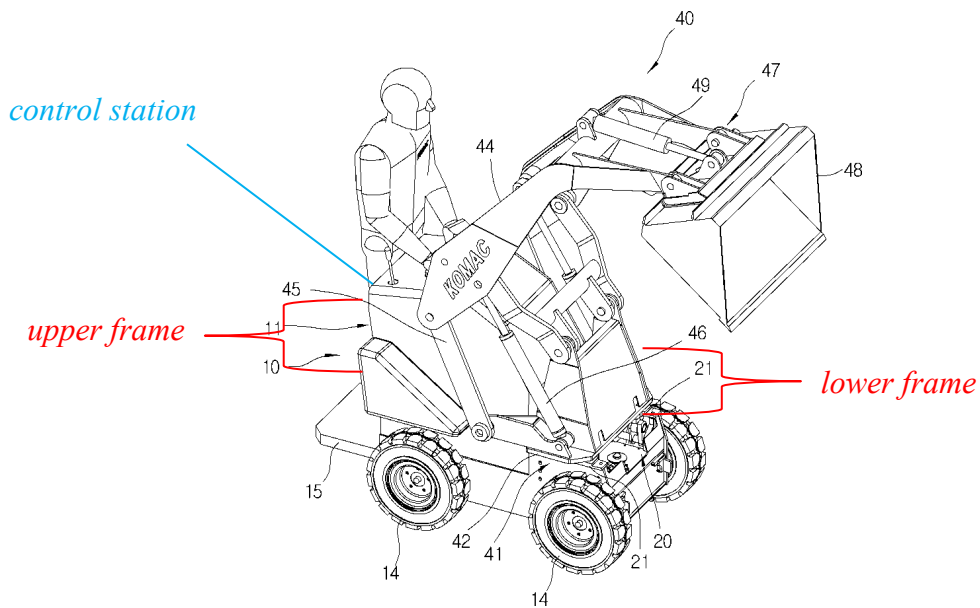
KR996 (EX1005), [0049], Figs. 8-9. Third, POSITA would have recognized placing the attachment points low on the loader support to lower the center of gravity of the apparatus and reduce the frame requirements by connecting the loader lower on the loader support. This is discussed further below at claim 14.

92. Thus, KR996 discloses or renders obvious [1.7] and claim 1 in its entirety.

3. Claim 2

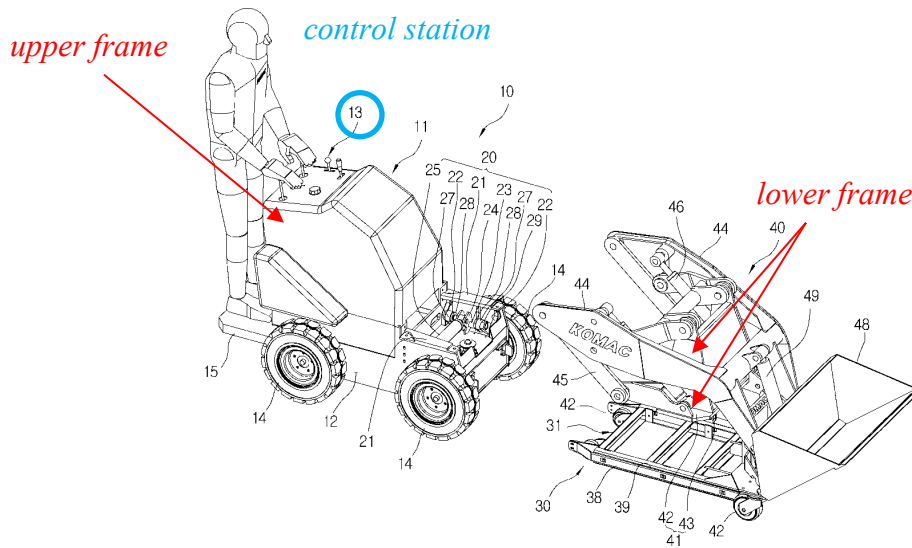
[2] *The loader apparatus as set forth in claim 1 wherein the loader support comprises a lower frame and an upper frame, the control station being mounted to the upper frame.*

93. KR996 teaches or renders obvious claim 1, and KR996's *loader support* also includes *a lower frame and an upper frame*. The control unit 13 (*control station*) is *mounted* on the main body 11, which forms at least part of the *upper frame*. KR996 (EX1005), [0017] ("a control unit installed...").



EX1005, Fig. 9
(annotated)

94. I have reviewed the '266 Patent and it does not use the term “lower frame” in its specification and while providing no definition of “upper frame,” in its FIG. 7 includes “an upper frame 39.” See '266 Patent (EX1001), 3:64-66. To the extent Patent Owner asserts the *upper frame* and *lower frame* must be separatable, KR996 teaches this. Fig. 1 illustrates a portion of a main body 11 (*upper frame*) separable from a portion of the loader support having the pivot point attachments with the linkages/actuator to the *lower frame*, just like the '266 Patent's illustration.



**EX1005, Fig. 1
(annotated)**

95. Thus, KR996 discloses or renders obvious claim 2.

4. Claim 3

[3] *The loader apparatus as set forth in claim 1 wherein the loader support incorporates a single weldment.*

96. KR996 renders this element obvious.

97. KR996 teaches or renders obvious claim 1 and also renders obvious a loader support *incorporat[ing] a single weldment*, which is a term not defined by the '266 Patent but used in the alternative with “fasteners (e.g., nuts and bolts).”
See EX1001, 2:56-58.

98. POSITA would have found it obvious to form one or more portions of

the loader support of KR996 as a *single weldment* because use of welding to join components of a support frame for a loader apparatus was a well-known method of fabrication. Welding technique in substantially similar compact tool carriers were typical. See, e.g., Bares(EX1010), 4:8-34 (“The body or frame 12, as shown, is a unitized welded body that includes side walls 90A and 90B extending in fore and aft direction.... The body 12 is fully welded together with the components...”). And implementing welding in other earth-moving vehicles known to have vertical lift mechanisms was also typical. See Yasuda (EX1022) 4:50-11:25 discussing “welding.” See also, EX1006 discussing a suitable mainframe that is welded [0020] (“general mounting means such as welding or the like,”) [0016] (“enabling welding work to be stably performed, easily and efficiently,”)

99. A POSITA would recognize that there are known trade-offs in the engineering or design choice between a single weldment and attachment by, for example, nuts and bolts. These factors include aesthetics (e.g., a weld can provide a smooth surface), ease of manufacturability of the component (e.g., welding is a simple, easy to apply process), reliability of the attachment, positioning the surrounding components (e.g., placement of the engine in the loader apparatus), replaceability of parts, structural rigidity, and/or costs. One benefit of connecting pieces by a weld allows for forming a smooth, continuous surface. JP705 (EX1006), (“attaching means such as welding...to form a smooth, continuous

surface.”) [0031]. And this reduction of parts allows for a reduction in component costs and weight. JP705 (EX1006), [0008]. In addition to reducing the number of parts, welding connections can reduce the need for additional intermediate fasteners that could loosen over time thus reducing both the security of the attachment and the corresponding structural rigidity of the system. JP705 describes what a POSITA recognizes, enabling welding work to be stably performed, easily and efficiently. EX1006, [0016]. ¶

100. To the extent Patent Owner argues certain components of the loader support are required to be coupled by a weldment, POSITA would have been motivated to form KR996’s loader support consisting of a *single weldment* because the fastening method was well within their skill set and provides benefits discussed above to predictably form a welded structure. EX1006, [0019] (“The main frame 1 is construed from case steel for welding construction); EX1010, 4:8-10, 4:31-34 implementing a unitary frame on a compact loader (“The body or frame 12, as shown, is a unitized welded body that includes side walls 90A and 90B extending in fore and aft direction.... The body 12 is fully welded together with the components...”)

101. Thus, claim 3 is rendered obvious by KR996.

5. Claim 4

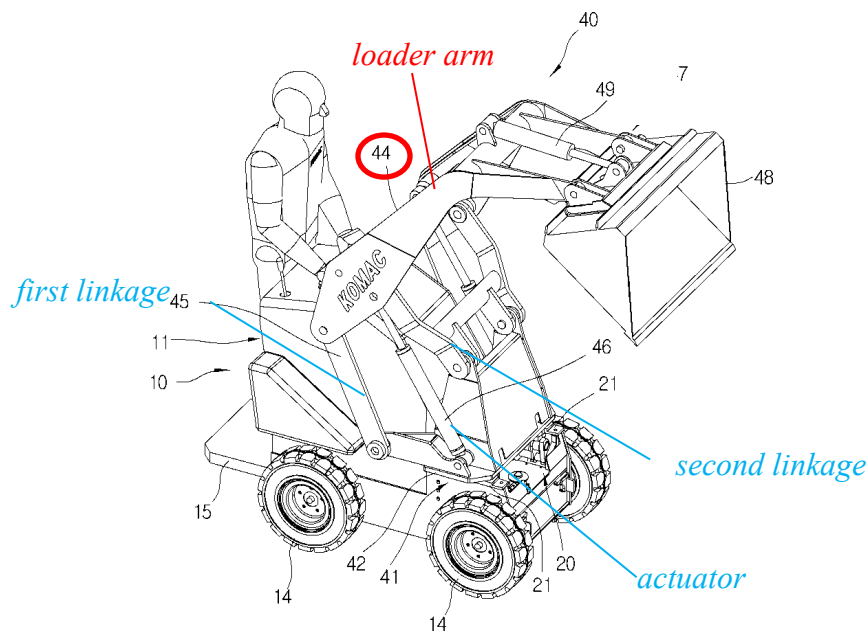
[4] *The loader apparatus as set forth in claim 1 wherein the loader comprises a*

loader arm, the loader arm being pivotally connected to the first side of the loader support.

102. KR996 teaches this element.

103. KR996 teaches or renders obvious claim 1 and also provides the loader unit 40 (*loader*) includes a boom 44 (*loader arm*) *pivotally connected to the first side of the loader support* through linkages/actuator, which are pivotally attached to the boom 44 (*loader arm*) and the loader support. See [1.3]-[1.5].

KR996 (EX1005), [0133], claim 1, [0054], Figs. 1-13, 21.



**EX1005, Fig. 9
(annotated)**

104. The nature of the of the attachment between the loader arm and the loader support is *pivotable* to effectuate the raising and lowering of the boom 44 in a four-bar mechanism. KR996 (EX1005), Figs. 8-9. There are pivot point

connections, each a point of relative rotation between the linkage and each of the boom 44 and the loader support. The attachment at each end of the link and actuator discussed herein is pivotable as it is a joint that allows for rotary motion. These pivot point connections are standard in a four-bar mechanism. *See, e.g.*, EX1023, p. 6, EX1028, p. 21. That is, as described beginning in paragraph 33, the four-bar mechanism contains two fixed pivot points and an imaginary fixed linkage between them, and the other 3 bars and 2 pivot points move relative to the fixed pivots. *See also*, Beltrami (EX1008), 3:12-22; FIG. 2; FIG. 3; 5:26-73

105. This is the same configuration for *pivotally connected* as provided in the '266 Patent. EX1001, 4:21-25 (“The first loader arm 15a is pivotally connected to the first side 38a of the mainframe 10...The loader arm[] and side[] of the mainframe each include three pivot points for pivoting the loader 8 relative to the mainframe.”)

106. Thus, claim 4 is taught or rendered obvious by KR996.

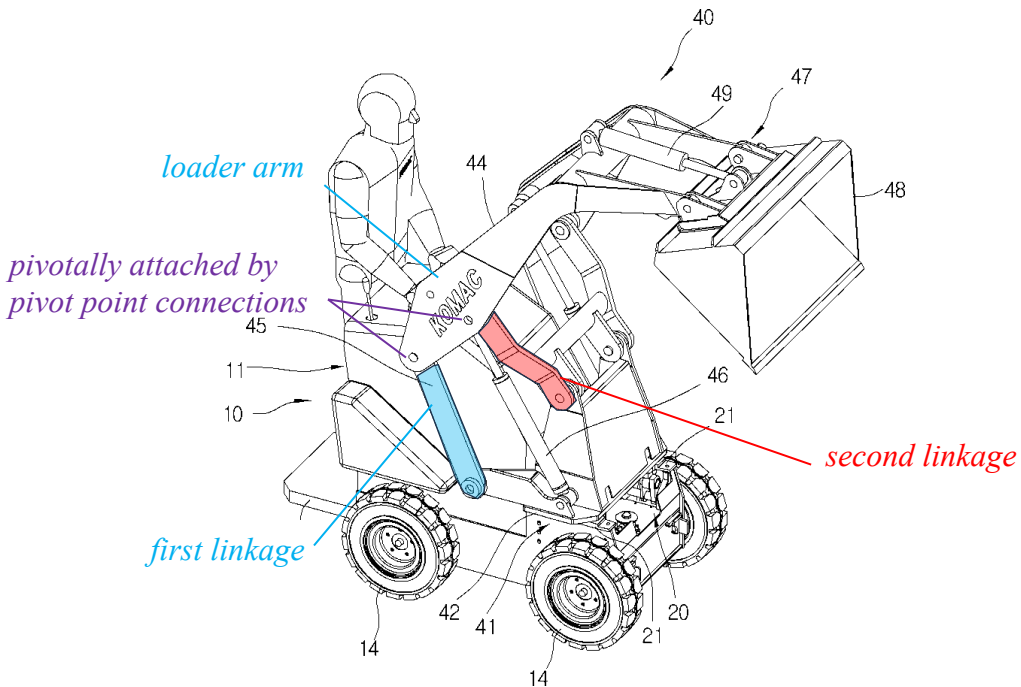
6. Claim 5

[5] *The loader apparatus as set forth in claim 4 wherein the first and second linkages are pivotally attached to the loader arm.*

107. KR996 teaches this element.

108. KR996 teaches or renders obvious claim 4 and also discloses the *first/second linkages* ([1.3], [1.4]) are *pivotaly attached* to a boom 44 (*loader*

arm). EX1005, Figs. 8-9, [0016], [0054]. Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

109. The nature of the attachment between the linkages and the loader arm is *pivotal* to effectuate the raising and lowering of the boom 44 in a four-bar mechanism. KR996 (EX1005), Figs. 8-9. There are pivot point connections, each a point of relative rotation between the linkage and each of the boom 44. The attachment at each end of the link is pivotal as it is a joint that allows for rotary motion. These pivot point connections are standard in a four-bar mechanism. *See, e.g.,* EX1023, p. 6, EX1028, p. 21. That is, as described beginning in paragraph 33, the four-bar mechanism contains two pivot points that move relative to the fixed

pivots with the loader support. *See also*, Beltrami (EX1008), 3:12-22; FIG. 2; FIG. 3; 5:26-73

110. This is the same configuration for *pivotally connected* as provided in the '266 Patent. EX1001, 4:21-25 (“The first loader arm 15a is pivotally connected to the first side 38a of the mainframe 10...The loader arm[] and side[] of the mainframe each include three pivot points for pivoting the loader 8 relative to the mainframe.”)

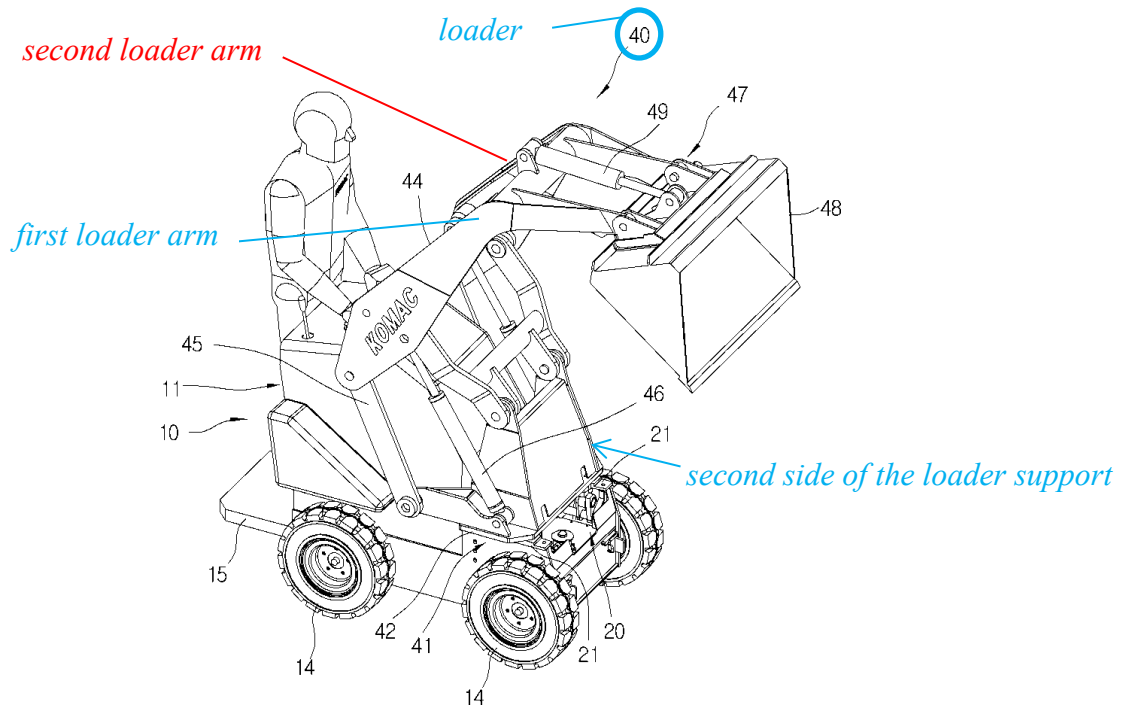
111. Thus, claim 5 is taught or rendered obvious by KR996.

7. Claim 6

[6] *The loader apparatus as set forth in claim 4 wherein the loader arm is a first loader arm, the loader comprising a second loader arm, the second loader arm being pivotally connected to the second side of the loader support.*

112. KR996 teaches this element.

113. KR996 teaches or renders obvious claim 4 and provides boom 44 (*the loader arm*) being a *first loader arm* and describes a second boom 44 (*a second loader arm*) connected to the *second side of the loader support*. EX1005, claim 1, [0054], [0133], Figs. 1-13, 21. Fig. 9 is illustrative:



EX1005, Fig. 9
(annotated)

114. The second boom 44 (*second loader arm*) is *pivotally connected* to the *second side of the loader support*, just like described with respect to the first loader arm in [4] as the second side of the loader and attachment thereto is the same as the first side. In other words, both sides of the vehicle use a four-bar mechanism. And a POSITA would recognize providing substantially the same structure of both sides of the vehicle to provide a balance in weight.

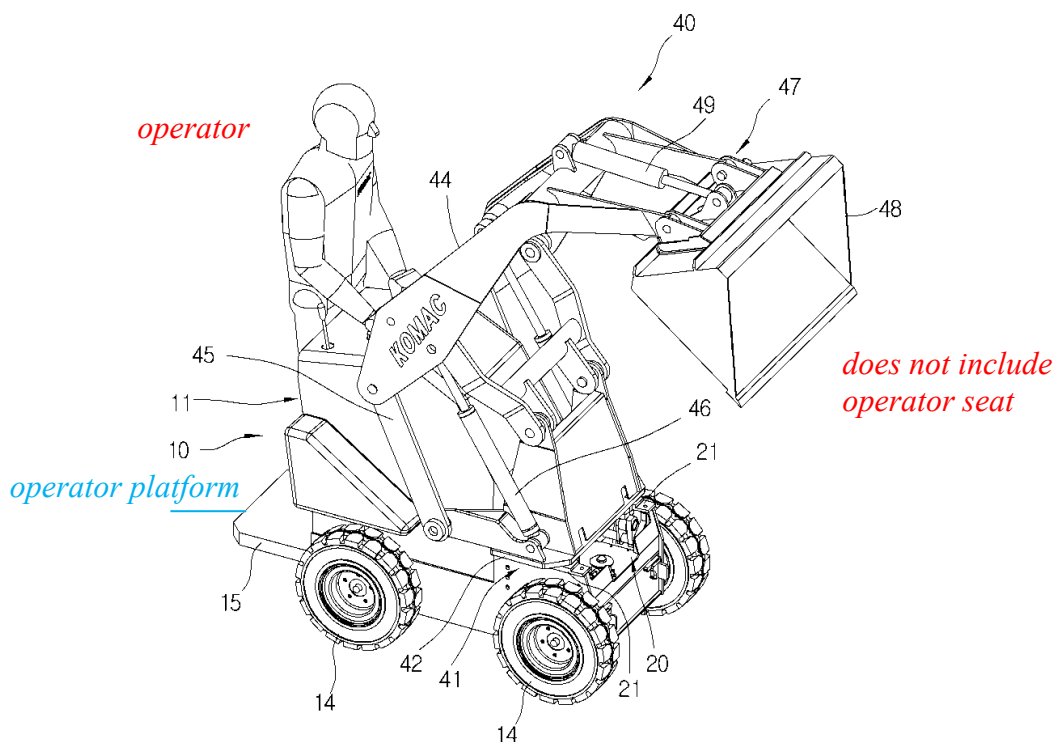
115. Thus, claim 6 is rendered obvious by KR996.

8. Claim 28

[28] *The loader apparatus as set forth in claim 1 wherein the loader apparatus does not include an operator's seat.*

116. KR996 teaches this element.

117. KR996 teaches or renders obvious claim 1 and also teaches its vehicle *does not include an operator's seat*. Fig. 9 is illustrative of the operator position in the loader apparatus of KR996 being standing on a safety step 15:



**EX1005, Fig. 9
(annotated)**

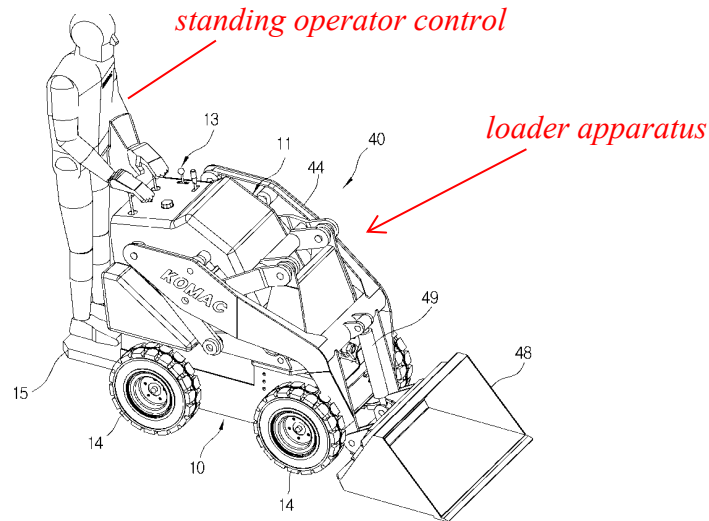
KR996 (EX1005), Figs. 9, 21, [0090] (“driver, who is standing upright”).

118. Thus, claim 28 is taught or rendered obvious by KR996.

9. Claim 7

[7.0] A loader apparatus for standing or walk-behind operator control and comprising:

119. KR996 discloses this element. *See* [1.0].



**EX1005, Fig. 8 (portion)
(annotated)**

120. This claim term uses the disjunctive “or” meaning one or the other, or both. To the extent the Patent Owner argues both standing operation and walk-behind operation are required, KR996 supports this. KR996 discloses an operator platform that is described as a folding step and thus, suitable for being displaced when operating the vehicle. KR996 (EX1005), claim 18 (“folding safety step”), [0033] “foldable step,” [0044]. EX1013 (Azure) confirms that a folding step for an operator platform provides both walk-behind and standing/riding platform operation of the vehicle. EX1013, [0004]–[0006], [0008], FIG. 4. Thus, KR996 teaches a vehicle that provides the *loader apparatus*.

[7.1] *a control station having operator controls toward a rear of the loader apparatus;*

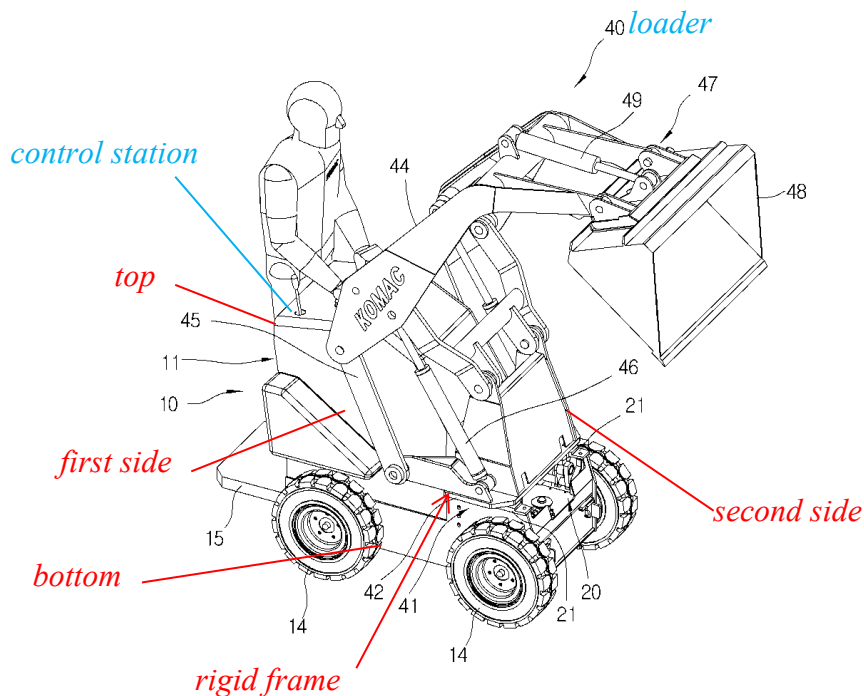
121. KR996 provides a control unit 13 (*control station*) as shown in [1.6] that is *toward a rear of the loader apparatus* and is illustrated with *operator controls*. KR996 (EX1005), Figs. 8-9, 21.

[7.2] *a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position;*

122. As discussed in [1.1], KR996 describes *a loader* including loader unit 40, which is *moveable between a down position* (Fig. 8) *and a vertically raised position* (see Figs. 7-9) and *adapted to carry a tool* such as bucket 48. “At the end of the boom (44), a **bucket attachment (47)** is installed, and a **bucket (48)** is **coupled** to the bucket attachment (47)[.]” KR996 (EX1005), [0054].

[7.3] *a rigid frame for supporting the control station and the loader, the rigid frame having a first side, a second side, a top, and a bottom;*

123. The '266 Patent specification use the term “rigid frame” only within its background portion and there when discussing conventional equipment. See '266 Patent (EX1001), 1:25-32. KR996 provides the same *rigid frame* in a load-resisting structure having *first/second sides* and a *top/bottom*, which supports the control unit 13 (*control station*). Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

124. KR996’s *rigid frame* is for supporting the control station as the control unit 13 is attached to it. KR996 (EX1005), [0017] (“a **control unit installed** to operate the equipment while a worker is on board at the rear”).

Further, a POSITA would have understood the construction of KR996 to follow what is suggested by industry standards, which provides the framework of such a compact loader carrier to be a “rigid frame.” EX1015 p. 2 (“self-propelled crawler or wheeled machine...with a **rigid frame**, having either a pedestrian operating positions or standing operator platform at the rear of the machine and having...lift arms with an attachment bracket capable of coupling to interchangeable, front-

mounted attachments.”)³ Use of a rigid frame is standard in equipment such as a compact tool carrier to support its functionality. The rigid frame, like the mainframe, loader support or machine structure, is known to provide a weight-bearing frame for supporting components (e.g., control station, loader).

[7.4] a first linkage pivotally attached to the first side of the rigid frame at a first pivot point and pivotally attached to the loader at a second pivot point; ...

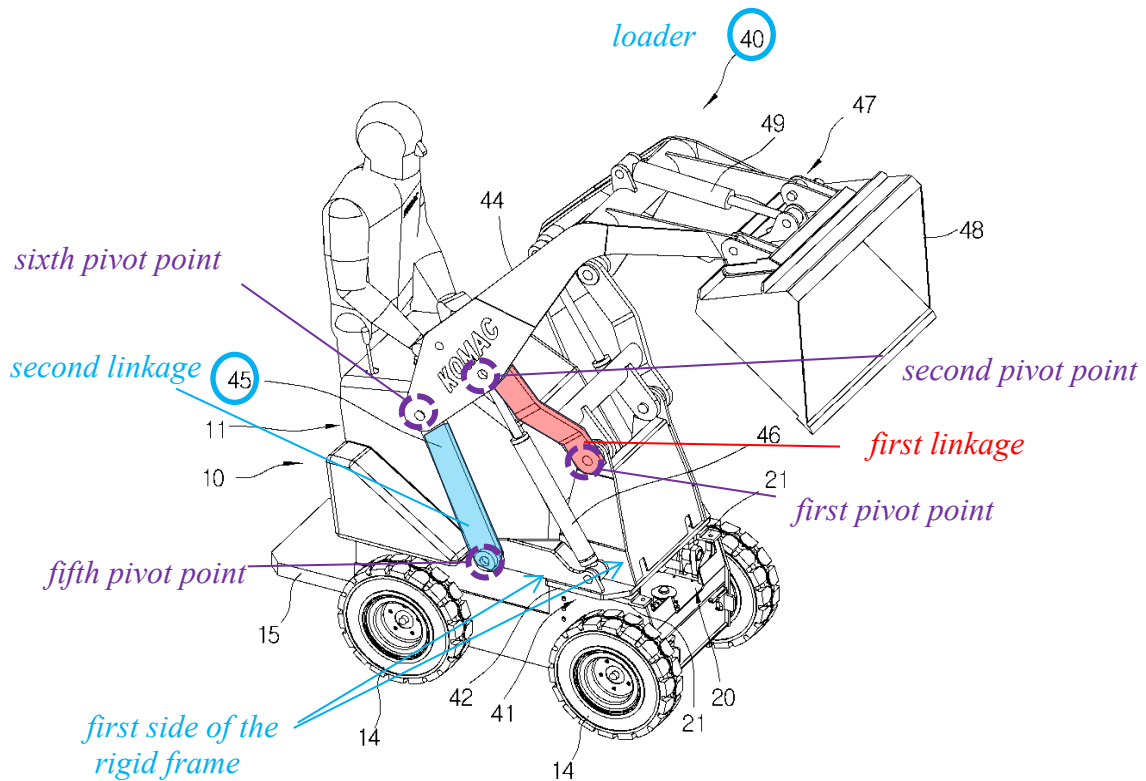
[7.6a] a second linkage pivotally attached to the first side of the rigid frame at a fifth pivot point and pivotally attached to the loader at a sixth pivot point,

125. KR996 illustrates a link (forward on the equipment) providing *a first linkage pivotally attached to the first side of the rigid frame at a first linkage pivot point and pivotally attached to boom 44 (an arm of the loader) at a second pivot point. See [1.4] above.* And KR996 illustrates a link 45 providing *a second linkage pivotally attached to the first side of the rigid frame at a fifth pivot point and pivotally attached to boom 44 (an arm of the loader) at a sixth pivot point. See [1.3] above.* EX1005, claim 1, [0054] (“A boom (44) connected by a link (45)...”),

³ The '266 Patent claims use different terms for the frame structure; *loader*

support, rigid frame, machine structure, mainframe, lower frame each include the weight-bearing portion at least supporting the loader and/or other features (e.g., drive mechanism, control unit). Thus, my analysis directed to one applies to another term.

[0134], Figs. 1-10. Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

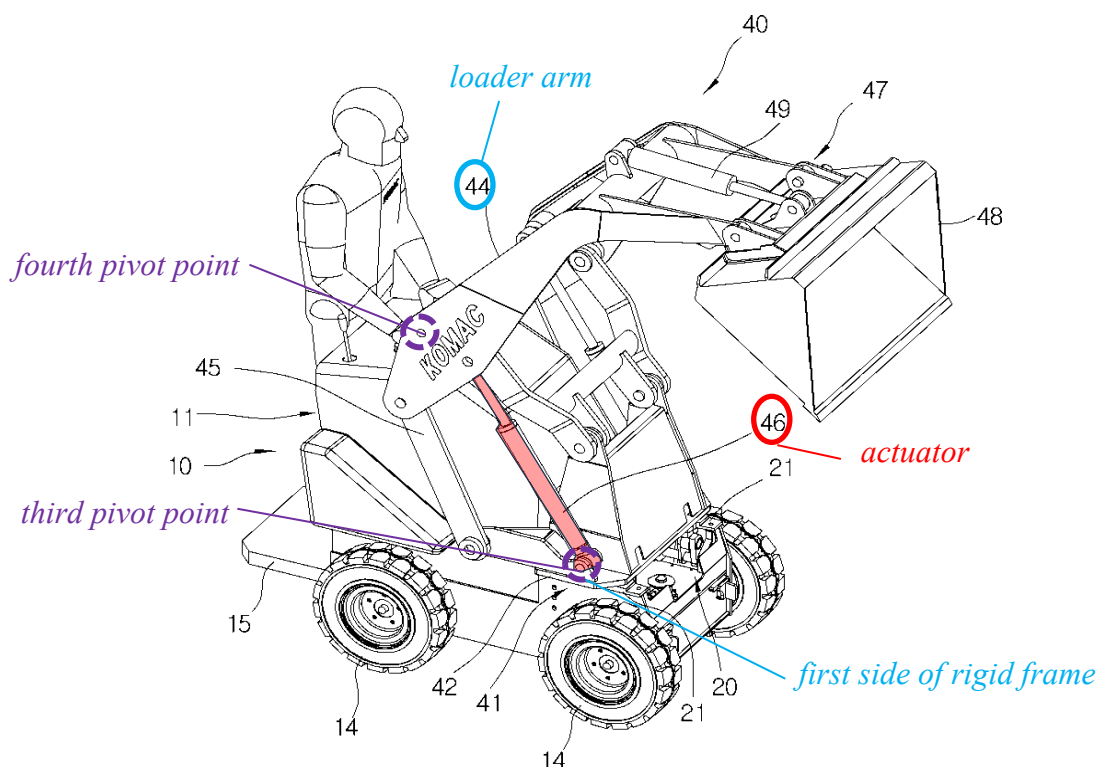
126. As in [1.3]-[1.4], these linkages are pivotable connections with the loader support/rigid frame as well as with the loader arm. This is a standard four-bar mechanism configuration and shown by Figs. 8 and 9 and the rotary joints.

Thus, this element is taught by KR996.

[7.5] an actuator pivotally attached to the first side of the rigid frame at a third pivot point and pivotally attached to the loader at a fourth pivot point; and

127. KR996 teaches this element.

128. KR996 describes a boom cylinder 46 (*actuator*) that drives the boom 44, which is the arm of the loader unit 40 (*loader*). *See* [1.5], EX1005, [0054], claim 1, [0134], Figs. 8-9, 21. The boom cylinder 46 (*actuator*) is *pivotally attached to the first side of the loader support at a third pivot point and pivotally attached to the boom 44 (an arm of the loader) at a fourth pivot point*. Fig. 9 below is illustrative:



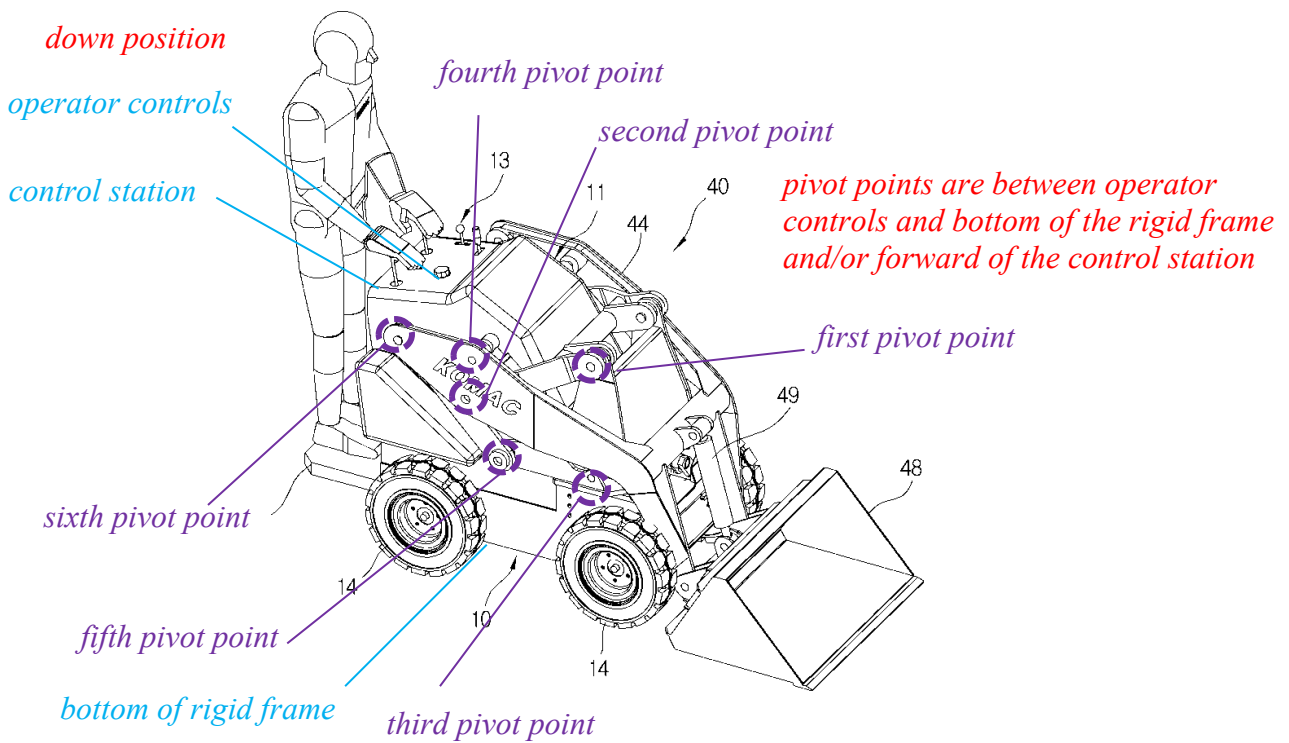
**EX1005, Fig. 9
(annotated)**

129. As in [1.5], the boom cylinder is an actuator and as discussed above both ends of the actuator are attached at pivotable connections (e.g., loader

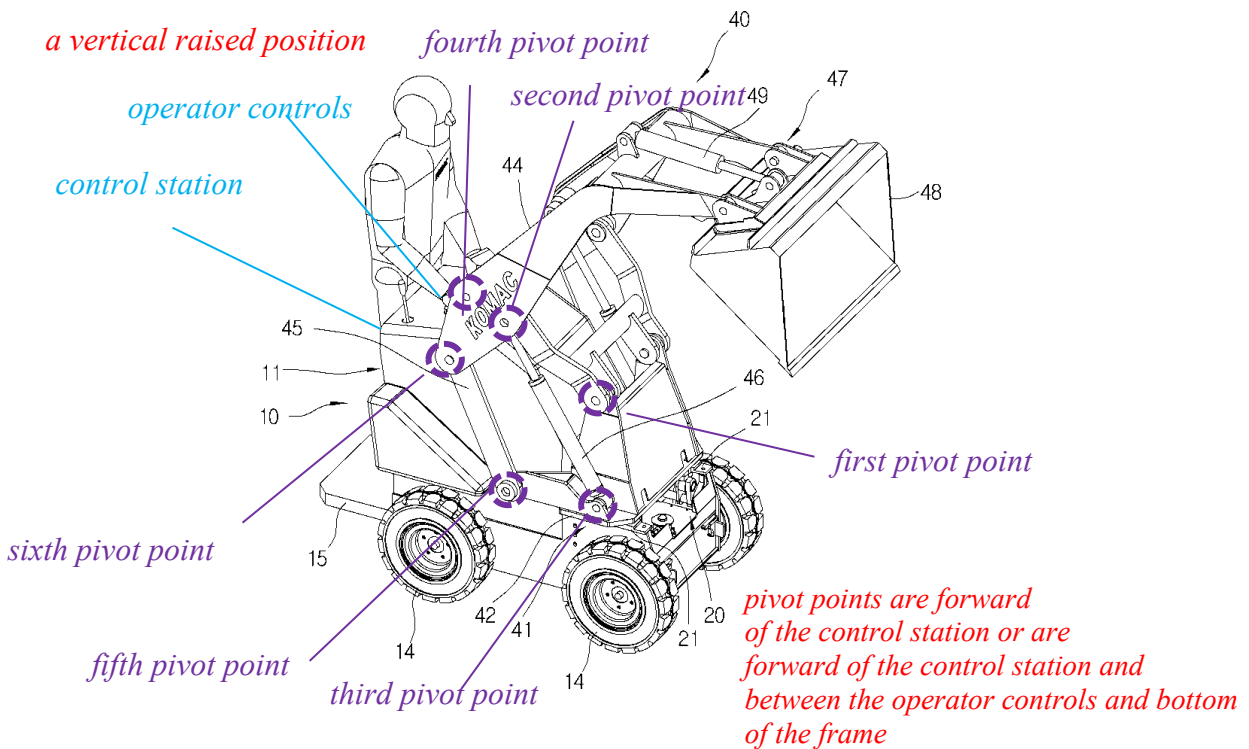
support/rigid frame as well as with the loader arm). This is configuration of an actuator to perform its function of driving the four-bar mechanism configuration as discussed in [1.5]. Thus, this element is taught by KR996.

[7.6b] wherein, as the loader travels from the down position to the vertically raised position, the first, second, third, fourth, fifth and sixth pivot points are (1) disposed between the operator controls and the bottom of the rigid frame and/or (2) disposed forward of the control station; and,

130. KR996 illustrates as the loader travels from *a down position* (Fig. 8) to a *vertically raised position* (e.g., Figs. 7, 9) of [7.2], the *first, second, third, fourth, fifth, and sixth pivot points* are (1) *disposed between the operator controls* of control unit 13 and *the bottom of the rigid frame* and/or (2) *disposed forward of the control unit 13 (control station)*. KR996's Figs. 7-9 are illustrative:

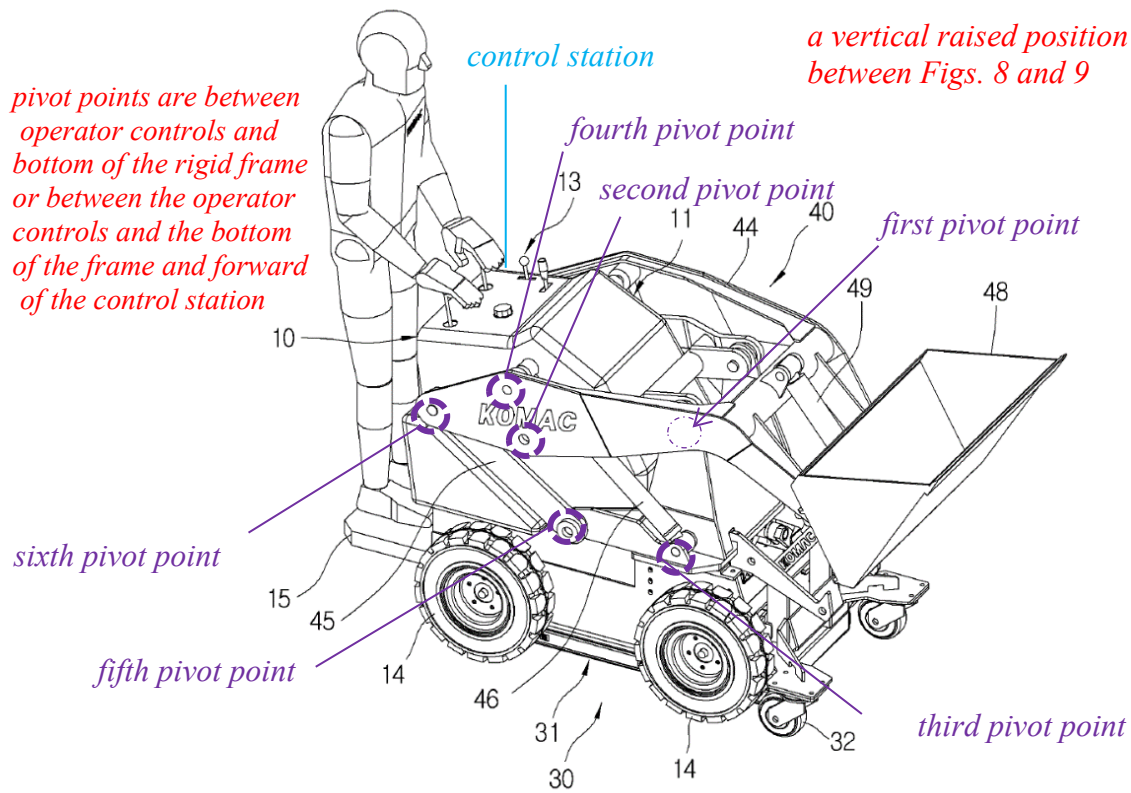


**EX1005, Fig. 8 (portion)
(annotated)**



EX1005, Fig. 9
(annotated)

131. Fig. 7 of KR996 is also illustrative of a *vertically raised position*:



**EX1005, Fig. 7
(annotated)**

132. To the extent Patent Owner argues KR996's figures are insufficiently to scale to directly teach the location of the pivot points, the configuration would have been obvious. First, a simple inspection of KR996's figures suggest to POSITA to apply these claimed pivot point connections. KR996 (EX1005), Figs. 7-9, 21. Second, POSITA would have recognized placing pivot point attachments to the rigid frame low to lower the center of gravity of the apparatus and reduce the frame requirements. This is discussed in further detail with respect to claim 14. Positioning the pivot points lower on the mainframe, lowers the gravity center

avoiding tipping and the like. Third, POSITA would have recognized a benefit to provide an environment around the operator free from hazard, thus moving the pivot points forward and/or below the controls with which the operator interacts. ISO 3457 on Earth-moving machinery – Guards – Definitions and requirements (EX1017) suggests to “minimize the possibility of contact.” EX1017, p. 1.

[7.7] *wherein the loader apparatus does not include an operator's seat.*

133. KR996's vehicle *does not include an operator's seat*. KR996 (EX1005), Figs. 7-9, 21, [0033], [0049].

134. Thus, claim 7 is taught or rendered obvious by KR996.

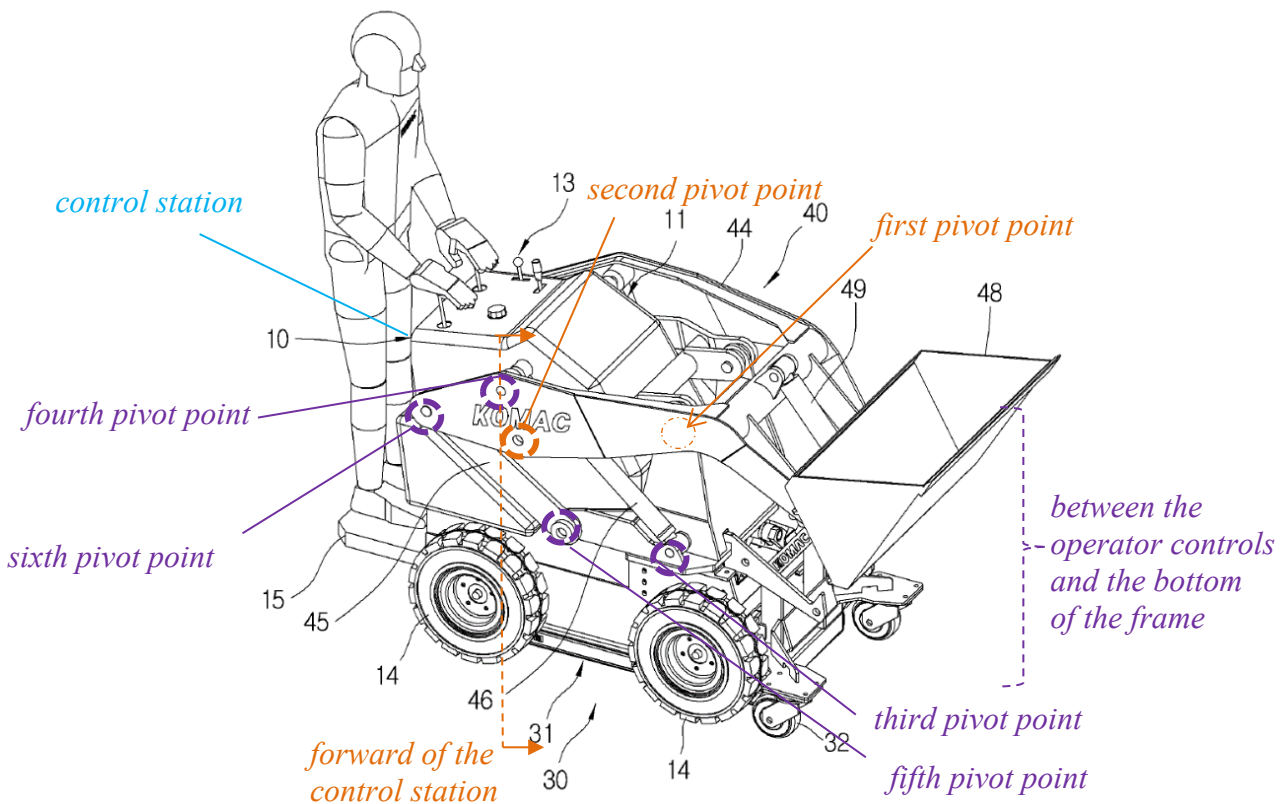
10. Claim 10

[10] *The loader apparatus as set forth in claim 7 wherein, in the vertically raised position, the first and second pivot points are disposed forward of the control station and the third, fourth, fifth and sixth pivot points are disposed between the operator controls and the bottom of the rigid frame.*

135. KR996 teaches this element.

136. KR996 teaches or renders obvious claim 7 and also illustrates in a *vertically raised position* (e.g., Fig. 7), the *first and second pivot points* of the first linkage are *disposed forward of the control unit 13 (control station)* and the *third, fourth, fifth, and sixth pivot points* (those of the boom cylinder 46 and the second link 45) are *disposed between the operator controls* of the control unit 13 and the *bottom of the rigid frame*. Fig. 7 is illustrative of *vertically raised position* (e.g.,

bottom of the bucket 48 is substantially coplanar with the pivot point connections, rather than as illustrated in Fig. 8). This same configuration would be applied during operation of the loader unit 40 (e.g., between Fig. 8 and Fig. 9).



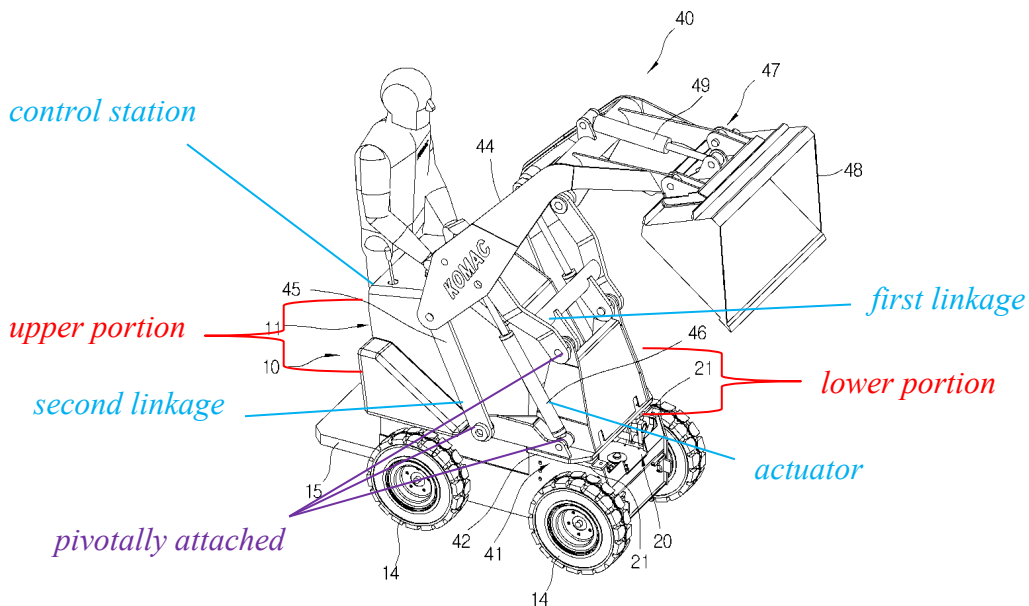
EX1005, Fig. 7
(annotated)

137. Thus, claim 10 is taught or rendered obvious by KR996.

11. Claim 11

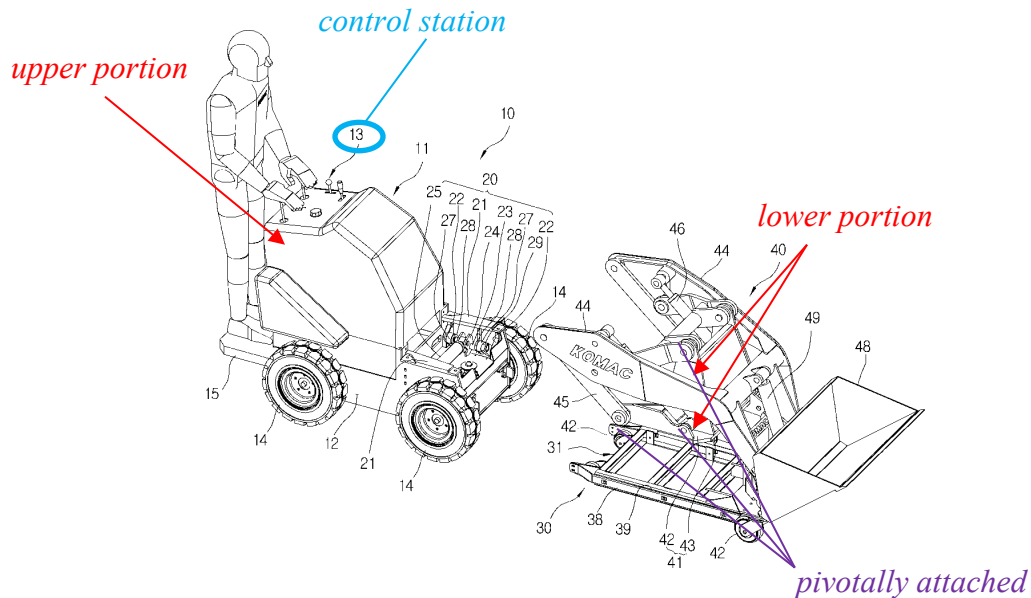
[11] The loader apparatus as set forth in claim 7 wherein the rigid frame comprises a lower portion and an upper portion attached to the lower portion, the first linkage, the second linkage and the actuator each being pivotally attached to the lower portion, the upper portion supporting the control station.

138. KR996 teaches or renders obvious claim 7 and the *rigid frame* of KR996 also includes *a lower portion* and *an upper portion* attached to the lower portion in operation. The *upper portion* includes main body 11 and is *supporting* the control unit 13 (*control station*). KR996 (EX1005), [0016] (“a control unit installed...”). And the *lower portion* includes the rigid frame portion with the pivot point attachments to the linkages/actuator. Fig. 9 is illustrative of the portions together in operation:



**EX1005, Fig. 9
(annotated)**

139. To the extent Patent Owner asserts that the upper and lower portions must be separable, KR996 also teaches this. Fig.1 is illustrative:



**EX1005, Fig. 1
(annotated)**

140. Thus, KR996 discloses or renders obvious claim 11.

12. Claim 12

[12] *The loader apparatus as set forth in claim 7 wherein the rigid frame comprises a lower frame and an upper frame, the control station being attached to the upper frame.*

141. KR996 teaches or renders obvious claim 7 and provides the *rigid frame* of KR996's vehicle includes *a lower frame and an upper frame* with control unit 13 (*control station*) attached to the *upper frame*, as discussed above in [11].

Thus, KR996 discloses or renders obvious claim 12.

13. Claim 13

[13] *The loader apparatus as set forth in claim 7 wherein the rigid frame incorporates a single weldment.*

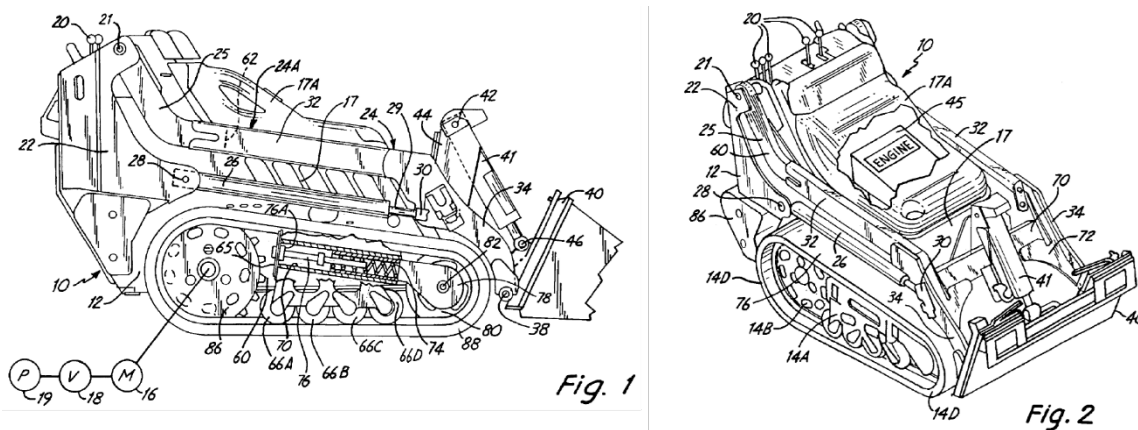
142. KR996 teaches or renders obvious claim 7 and it would have been obvious for the *rigid frame* of KR996 to *incorporate[] a single weldment*, as discussed in [3] (loader support applying equally to a rigid frame) including by implementing the well-known choice of welding as a fastening means.

143. Thus, KR996 discloses or renders obvious claim 13.

D. Ground 2 : KR996 and Bares

1. Bares (EX1010)

144. Bares “relates to a small...walk behind loader that is, in the form shown, track propelled.” Bares (EX1010), 1:33-35. Bares provides a first embodiment illustrated by side and perspective views in FIGS. 1-2, reproduced below. Bares (EX1010), 2:14-16.

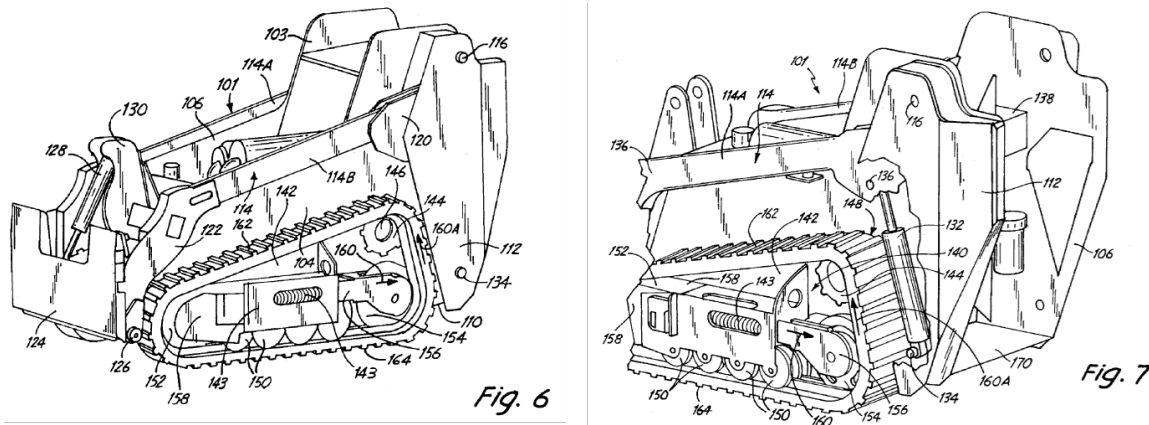


EX1010, FIGS. 1, 2

145. A track assembly 14 is on each side of the loader for propelling the loader in a forward or reverse direction through use of drive hydraulic motors

indicated generally at 16, which are operated through a pump 19 “driven by an internal combustion engine 45 mounted on the [frame] 12.” Bares (EX1010), 2:35-46.

146. Bares also describes modified carrier with a drive motor 146 and a drive sprocket 144 raised above a tensioner idler wheel. Bares (EX1010), 1:59-63, 5:24-29, FIGS. 6-8.



EX1010, FIGS. 6, 7

147. Bares describes its loader can be a “walk behind unit, or can have a support platform 170 for supporting an operator.” Bares (EX1010), 5:55-57. Bares also recognizes in lieu of track assemblies, wheels are also a common configuration for this type of vehicle. Bares (EX1010), 2:1-11, 4:44-51.

2. Reasons to Combine KR996 and Bares (KR996-Bares)

148. KR996 and Bares are analogous art to the '266 Patent because they

are in the same field of endeavor as the '266 Patent, pertaining to working vehicles (e.g., earth-moving equipment) and in particular, self-propelled vehicles with a stand or walk behind operation and a loader. KR996 (EX1005), Abstract, [0001], FIG. 21; Bares (EX1010), 5:55-57, FIGS. 1-8; '266 Patent (EX1001), 1:21-35, 2:61-3:5, FIG. 1. KR996, Bares, and '266 Patent are also each reasonably pertinent to a same problem faced by the inventor regarding the need to provide compact tool carriers with a relatively low-profile, compact design. KR996 (EX1005), [0008]-[0009], [0012]; '266 Patent (EX1001), 1:36-40, 2:61-3:5; Bares (EX1010), 1:46-58.

149. POSITA would have been motivated, and found it easy, to combine the extended frame of Bares with KR996 to produce a predictable and beneficial configuration of a barrier adjacent the operator's environment on the safety step. POSITA would have recognized a benefit in Bares' configuration as it provides operator protection suggested by industry standards. For example, ISO 3457 (EX1017) standard is directed to guards for earth-moving machinery such as KR996 and Bares. ISO 3457 would have suggested to a POSITA to provide Bares' extension of the mainframe to provide a barrier between the KR996's operator and drive mechanism or loader, as should a hazard exist, a "guard that restricts the movement of a person's body or a part of it, in order to avoid its contact with a machine component or exposure to other, similar hazards" is desired. ISO 3457 (EX1017), p.

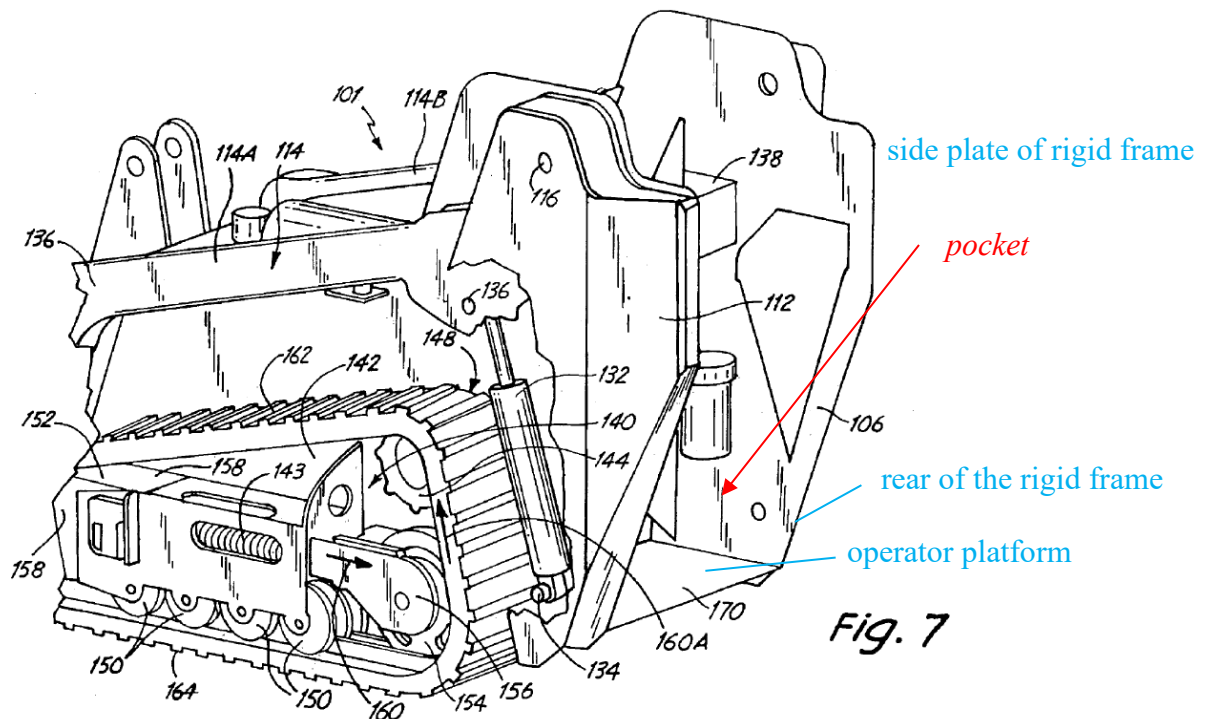
1. By providing the extension of the frame of Bares to that of KR996, a barrier is provided between an operator and the equipment (e.g., drive mechanism and/or loader) avoiding contact with the drive mechanism/loader and/or debris generated. POSITA would have had a reasonable expectation of success in implementing the configuration as it merely extends a portion of the existing frame adjacent the safety step 15 of KR996 adjacent the operator. See, e.g., McIlwraith (EX1007) at 3:19-24, FIGS. 1-3. Further reasons to combine the teachings of Bares are provided in Ground 3.

3. Claim 8

[8] *The loader apparatus as set forth in claim 7 wherein the rigid frame defines a pocket toward a rear of the rigid frame to partially surround an operator.*

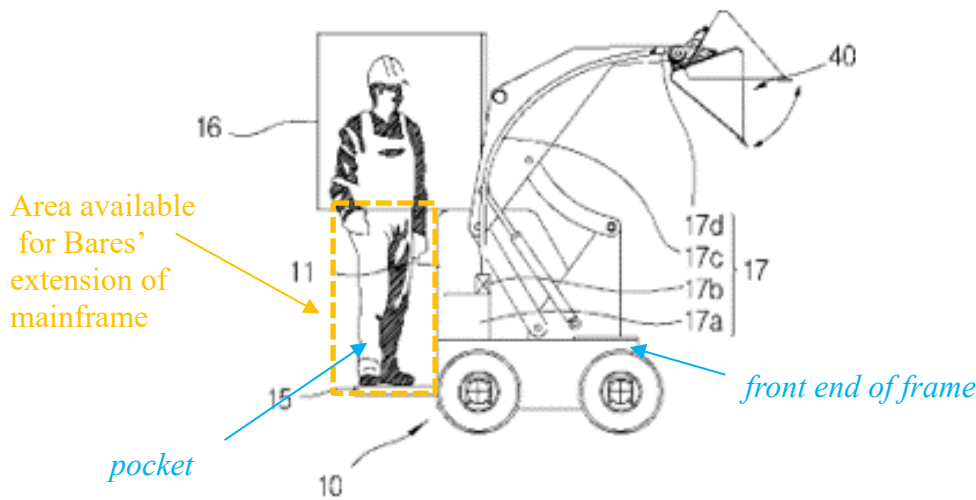
150. KR996 in view of Bares provides this element.

151. KR996 teaches and/or renders obvious claim 7 including providing a rigid frame. KR996 also describes an operator's safety step 15 that extends from that rigid frame. KR996 (EX1005), Figs. 1, 7-10, 21, [0033], [0049]. Bares similarly describes a step at the rear of a compact loader on which the operator stands during operation: "platform 170." Bares (EX1010), 5:55-57, FIG. 7. Bares illustrates a portion of a *rigid frame* – side plates 104, 106 – extends such that platform 170 is at least partially within *a pocket* defined by the extension of the frame and thus, is toward the rear of the rigid frame. FIG. 7 of Bares is illustrative:



EX1010, FIG. 7
(annotated)

152. Extending the frame as taught by Bares to KR996's vehicle provides the frame defines a pocket toward a rear of the rigid frame to partially surround an operator while positioned on the safety step 15.



□ **EX1005, Fig. 21
(annotated)**

153. Thus, claim 8 is rendered obvious by KR996 and Bares.

4. Claim 9

[9] The loader apparatus as set forth in claim 8 further comprising an operator platform at least partially within the pocket.

154. KR996 and Bares teach this element.

155. KR996-Bares renders obvious claim 8 and provides a safety step 15 (operator platform) at least partially within the pocket provided by the frame extension of Bares, where adjacent the step 15 the extended frame forms a “pocket.” The pocket is shown by the annotation of Fig. 21 above and the safety step 15 is at least partially within the pocket. See also, Bares (EX1010), FIGs. 6-8, EX1007, Fig. 3.

156. Thus, claim 9 is rendered obvious by KR996 and Bares.

E. Ground 3 : KR996, Bares, and Beltrami

157. Claims 14-16 and 19-27 are rendered obvious by KR996 in combination with the teachings of Bares, which describes not only the extension of the mainframe discussed above, but also a track assembly, and the teachings of Beltrami, which teaches pivot point attachment techniques of vertical lift style loader arms. Bares is discussed above, Beltrami below, and below discusses their reasons to combine.

1. Beltrami (EX1008)

158. Beltrami, a patent issued in June 1971, is directed to digging and lifting devices “fitted on tractors or like tracked, half-tracked, wheeled or like self-propelling means, which comprise a standard bucket adapted to be driven upwardly...to dump the soil or other excavated material.” Beltrami (EX1008), 1:5-15. Beltrami begins by reviewing an “already well known” loader configuration with arm(s) supporting a bucket at one end and with an opposite end(s) directly, pivotally connected with a stationary pivot point providing a curved lift path. Beltrami (EX1008), 1:16-52, 2:41-3:7; FIG. 1. This first embodiment of Beltrami is a radial lift loader implementing a two-bar mechanism as I discussed above.

159. Recognizing drawbacks of a radial lift, Beltrami describes a **vertical** lift loader where the arms are not directly connected to the body of the vehicle rather attached using two connecting rods (i.e., linkages) and a hydraulic jack (i.e.,

actuator), which are pivotally attached to raise the loader arm and mounted bucket in a more vertical manner. *See* Beltrami (EX1008), FIGS. 2-4, 1:57-2:25, 3:12-34. Beltrami recognizes a desire to keep the pivot point connections between the intermediate parts and mainframe “**in such a low position on the vehicle** that no supporting frame is needed...and finally a lifting can be performed without having the equipment center of gravity undergo an unnecessarily large shifting.” Beltrami (EX1008), 3:35-45.

2. Reasons to Combine KR996 and Bares (KR996-Bares)

160. Bares and KR996 are analogous art to the '266 Patent as shown in Ground 2, which also discusses reasons to combine Bares in the context of its frame extension also applicable here.

161. POSITA would have been motivated to combine the teachings of Bares with KR996 to produce a predictable and beneficial configuration of a track assembly on the vehicle. The simple substitution of Bares' track assembly for the wheels in the KR996 vehicle would have been predictable with a reasonable expectation of success because both KR996 and Bares relate to similar vehicle types with a similar mainframe having a drive mechanism attached thereto.

162. Designing this vehicle type with a drive mechanism of either a wheeled assembly or a tracked assembly was a known alternative. *See* Rorabaugh (EX1032) [0011], which describes a compact tool carrier having a track or “[a]lternatively, ...a

wheeled unit.” Bares itself recognizes that wheel and track assemblies were known alternatives. Bares (EX1010), 2:1-2. Bares ’568 (EX1009), 4:30-39 (“[t]he propulsion system for moving the loader is disclosed specifically as a track unit. However, skid steer loaders are commonly mounted on wheels...Thus the propulsion system that supports the loader for movement can be sets of wheels mounted in place of the tracks shown.”). Industry standards for compact tool carriers also recognize these two common alternatives: “self-propelled crawler [tracked assembly] or wheeled machine.” SAE J2752 (EX1015), p. 2, ISO 6165 (EX1016), p. 5 (“self-propelled [] machine on wheels, crawlers or legs...”.) A crawler is a track assembly.

163. It was a known practice to market compact tool carriers such as KR996 and Bares to provide the buyer a choice of a wheel configuration or a track configuration. The buyer’s choice may be dependent upon the target terrain for the carrier’s use. For example, depending on the terrain, a buyer may choose a tracked assembly for example, if targeting applications with a more diverse or rocky terrain. KR996 provides for use in deconstruction work, which can provide uneven terrain and debris that its vehicle must traverse, which would benefit from a tracked configuration. The traction provided by a tracked configuration is also typically greater than the traction provided by wheeled configurations. Tracked vehicles spread their ground load over a much greater surface area than wheeled vehicles.

This results in lower pressure over the ground and less likelihood of the vehicle sinking on soft surfaces such as mud. Moreover, the significantly larger contact patch (surface area in contact with the ground) allows for much higher torque transmitted to the ground without slippage, i.e., better traction. Also, by having a continuous tread, tracked vehicles have the ability to cross holes and trenches in which wheels would sink.

164. In some desired applications for the vehicle, a POSITA would have had reason to replace the wheel configuration, which can provide higher pressure to the supporting surface of the vehicle, with a track configuration, which can provide a reduced pressure to the supporting surface. The choice to provide the tracked configuration can be driven by the surface composition and/or need to mitigate impact to said surface intended for the vehicles use. For example, track configuration, providing lower ground pressure, can be advantageous on soft surfaces.

165. A POSITA would have recognized a reasonable expectation of success in providing a tracked assembly on the KR996 vehicle as track assemblies were well known in the art and perform the same function as the wheel mounted drive mechanism illustrated in KR996. This is simple substitution of one known, equivalent element for another to obtain predictable results and performing the same function. And Bares describes its track assembly can be easily installed. Bares

(EX1010), 1:8-16.

3. Reasons to Combine KR996-Bares and Beltrami

166. KR996-Bares and Beltrami are analogous art to the '266 Patent because they are in the same field of endeavor of earth-moving machinery. EX1001, 1:21-35; EX1005, Abstract; EX1008, 1:5-15. In fact, each of KR996 (including as modified by Bares) and Beltrami, like the '266 Patent, are directed to earth-moving machinery with a vertical lift loader. EX1001, FIG. 1; EX1005, Fig. 9; EX1008, Figs. 2-6, 2:10-15. KR996-Bares and Beltrami are also analogous art to the '266 Patent because they are reasonably pertinent to a same problem faced by the inventor providing a vertical lift path for the attached tool in operation. EX1001, 1:41-43; EX1005, Figs. 8-9; EX1008, 1:24-40.

167. A POSITA would have been motivated to combine the teachings of Beltrami including locating the pivot point attachment of intermediary parts **low** on the mainframe and KR996 in view of Bares to produce a predictable and beneficial vehicle configuration. As discussed above, KR996-Bares and Beltrami describe a loader arm configuration that is attached to a vehicle using intermediate parts (linkages and hydraulic cylinder) pivotally attached to a mainframe that forms a four bar mechanism as I discuss above starting at paragraph 33. KR996 (EX1005), Figs. 8, 9; Beltrami (EX1008), Figs. 2, 3, 6. Beltrami explains the well-known knowledge in vehicle designs: the locations of the pivot point connections between each of these

intermediate parts (links and actuator) and the mainframe are result-affecting variables that can be selected based on desired performance. Beltrami (EX1008), 4:35-50 (“The **path []** can be modified at the convenience both in the manufacturing stage e.g. by an **arrangement of pivot points...**”); 5:61-65 (“Even in the latter embodiment **the shape of the path 125** can be **modified** by the previously specified means adapted to **change the position of pivot points** and in particular of pivot points 109 and 112 [pivot points between vehicle frame and rods (links)].”) The pivot point locations, like the linkage lengths and positions, determine the output motion of the four-bar mechanism, here the loader path. *See also*, EX1025, Theory of Machines and Mechanisms, Shigley, J.E. and Uicker, J.J. Jr., McGraw Hill, 1980. Thus, a POSITA would have recognized that a design of a vehicle such as KR996 includes routine determination of pivot point locations, because it was well-known that pivot point locations are result-affecting design variables for desired performance of the mechanism, as confirmed by Beltrami.

168. In considering the pivot point locations, a POSITA would have had reason to further apply Beltrami’s teachings of locating the pivot point attachments between the intermediate parts (linkage(s)/actuator) and the mainframe **low** on the mainframe to position the attachment points near the rotational axis such that the distance between the pivot points and the axis is, for example, less than 1.5 times the distance between the axis and the ground (and/or less than 0.75 times the distance

between the axis and the bottom of the frame), or less. Beltrami describes that benefits of positioning the location of these pivot point attachments low on the equipment include decreasing the frame requirements and maintaining a low center of gravity. Beltrami (EX1008), 3:35-41. A POSITA would recognize that these benefits stem from basic engineering principles, i.e., attaching the loader low on the carrier lowers the center of mass. And providing pivot points lower reduces the mainframe structural needs above the attachment point. The lower the center of mass, the more stable the skid steer is to tipping over due to a working load and/or the slope of the ground that the loader is traversing. The working load comes from the weight of the attached tool, the weight of the material being lifted and/or the forces imposed on the loader from the job itself. The tendency of the working load and the slope of the ground to tip the loader is compensated by the skid steer's weight, track width, wheelbase, and the location of its center of mass. Compact tool carriers are limited by overall weight and dimension, so the primary means of reducing the center of mass is by attaching the loader as low as possible on the machine. This will result in the lowest possible center of mass throughout the motion of the loader. A POSITA would also recognize these same benefits would be gained by providing the pivot points of the similarly configured loader of KR996-Bares low on its frame, in particular, a relatively small vertical distance from the rotational axis of the drive mechanism.

169. A skid steer's ability to turn is based on differential speeds on either side of the vehicle. This allows for the vehicle's ability to negotiate very tight spaces. In fact, a skid steer can rotate with near zero radius of curvature by propelling opposite side wheels/tracks at equal and opposite speeds. The lateral cornering force on a turning vehicle is proportional to its forward speed squared and is inversely proportional to the radius of curvature of its path. Even with a low forward speed, these lateral forces can be relatively large with low radius of curvature turns. Moreover, the slope of the ground being traversed can add to the likelihood of tipping. Since skid steers have generally narrow track widths, such low radius of curvature turns can cause the skid steer to tip laterally. This is also mitigated by a low center of gravity. Thus, similar to above, a POSITA would recognize the benefits gained by providing the pivot points of the similarly configured loader of KR996 low on its frame, in particular, a relatively small vertical distance from the rotational axis of the drive mechanism, to lower the center of gravity.

170. Thus, the proposed combination of the teachings of Beltrami is merely applying a known technique to a known device (*e.g.*, Beltrami's suggestion of lowering pivot point attachments when mounting a four-bar mechanism to a vehicle, applied to KR996's pivotally attached four bar mechanism) ready for improvement (*e.g.*, decreasing the frame requirements and/or lowering the center of gravity) to yield predictable results.

171. The results of combining Beltrami's technique with KR996-Bares would have been predictable and there would have been a reasonable expectation of success in the combination given that both KR996 and Beltrami relate to similar vehicles with a similar configuration of its loader. In particular, both references illustrate a loader based upon a four-bar mechanism. Modifying the vehicle of KR996-Bares to provide low pivot points for the attachment of the intermediate parts (linkages/actuator) would have been a straightforward and simple matter well within the skills of a POSITA during a typical vehicle design process. I further discuss the predictability of applying these teachings to KR996 vehicle including as modified by Bares below and with respect to Appendix A (EX1004).

4. Claim 14

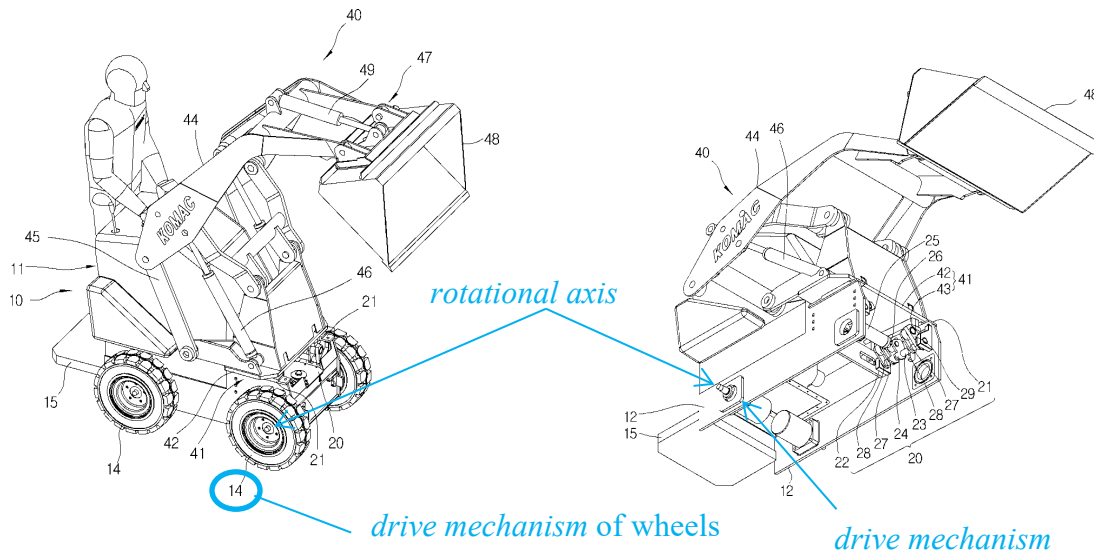
172. The analysis of claim 14 is the same as that for claims 1 and/or 7 in Ground 1, with additional elements discussed below the cross-referencing chart.

		Refer to analysis in:
[14.0]	<i>A loader apparatus for standing or walk-behind operator control and comprising:</i>	[7.0]
[14.1]	<i>a loader adapted to carry a tool;</i>	[7.2] including loader unit 40 (<i>loader</i>) carrying bucket 48 (<i>tool</i>)

[14.2]	<i>a loader support for supporting the loader, the loader support having a first side and a second side, the loader being free from direct attachment to the loader support;</i>	[1.2] KR996's frame provides a <i>loader support</i>
[14.3]	<i>a first linkage pivotally attached to the first side of the loader support at a first pivot point and pivotally attached to the loader at a second pivot point;</i>	[7.4] including link (<i>first linkage</i>)
[14.4]	<i>an actuator pivotally attached to the first side of the loader support at a third pivot point and pivotally attached to the loader at a fourth pivot point; and</i>	[7.5] including boom cylinder 46 (<i>actuator</i>)
[14.5]	<i>a second linkage pivotally attached to the first side of the loader support at a fifth pivot point and pivotally attached to the loader at a sixth pivot point; and</i>	[7.6a] link 45 (<i>second linkage</i>)
[14.6]	<i>a drive mechanism...less than 1.5 times D1.</i>	See below

[14.6a] *a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the rotational axis R and a bottom of the first side of the loader support being separated by a vertical distance D5...the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1*

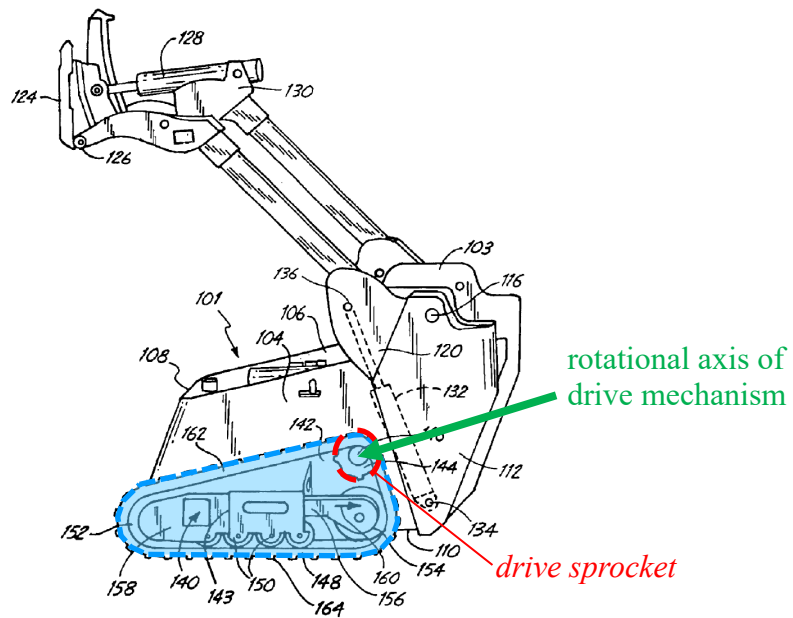
173. KR996 describes a drive mechanism including “wheels (14)” having a rotational axis and for propelling the vehicle (loader apparatus) over a supporting surface (e.g., ground). EX1005, [0042], Figs. 1, 8-10.



**EX1005, Figs. 9, 10
(annotated)**

174. It would have been an obvious, simple substitution of KR996's wheeled assembly *drive mechanism* for a track assembly. Bares illustrates a track assembly (*drive mechanism*) for *propelling* a small loader vehicle. Bares (EX1010), Figs. 1, 8, 2:36-37, 3:24-32, 5:18-43. Bares illustrates each track assembly includes a frame 142, a drive sprocket 144 (*drive sprocket*) and wheels 150, 154 over which a track 148 is mounted. Bares (EX1010), 5:18-42, FIGS. 6-8. Bares explains its drive mechanism is *for propelling the loader apparatus over a supporting surface*. See EX1010, 2:37-39 (“[**ground drive**] **assembly** [] on each side of the loader for **propelling the loader in forward** and reverse directions.”), 5:18-43 (“to power the unit and propel it over the ground.”) And Bares’ drive sprocket 144 driven by motor

146 defines, and rotates above, *a rotational axis*, just like in the '266 Patent. Bares' drive mechanism as illustrated and on KR996's provides these same features.



EX1010, FIG. 8
(annotated)

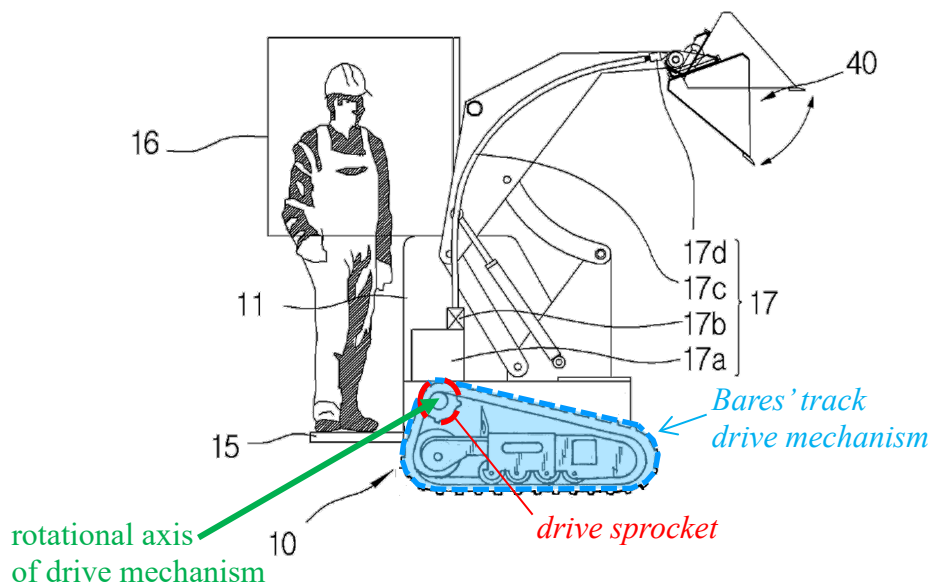


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

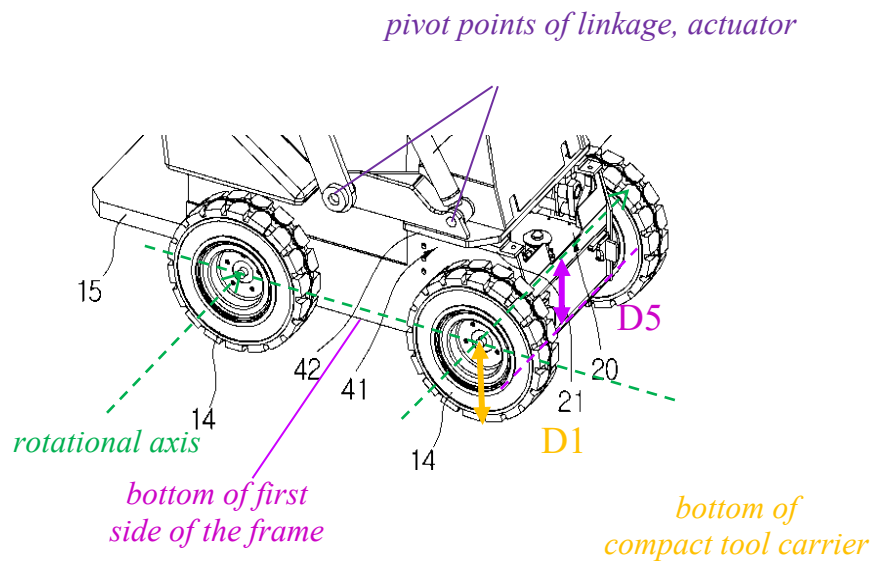
Figure A is but one example of implementation based on Figure 21 of KR996, with how a POSITA would understand Bares' track assembly, taken from Bares' FIG. 8, would be applied to the vehicle. (The illustration of the tracked assembly of Bares' FIG. 8 is flipped and lead lines/labels removed substituted for KR996's Fig. 21's wheel assembly.)

175. KR996's vehicle with Bares' track assembly has a *bottom* at which track 148 of the track assembly (*drive mechanism*) *contacts the supporting surface* (e.g., ground). The *rotational axis* and *bottom of the compact tool carrier* are separated by a *vertical distance D1*. A POSITA would recognize that this distance D1 (between the rotational axis and the bottom of the carrier (i.e., contacting ground)) is a result affective variable that is selected in the design process. D1 is determined by a size (i.e., diameter) of the wheels. And the size of the wheels is selected based on the desired function of the equipment including the desired terrain, its intended operational speeds, and the drivetrain's characteristics. For example, wheel size and associated vehicle ground clearance would dictate the size of the obstacles that the equipment would be able to overcome. Should the equipment be targeted for operation over rough terrain with larger obstacles, the distance between the rotational axis and the ground can be increased. In some implementations, the carrier may include a track assembly as drive mechanism, which is a known alternative to wheels. *See* Bares '568 (EX1009), FIG. 1.

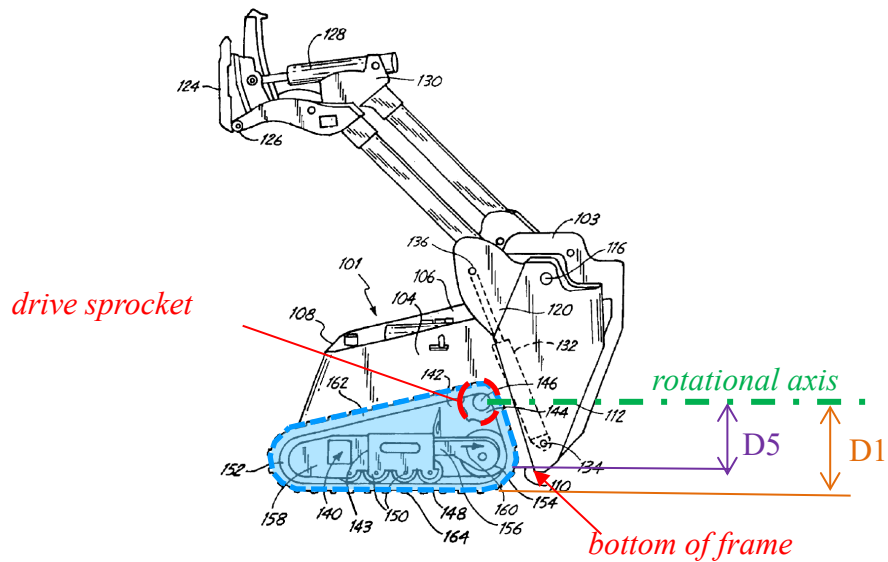
176. The rotational axis and the bottom of the first side of the mainframe are separated by a vertical distance D5. A POSITA would also recognize that this distance [D5] is a result-affective variable selected in the design process. A POSITA would determine the distance D5 based on the desired terrain and function of the vehicle such that suitable clearance is provided between the frame and the ground. Further, an increase in D5 provides for additional frame structure to distribute the stress of supporting the loader arm, drive mechanism, and other attachments. Moreover, an increase in D5, while reducing ground clearance, would allow for a benefit of a lower center of gravity of the equipment.

177. Each of KR996 and Bares⁴ illustrate D1 and D5, and the distances remain in KR996-Bares.

⁴ See also, Bares (EX1010), Figs. 4-5, slide frame 64.



KR996 (EX1005), Fig. 9 (portion)
(annotated)



EX1010, FIG. 8
(annotated)

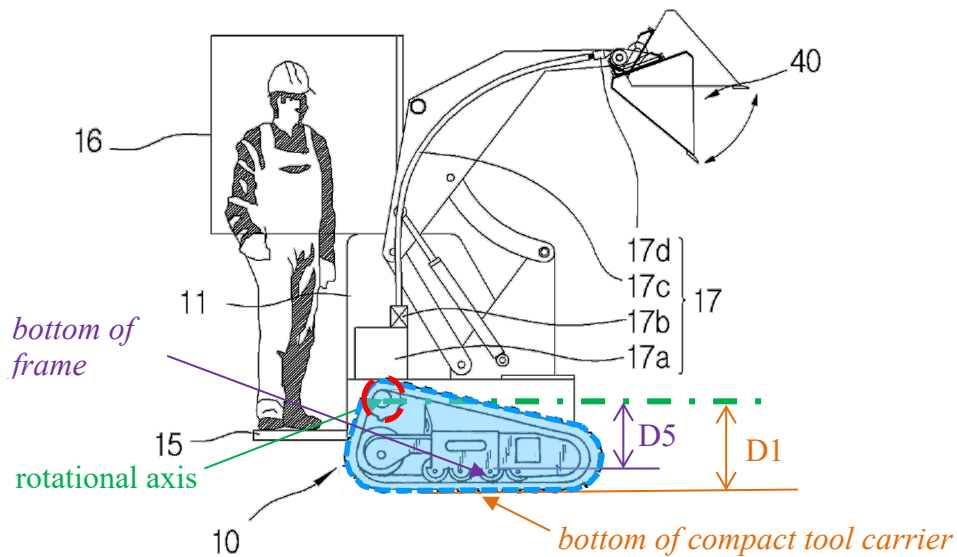


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

178. The vertical distances D1 and D5 are required for the functionality of the carrier, i.e., the sprocket 144 defining the rotational axis is disposed above the bogie wheels 150 and guide wheel 152 portion of the assembly thus, a vertical distance D1 from the ground and a vertical distance D2 from bottom of the mainframe. Bares describes its “plates 104, 106...extend all the way to the bottom of the loader frame, the lower edge line of which is shown at 110, in FIG. 8.”) See also, Bares (EX1010), 5:22-23 (“These frame assemblies [140] include frame plates 142, bolted onto the frame plates 104 and 106.”) There are design considerations that a POSITA would recognize suggest advantages to raising the sprocket location

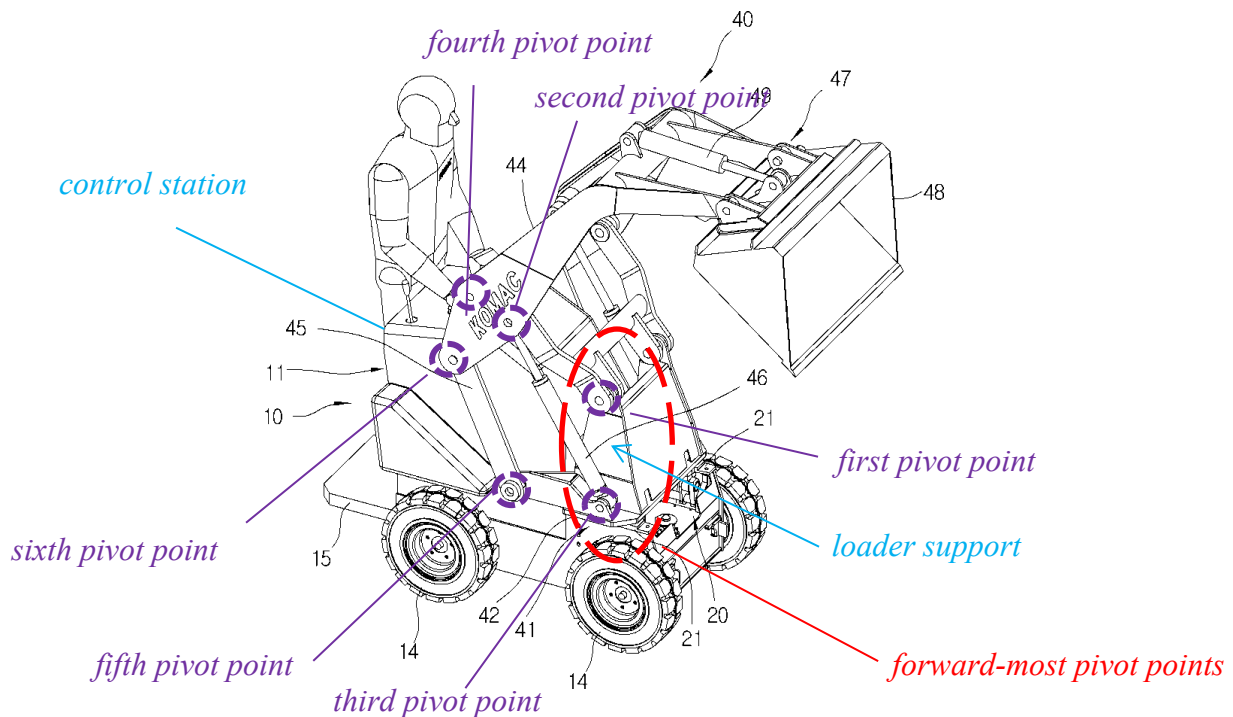
(e.g., increase in protection from damage (e.g., debris or harsh conditions) and ease of connection to drive system. Oestmann (EX1035), US 3,828,873, 1:12-14 illustrating disadvantage of a low drive sprocket “closely adjacent to ground level to thus subject it to wear and damage.” This raised sprocket is a typical design choice implemented in such tools. SAE Standard, p. 11, Valere (EX1033), FIG.1, [0021], Oestmann (EX1035), FIG. 1. Moreover, the guide wheel’s size is selected based on the obstacles that the vehicle must overcome. A separate sprocket allows for its size to be determined based on the other drive line components' properties, such as the hydraulic drive motors, hydraulic pump output, etc., and the desired loader performance such as speed and climbing ability. Also, a raised drive sprocket allows it to be independent from any motions of the track tensioning system.

179. Thus, KR996 in view of Bares teaches this element.

[14.6b] *the loader support comprising a forward-most pivot point with the first pivot point or the third pivot point being the forward-most pivot point,*

180. KR996 teaches this element.

181. KR996 describes the *forward-most pivot point* of the *first pivot point* or the *third pivot point* as identified in [14.3], [14.4]. Fig. 9 is illustrative:

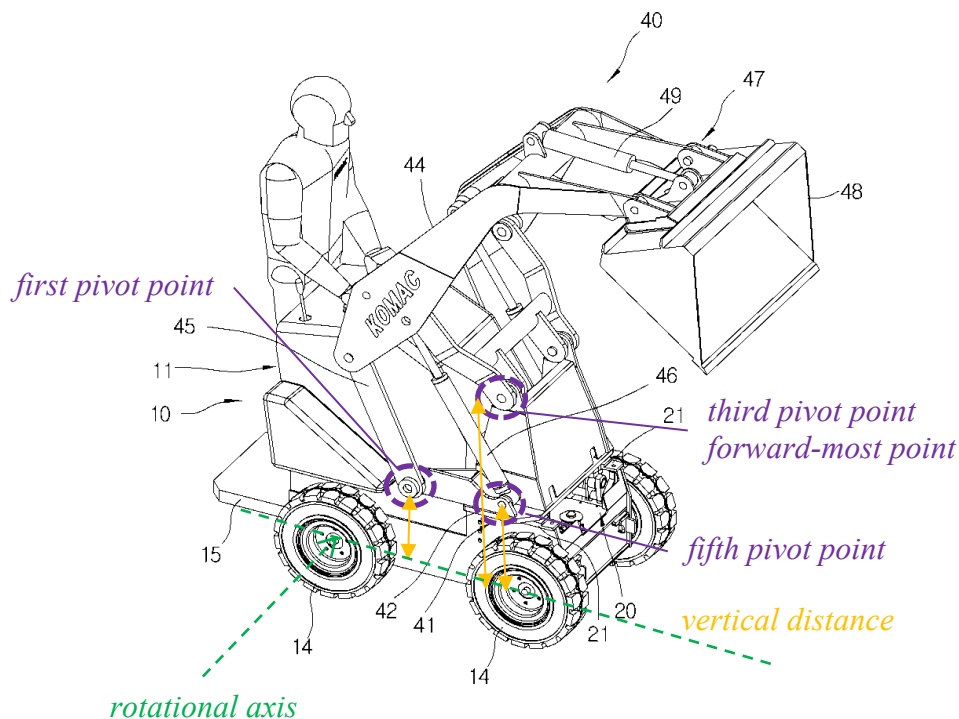


**EX1005, Fig. 9
(annotated)**

See also, KR996 at Fig. 21, which illustrates the first pivot point is the forward-most pivot point. This configuration also is in KR996-Bares as discussed below and is maintained in lowering pivot points as discussed in Beltrami. For example, at a paragraph 206 I illustrate a figure with kinematic outline with the first pivot point being the forward-most pivot point.

[14.6c] a vertical distance between the rotational axis R and the forward-most pivot point being less than $0.75 D5$, ...the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times $D1$, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times $D1$, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times $D1$.

182. KR996 teaches, including through simple review of its figures, that there is a *vertical distance* between each of the *first, third, and fifth pivot point[s]*, those at which the links (*first linkage, second linkage*) and boom cylinder 48 (*actuator*) are attached to the *loader support*, respectively, and the *rotational axis R*. EX1005, Figs. 8-9, 21. In the context of KR996, Fig. 9 is illustrative:



**EX1005, Fig. 9
(annotated)**

183. In the KR996-Bares vehicle, this vertical distance would also be presented and as discussed above, the rotational axis is raised (relative to the illustrates of KR996) in implementing Bares' track assembly, thus, decreasing the vertical distances between the pivot points and the rotational axis.

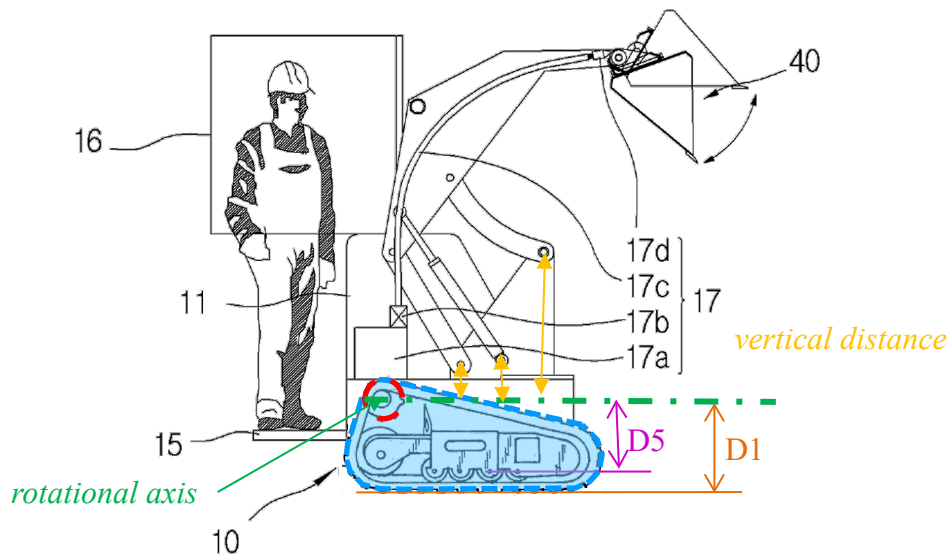


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

184. The *first pivot point* and the *fifth pivot point* appear by plain inspection to be within the recited relative dimension. Additionally, a POSITA would have recognized a benefit to configure the vertical distance between each pivot point, including the forward link, and the rotational axis each being *less than 1.5 D1* and the *forward-most pivot point less than 0.75 times D5* in KR996-Bares vehicle in light of the teachings of Beltrami as discussed below and above with reference to the reasons to combine Beltrami.

185. KR996 teaches the same vertical lift loader with pivot points between the same intermediary parts (linkages/actuator) as the '266 Patent. And configuring

the pivot points as claimed is merely optimization within prior art conditions or through routine experimentation. In other words, both the '266 Patent and KR996 are implementing four-bar mechanisms and arranging that mechanisms attachment to the equipment is simple optimization for desired performance.

186. KR996 teaches the same vertical lift loader configuration as the '266 Patent, also with pivot points between the same intermediary parts (linkages/actuator). And optimization within prior art conditions, i.e., four-bar mechanism and mainframe configuration, or through routine experimentation is easy to perform as I discuss herein.

Standard Practice to Optimize Pivot Point Locations :

187. A POSITA would recognize that changing the linkage lengths and joints (pivot points) configurations of a four bar mechanism adjusts the output path of the mechanism. “The equation of the coupler-point curve for a four-bar linkage may be obtained by analytic geometry.” EX1025, Kinematic Synthesis of Linkages, p. 150. As I discuss above, dimensional synthesis is the act of determining the linkage dimensions, configuration, and joints (pivot points) required to achieve a prescribed coupler output motion should the design require a certain loader path. To the contrary, in a kinematic analysis, the linkage dimensions, configuration and joints are provided and the corresponding coupler output motion is determined (i.e.,

a loader path). To achieve a lower center of gravity, a POSITA would recognize lowering the pivot point attachments and with that goal in mind, optimizing the link lengths and configuration of the link and pivot points (joint) to achieve the desired output path, in some cases, to achieve the equivalent function (if desired). This is merely routine experimentation of optimizing (either through trial and error or through the use of the many analytical methods available in the literature) the variables (link length, link configuration, pivot point/joint configuration) defining the four-bar mechanism output.

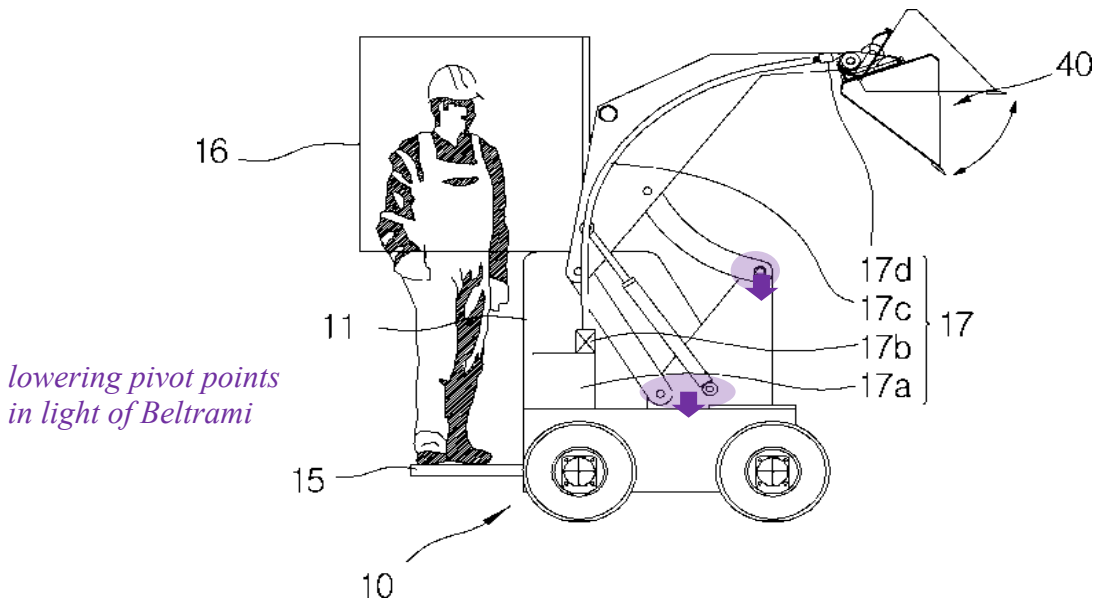
188. As its pivot point configurations affect the four-bar mechanism – loader path - output, it was a routine practice when designing a loader for a vehicle implementing such a mechanism to consider placement of pivot points between linkages/actuator and the mainframe depending on the desired design specifications. In my personal experience teaching and advising students and directing the design of many complex machines, I oversaw the application of these basic engineering principles and the modification of the pivot point attachments and linkage lengths to provide various coupler motion paths through manual calculation as well as through the use of computerized systems (e.g., computer-aided design).

Beltrami Confirms it was Known to Optimize Pivot Point Location Low on Mainframe:

189. Beltrami also confirms that decades prior to the '266 Patent, modifying positions of the relevant pivot points affected the design goals and was a known

technique in designing such a vehicle. Beltrami (EX1008), 4:25-50 (“...a substantially vertical path such as that indicated by the reference number 68 can be obtained by the pivot point arrangement shown in said FIG. ... The path 68 can be modified at the convenience both in the manufacturing stage, e.g., by an arrangement of pivot points different from that shown in the figures...”).

190. And as indicated above, Beltrami also explicitly describes there are benefits in providing the pivot point attachment locations low on the vehicle (*i.e.*, minimizing D2, D4). Beltrami explains “[a]mongst the various advantages, the following ones are to be emphasized: the pivot points 24, 26 and 30 **can be kept in such a low position on the vehicle that no supporting frame is needed; the arm can be lifted with nearly constant power input and speed; and finally a lifting can be performed without having the equipment gravity center** to undergo an unnecessarily large shifting.” Beltrami (EX1008), 3:35-41. See also, Beltrami (EX1008), 2:69-75 discussing “ill-effects” of “shiftings of the equipment gravity center.” A POSITA would recognize that general physics principles dictate that lowering the attachment of the loader arm lowers the center of gravity, which reduces risk of tipping as discussed above beginning at paragraph 168. As Beltrami suggests, lowering the equipment gravity center mitigates, when raising a load, the shifting of the center of gravity to undesired heights.



**EX1005, Fig. 21
(annotated)**

191. Thus, POSITA would have had the skillset, desire, and motivation to provide the pivot points low (*i.e.*, minimizing vertical distance between the pivot points and the rotational axis) to provide, for example, a compact size mainframe and a low center of gravity of the carrier as taught by Beltrami by lowering the attachment pivot points of the links and boom cylinder in the context of KR996-Bares to the extent it is required.

The Benefits of Providing Low Pivot Points were well understood:

192. Further, it would have been obvious to position the pivot points such they are configured are *less than 1.5 times D1* and the forward-most pivot point *less than 0.75 D5* as claimed, or the other dimensions of the '266 Patent or its family. I have reviewed the '266 Patent and recognize that it provides no specific advantage,

benefit, or surprising result to any one of the myriads of claimed relative dimensions related to these pivot points including those of Claim 14. Instead, the '266 Patent espouses only general benefits in general terms:

By positioning the pivot points relatively low on the mainframe 10, the mass of the mainframe 10 and the resulting **cost** of the carrier 5 may be reduced. Further, such a low-profile mainframe 10 **improves visibility for the operator** and **allows the center of gravity** of the carrier 5 to be **lowered** which improves its stability.

'266 Patent (EX1001), 5:62-6:2 (emphasis added). These same advantages of the location of pivot points locations – “relatively low” – were known well before the earliest priority date claimed by the '266 Patent. As discussed above, Beltrami explicitly recognizes advantages of a lower center of gravity and a reduction in frame requirements. Beltrami (EX1008), 3:35-41 (“the pivot points 24, 26 and 30 **can be kept in such a low position on the vehicle that no supporting frame is needed;** the arm can be lifted with nearly constant power input and speed; **and finally a lifting can be performed without having the equipment gravity center** to undergo an unnecessarily large shifting.”), 2:69-75. A POSITA would also have recognized providing pivot points low on the mainframe, and closer to the axis, for the exact same benefits touted in the '266 Patent. This is simply the result of basic engineering principles – placing the attachment of the mechanism lower on the frame

allows for the frame to have less structure above the attachment decreasing the frame height and the material costs associated therewith. And a result, not only is the stability of the vehicle improved, the visibility of the operator is increased, i.e., the operator's line of sight to the ground in front of the carrier is increased.

193. The following provide an exemplary showing that these same principals were recognized in the art:

- Hoechst (EX1012) 3:56-64 (“...the rear **pivot** of link 50 is substantially directly vertically above the rear axle 17, and it is **much closer to the axle** than in previous designs. The **number of structural components** between the points of attachment of the boom to the loader frame and the wheel attachment to the loader frame is **reduced**. ... the shorter load bearing paths **simplifies and reduces the costs** in the overall load and carrying structure.”)
- Komatsu (EX1011) teaching that lowering attachment points of linkages of a vertical lift arm can increase visibility and stability. See, e.g., [0003]-[0004], [0006]-[0009].
- Bares '568 (EX1009) teaching lowering the pivot point attachments of a loader for “visibility” and “lowering the center of gravity. See, e.g., 4:17-29, “low profile lift arms aid side-to-side visibility,” 1:18-11.

- JP705 (EX1006) confirms a desire to provide a mainframe that is “lightweight.” [0010].

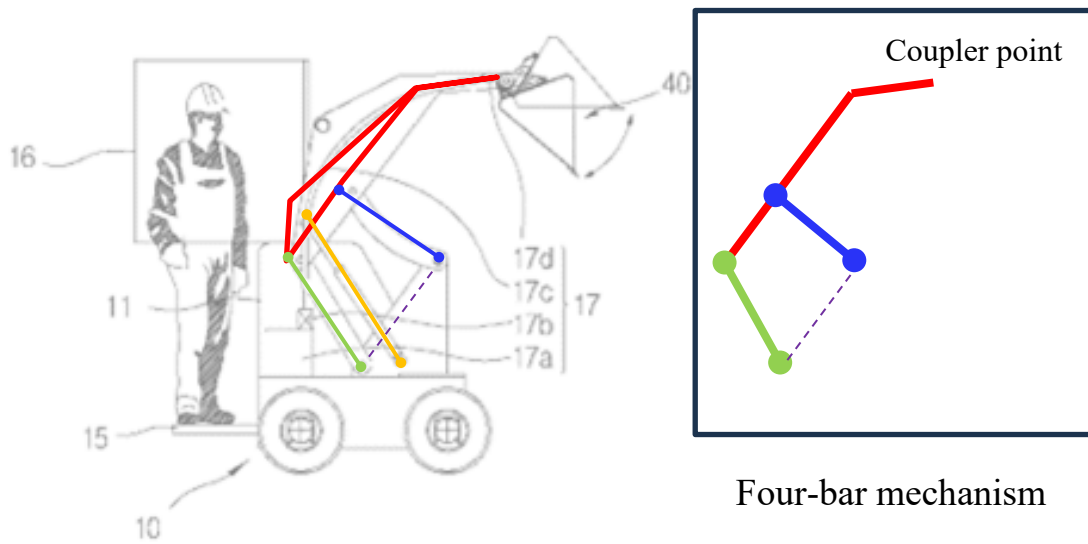
194. A POSITA would have also understood that lowering the pivot point attachment of the boom cylinder 46 in KR996 allows for a longer path of the actuator. See, e.g., EX1012 (Hoechst) at 3:53-55. A longer path for the boom cylinder increases the potential distance over which the cylinder can exert a force thus increasing the distance that the load can move and/or allowing for a greater load to be moved.

Implementation Details as to Lower Pivot Points – Example Embodiment

195. I rely on the *teachings* of low pivot point attachment as understood by a POSITA including as explained in Beltrami applied to the KR996 vehicle to illustrate that it was obvious to provide pivot points low to the rotational axis including having the relative dimensions claimed in Claim 14 and the claims that follow below. To further illustrate the predictability and operability of the KR996 vehicle with these teaching applied I provide the following additional support.

196. The predictability and functionality of these relatively low pivot points is confirmed by my application of the principles that define a four-bar mechanism and drawings and simulations below.

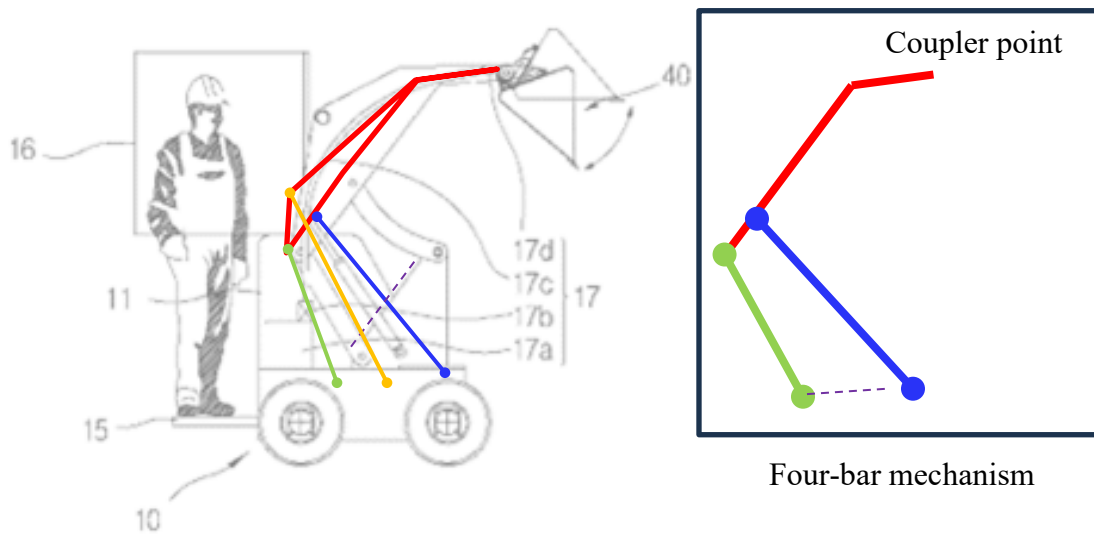
197. First, the four-bar mechanism of KR996 is illustrated by a kinematic diagram overlying the figure as provided below.



EX1005, FIG. 21
(annotated)

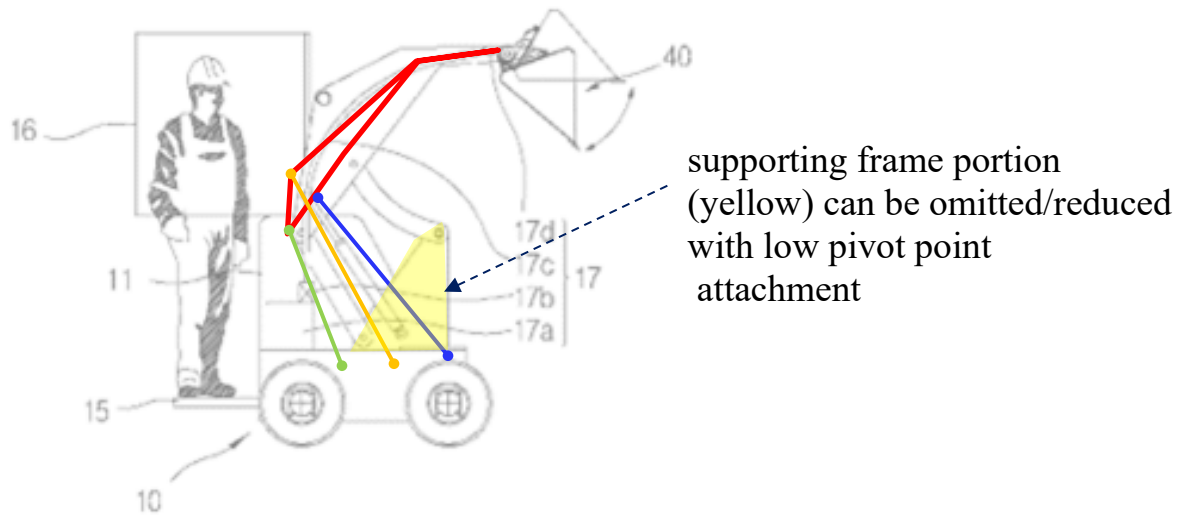
198. As I discuss above, in my experience and as readily recognized by a POSITA, the task of designing a mechanism such as a four-bar (including that to form a loader) concerns determining the linkage/actuator lengths and attachment point locations. To lower the center of gravity of the carrier in station and in operation, the pivot point connection between the linkages (green/blue) forming the mechanism and the actuator (orange) driving the mechanism are lowered as discussed above. One implementation technique to lower the pivot points is to increase the length of the linkages and actuator.

199. I provide a schematic drawing of this modification below:



EX1005, FIG. 21
(annotated)

200. As discussed above, Beltrami suggests that lowering the pivot point attachments allows for a reduction in the frame. Beltrami (EX1008), 3:35-41 (“...no supporting frame is needed...”). Thus, Beltrami recognizes what a POSITA would understand, that moving the forward pivot point of KR996 lower on the mainframe allows for the support frame to be omitted and/or reduced. This is one exemplary design.



EX1005, FIG. 21
(annotated)

201. The above kinematic diagrams illustrate the linkage lengths and joint/pivot point connections of the mechanism with respect to KR996. The mechanism continues to be provided in the same manner on KR996 vehicle having Bares' tracked assembly. First, I provide an illustration of the four-bar mechanism on the KR996-Bares combination:

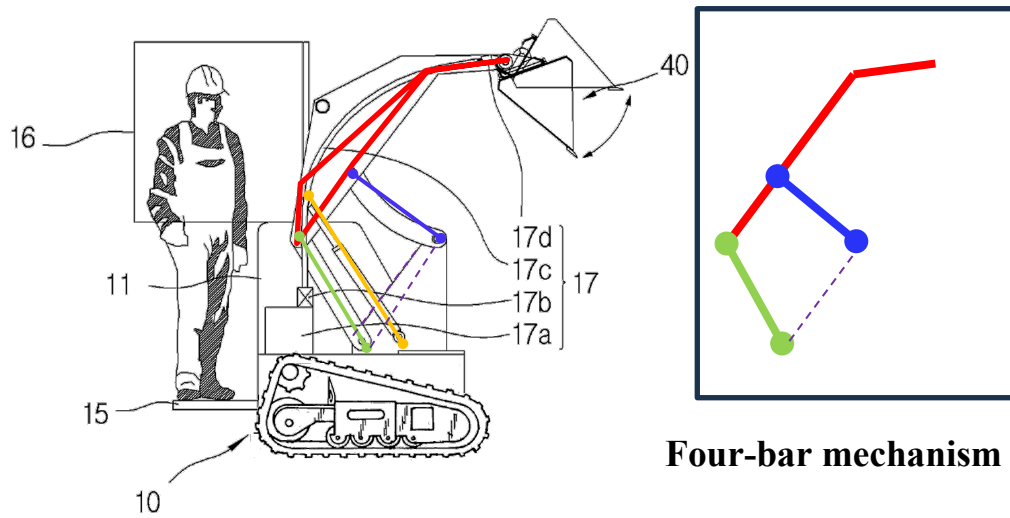


**Figure A
(annotated)**

202. And just as discussed above, a POSITA would have had reason to lower the pivot point connections including to lower the center of gravity. I provide the following kinematic diagrams as illustrative

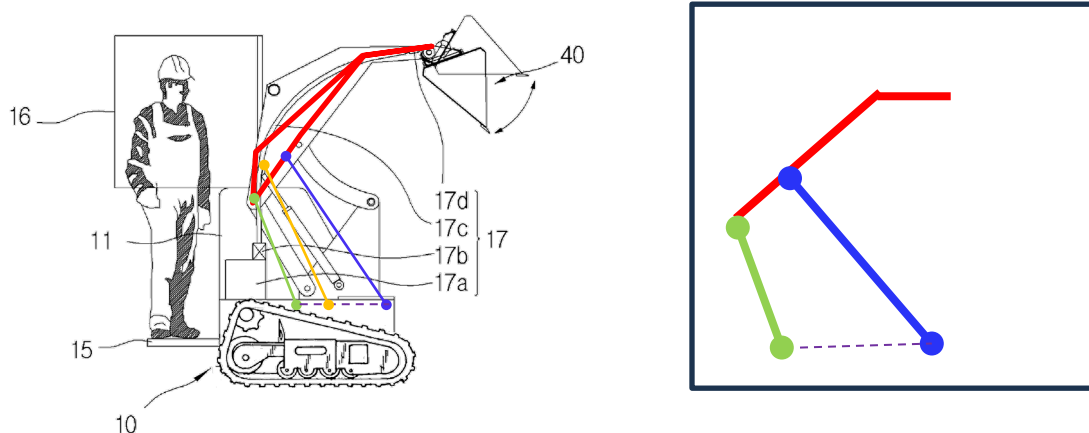


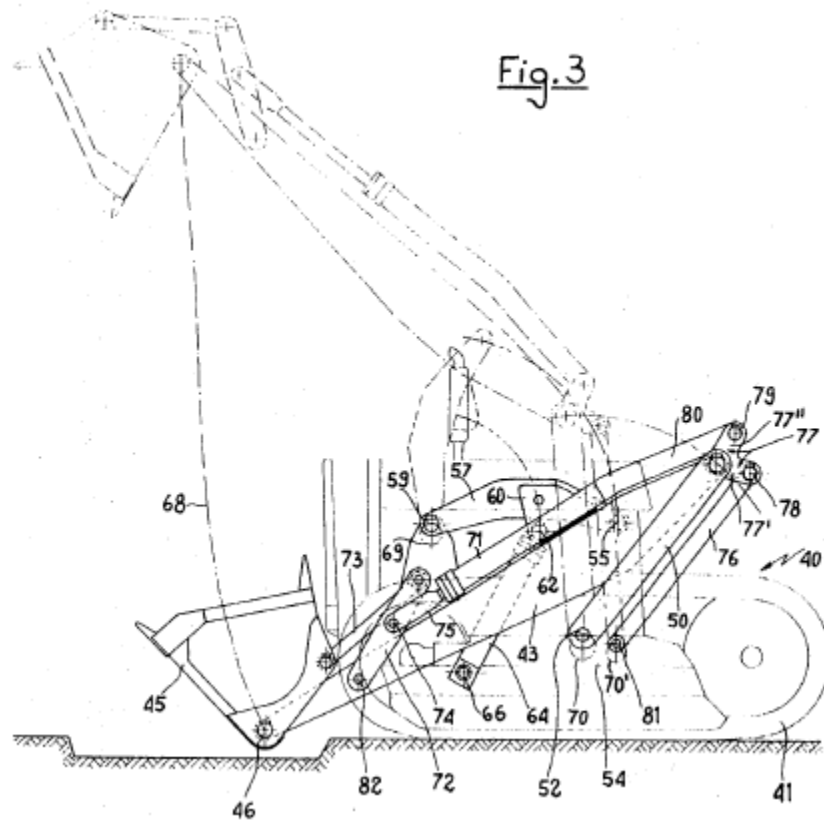
**Figure A
(annotated)
with lowered pivot points**

203. A POSITA would have understood in designing the application of the mechanism, specific shapes of the links may be determined. That is, the kinematics (i.e., motion) of the mechanism is dictated by the locations of the pivot points, but in the actual design, the links are not restricted to be perfectly straight. One of the design considerations is arrangement of components such that there is no interference with the operation of the mechanism. The linkages may be modified in shape, such as shown in the front linkage of FIG. 21 C-shape link or shown in the front link in FIG. 10 where there is a jog of the linkage into/out of the plane, to accommodate other features of the equipment such as a drive mechanism, operator area, safety fences or barriers, and the like.

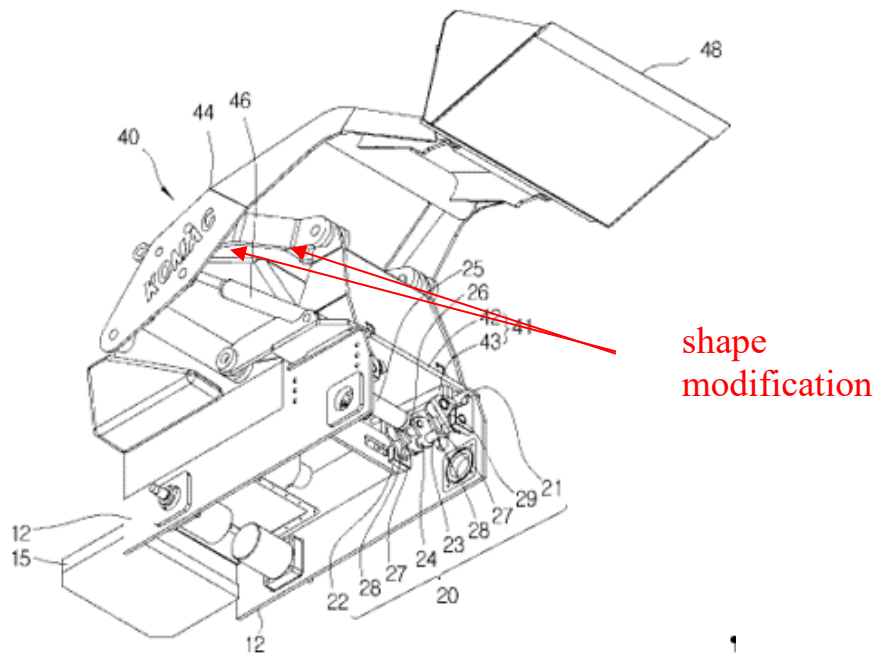
204. EX1021 (Yamada) also illustrates a four bar mechanism on a skid steer and shows this is a predictable, beneficial arrangement: “the front links 22, the rear links 21 and the lift cylinders 23 mounted to the frame 2 at the **substantially same level**. Since the links 21, 22 and the lift cylinders 23 are thus mounted to the robust frame 2 **at the same level**, a support structure for the lift arms 11 having an improved mechanical strength is realized and the skid steer loader 1 having such a support structure is suitable for use in handling heavy loads.” EX1021, [0034], FIG. 1. A POSITA would understand that this configuration is maintained in implementing the teachings of lowering the pivot point attachments as discussed above. See also, Appendix A. Yamada (EX1021) also recognizes that a POSITA would know to

place the attachment above the drive mechanism such that they “will not interfere with the front and rear wheels 3, 4, with the result that the vehicle may be made compact.” EX1021, [0035].

205. Further, configuring the vertical distances between the pivot point attachments to the mainframe to be less than 1.5 D1 and less than 0.75 D5, or any of the similar configurations discussed and claimed in the '266 Patent, is predictable and easy to implement. A POSITA would have had the knowledge to arrange components of the four-bar mechanism and the drive mechanism to not interfere with each components' respective function. Beltrami for example illustrates that the pivot point attachments of a four-bar mechanism were known to be at the same horizontal plane as the device mechanism. See, e.g., Beltrami, Fig. 3:



One manner of avoiding interference between components is to adjust a linkage shape. For example, a linkage shape can be designed to avoid drive mechanism components such as providing a jog (or bend) in the linkage as illustrated by the front linkage of KR996. See KR996, Fig. 10:



KR996 at FIG. 21 also shows a modified shape of the front linkage. A POSITA typically addresses several design choices when configuring the components attached to the mainframe including drive mechanism, lift mechanism, engine, and the link. They are straightforward choices with predictable results. As I discussed above, the actual link shapes can be modified to perform the specific application, the mechanism's functionality is defined by the respective kinematic lengths.

206. For ease of understanding, I provide Figure A, discussed above KR996 having Bares' track assembly with low pivot points shown by kinematic diagram. Figure A is an example, and other configurations may also be possible.

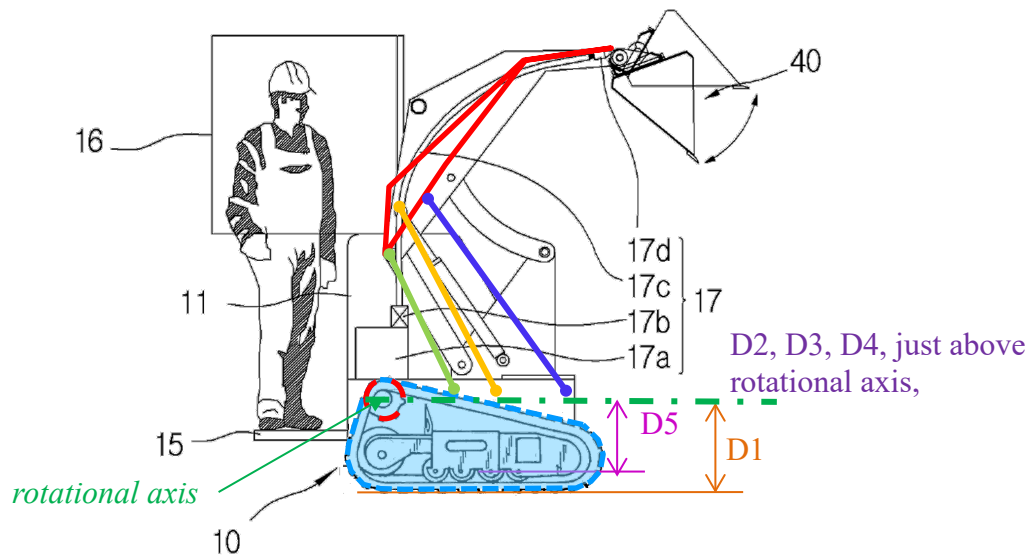


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly
and lowered pivot points

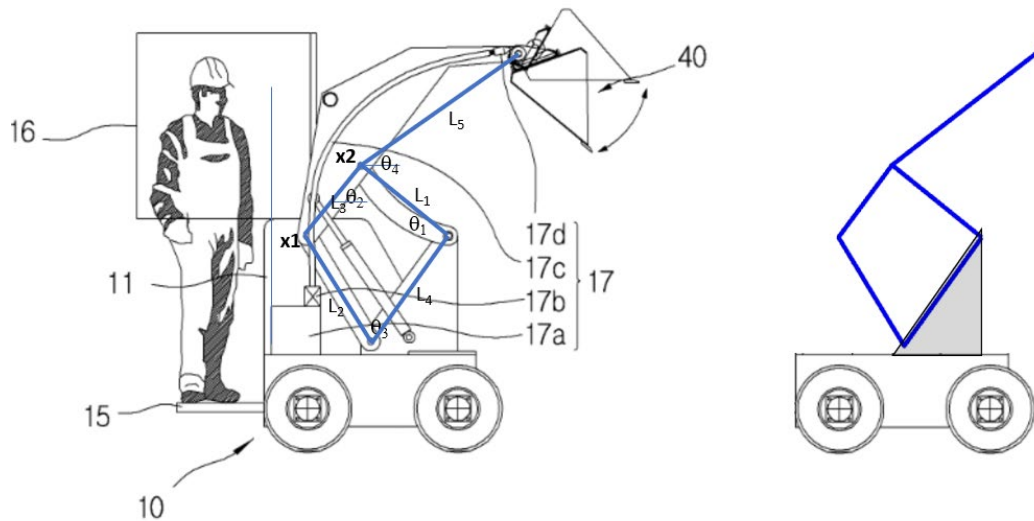
207. To further illustrate this straight-forward concept of lowering the pivot point connection of the KR996 mechanism, Appendix A of this declaration illustrates [1] a kinematic simulation of KR996 as drawn in the reference itself, and [2] a kinematic simulation of KR996 modified with the forward-most pivot point lowered. The simulations show the predictable result of loader movement.

208. I did not personally write the code that performs the simulation in Appendix A, but these simulations illustrate what I expect to have been provided by the simulation of KR996 Figure 21 and the modified KR996 Figure 21

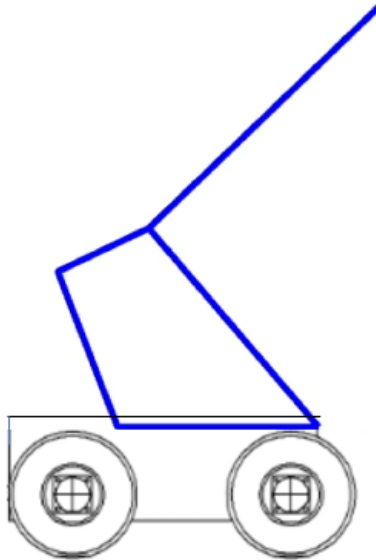
configurations. Simulation of four-bar mechanisms is based on commonly known linkage mechanics that depends upon the respective pivot point locations/linkage lengths. These mechanics are covered in general mechanics instruction. See EX1028, Chapter 2. Each linkage is treated as a rigid body connected by way of pivot point connections (e.g., pins) to either the mainframe of the vehicle or to the loader arm. Each pivot point permits relative rotation of the linked objects. The configuration of the system at any time can be fully defined by the length of each rigid linkage (see L1, L2, L3, L4) and each linkage's orientation angle (see Θ_1 , Θ_2 , Θ_3 , Θ_4). The angles of the linkages are constrained by compatibility; that is, the linkage must stay together while it moves. This allows one to determine the configuration of the entire linkage in terms of a single reference angle which is taken to be the rise angle of the front most linkage. To solve for the system configuration in terms of this reference angle, Matlab's nonlinear system solver was used to solve the compatibility equation to determine the positioning and orientation of each link. Then, by assigning the reference angle to vary over a large range the simulation was obtained, which shows the four-bar linkage in operation, bringing the loader to its lowered and raised position. This is a typical way in which a POSITA would have simulated a four-bar mechanism during design and development.

209. In a first kinematic simulation, the operation of the KR996 vehicle with

pivot points as drawn in the reference is shown. I provide a snapshot of this simulation below. The simulation shows, by kinematic diagram, the linkage and loader arm movement from a low position to a raised position.



210. In a second simulation, the operation of the KR996 vehicle with the forward-most pivot point lowered to be approximately at the same height as the pivot point between the link 45 and frame. The simulation shows, by kinematic diagram, the linkage and loader arm movement from a low position to a raised position.



211. Note that the pivot points are shown with respect to the lower portion of the KR996 frame as illustrated in Fig. 21. However, the location of the pivot point attachments is variable with respect to the frame depending on the desired design (e.g., center of gravity, weight distribution, reach). As I note above, the need for frame is reduced.

212. I note that these simulations confirm what I and a POSITA would readily recognize – that the joint/pivot points of the four-bar mechanism shown in KR996 can be easily and predictably configured lower on the vehicle while maintaining operation. That is, a forward pivot point of the four-bar mechanism of the KR996 vehicle can be lowered and the mechanism will continue to provide a path for the coupler point (e.g., bucket attachment) that is suitable for performing

the vehicle's function. The simulations show the highest vertically reach point and the lowest point of the coupler are substantially similar between the two configurations.

213. I note that according to standard practice, the actuator, which drives the four bar mechanism is not illustrated in the kinematic simulation. A POSITA would have recognized that the actuator, which drives the four-bar mechanism can be attached to the arm and mainframe in the modified configuration (e.g., between the two linkage pivot points as shown in the kinematic diagram above).

214. Thus, a POSITA would have had motivation and skill to form the predictable arrangement of the recited element.

215. Thus, claim 14 is rendered obvious by KR996, Bares, and Beltrami.

5. Claim 15

[15] *The loader apparatus as set forth in claim 14 wherein the loader support comprises a lower frame and an upper frame, the loader apparatus further comprising a control station having operator controls for propelling the loader apparatus forward and for raising and lowering the loader, the control station being attached to the upper frame.*

216. KR996 discloses this element.

217. KR996-Bares-Beltrami renders obvious claim 14 and KR996 further describes a control unit 13 (*control station*) having *operator controls for propelling the loader and raising and lowering the loader* as discussed in [1.6] that is attached to an *upper frame* of the *loader support* that also includes a *lower frame* as illustrated

in [2].

218. Thus, claim 15 is rendered obvious by KR996, Bares, and Beltrami.

6. Claim 16

[16] *The loader apparatus as set forth in claim 14 wherein the loader support incorporates a single weldment.*

219. KR996-Bares-Beltrami renders obvious claim 14 and it would have been obvious to form the loader support of KR996 *incorporat[ing] a single weldment* as illustrated in [3]. *See also*, EX1010, frame 12, 4:8-10, 4:31-34. Thus, claim 16 is rendered obvious by KR996, Bares, and Beltrami.

7. Claim 19

220. The analysis of claim 19 is the same as that for claim 14, with additional elements regarding a barrier guard discussed below the cross-referencing chart.

		See the analysis in:
[19.0]	<i>A loader apparatus for standing or walk-behind operator control and comprising:</i>	[7.0]
[19.1a]	<i>a machine structure comprising a mainframe and an upper frame,</i>	[12] where the frame analysis equally applies to “machine structure”
[19.1b]	<i>the machine structure defining a barrier guard;</i>	below

[19.2]	<i>a control station having operator controls toward a rear of the loader apparatus;</i>	[7.1] including control unit 13 (<i>control station</i>)
[19.3]	<i>an actuator pivotally attached to the mainframe;</i>	[7.5] including boom cylinder 46 (<i>actuator</i>)
[19.4]	<i>a front linkage pivotally attached to the mainframe;</i>	[7.4] including a link (<i>front linkage</i>)
[19.5]	<i>a rear linkage pivotally attached to the mainframe;</i>	[7.6a] including link 45 (<i>rear linkage</i>)
[19.6]	<i>a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position,</i>	[7.2] including loader unit 40 (<i>loader</i>) carrying bucket 48 (<i>tool</i>)
[19.7]	<i>the front linkage being pivotally attached to the mainframe at a first pivot point and being pivotally attached to the loader at a front linkage pivot point, the front linkage pivot point being a second pivot point, the rear linkage being pivotally attached to the mainframe at a third pivot point and being pivotally attached to the loader at a rear linkage pivot point, the rear linkage pivot point being a fourth pivot point, the actuator being pivotally attached to the mainframe at a fifth pivot point and being pivotally attached to the loader at a sixth pivot point, wherein:</i>	[7.5], [7.4], [7.6a] discussing the pivot point attachments having different nomenclature, annotated below
[19.8]	<i>in the down position, the front linkage pivot point is (1) disposed within the</i>	below

	<i>barrier guard and/or (2) disposed forward of the barrier guard; and as the loader travels from the down position to the vertically raised position, the rear linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and</i>	
[19.9]	<i>a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1,</i>	[14.6a] including Bares' tracked <i>drive mechanism</i> including drive sprocket 144 (<i>drive sprocket</i>)
[19.10]	<i>the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times D1.</i>	[14.6c] including Beltrami's teachings of low pivot points applied to KR996-Bares

[19.1b] *the machine structure defining a barrier guard*

221. First, I understand that the only instances of barrier guard in the '266 Patent specification were added to the specification by preliminary amendment and the Applicant argued support is found in the incorporated, prior art industry standard

Diagram illustrating a vehicle chassis (10) with a barrier guard (11) and various pivot points. The diagram shows a side view of the vehicle with a driver's seat (13) and a rear wheel (14). The barrier guard (11) is shown in a raised position. The pivot points are labeled as follows:

- first pivot point**: Located at the front of the chassis, connecting the front linkage (49) to the front wheel (14).
- second pivot point**: Located at the front of the chassis, connecting the front linkage (49) to the front wheel (14).
- third pivot point**: Located at the front of the chassis, connecting the front linkage (49) to the front wheel (14).
- fourth pivot point**: Located at the rear of the chassis, connecting the rear linkage (44) to the rear wheel (14).
- fifth pivot point**: Located at the front of the chassis, connecting the front linkage (49) to the front wheel (14).
- sixth pivot point**: Located at the rear of the chassis, connecting the rear linkage (44) to the rear wheel (14).
- rear linkage pivot point**: Located at the rear of the chassis, connecting the rear linkage (44) to the rear wheel (14).
- front linkage pivot point**: Located at the front of the chassis, connecting the front linkage (49) to the front wheel (14).

Other components labeled include the barrier guard (11), the chassis (10), the front wheel (14), the rear wheel (14), the front linkage (49), the rear linkage (44), the front wheel assembly (48), and the rear wheel assembly (48).

222. KR996 also describes a safety fence 16 in Fig. 21 that serves as a barrier to protect or guard the operator from “flying debris,” which provides a barrier guard under a broader construction. EX1005, [0089]-[0090], Fig. 21. Thus, KR996 discloses the *barrier guard*.

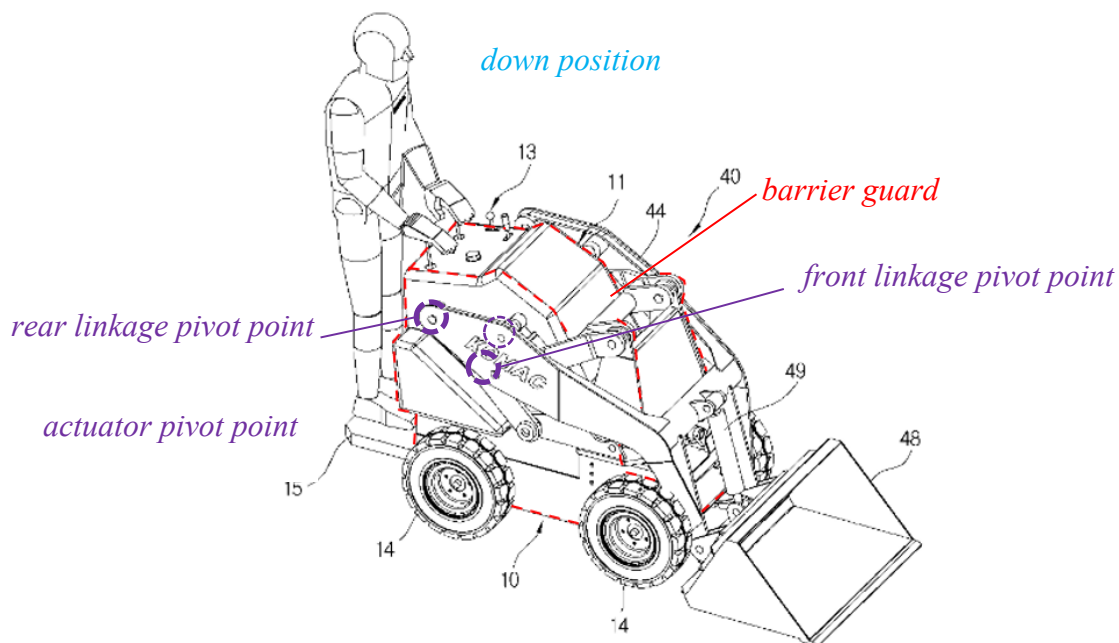
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Kubota North America Corporation

as the loader travels from the down position to the vertically raised position, the rear linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard

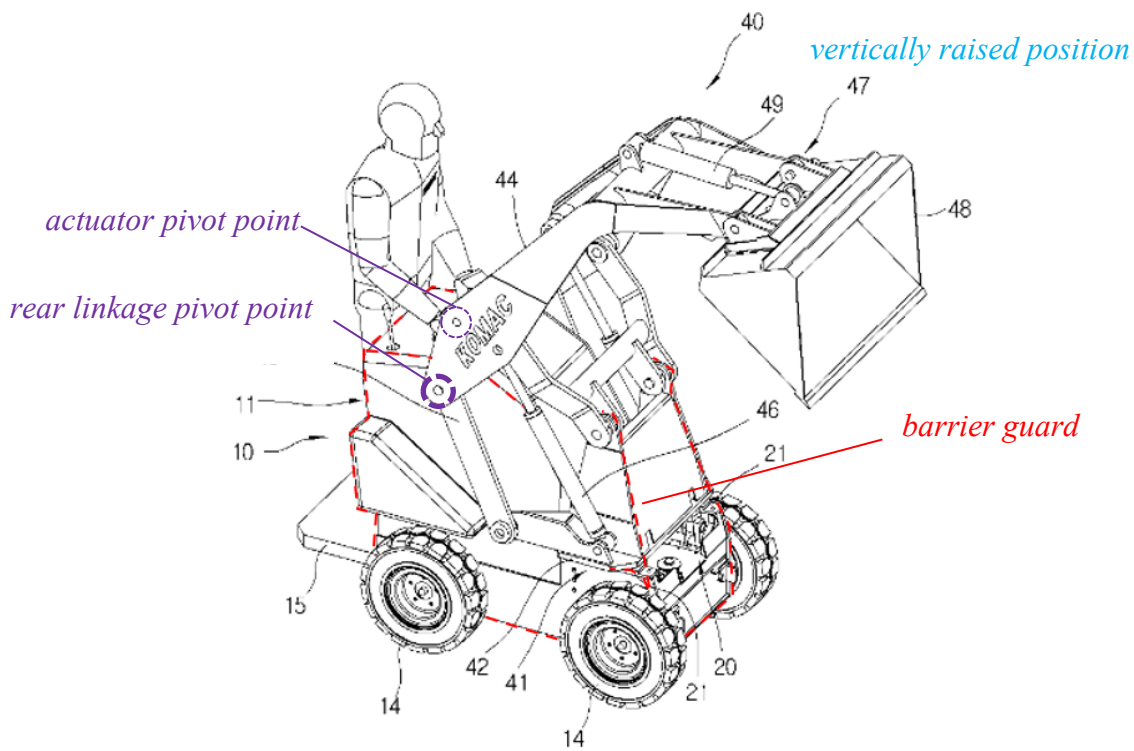
223. First, KR996 illustrates the *front linkage pivot point* is disposed within the *barrier guard* and/or *disposed forward of the barrier guard* in a *down position*. KR996 (EX1005), Fig. 8. And in the *down position*, the *rear linkage pivot point* is also *disposed within the barrier guard* and/or *disposed forward of the barrier guard*.

Fig. 8 is illustrative:



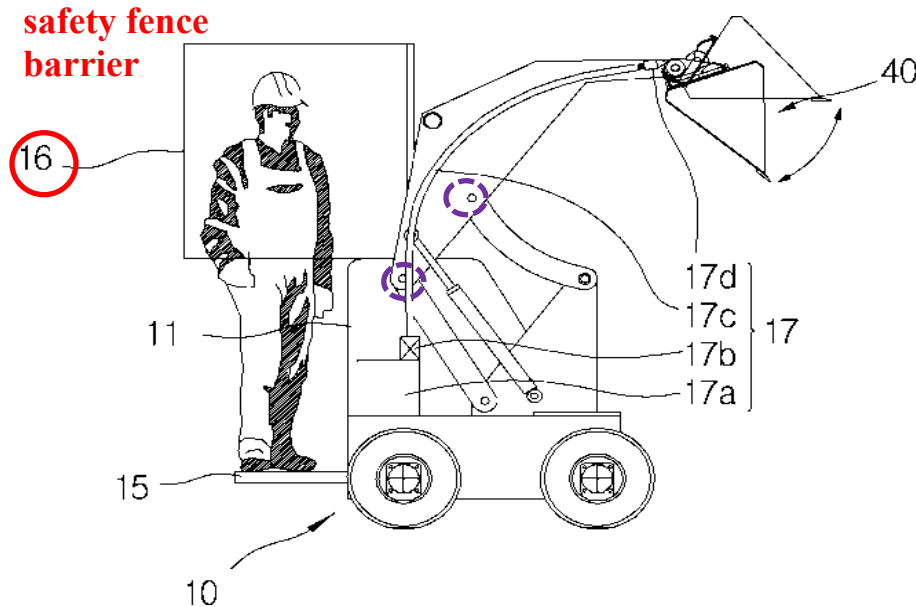
**EX1005, Fig. 8 (portion)
(annotated)**

224. And as the loader travels to a *vertically raised position* (e.g., Fig. 9), the *rear linkage point* is *disposed within the barrier guard* and/or *forward of the barrier guard*. EX1005, Figs. 7, 9, 21.



EX1005, Fig. 9
(annotated)

225. The pivot points with the loader boom 44 are similarly configured with the barrier guard when the pivot points with the frame are lowered as taught by Beltrami. Further, the referenced pivot points are each also in front of the safety fence 16, which is between the operator and the loader unit 40. EX1005, Fig. 21.



**EX1005, Fig. 21
(annotated)**

226. Thus, claim 19 is rendered obvious by KR996, Bares, and Beltrami.

8. Claim 20

[20] *The loader apparatus as set forth in claim 19 wherein, in the down position, the rear linkage pivot point is disposed within the barrier guard.*

227. KR996 teaches this element.

228. KR996-Bares-Beltrami render obvious claim 19 and KR996 illustrates in the *down position* (Fig. 8) *the rear linkage pivot point is disposed within the barrier guard* as defined by the perimeter of the tool. See [19]. See also, safety fence

16. Thus, claim 20 is rendered obvious by KR996, Bares, and Beltrami.

229. Thus, claim 20 is obvious.

9. Claim 21

[21] *The loader apparatus as set forth in claim 19 wherein the actuator is pivotally attached to the loader at an actuator pivot point, wherein, in the down position, the actuator pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard.*

230. KR996 teaches this element.

231. KR996-Bares-Beltrami render obvious claim 19 and KR996 illustrates the boom cylinder 46 (*actuator*) is pivotally attached to the boom 44 of the loader unit 40 (*loader*) and this actuator pivot point is disposed within (*see* Fig. 8) and/or forward (*see* Fig. 9) of the barrier guard. *See* [19.6]. Further, the actuator pivot point is disposed forward of the safety fence 16. *See* EX1005, Fig. 21. This configuration, like that of claims 19-20, remains when lowering the attachment to the frame as taught by Beltrami.

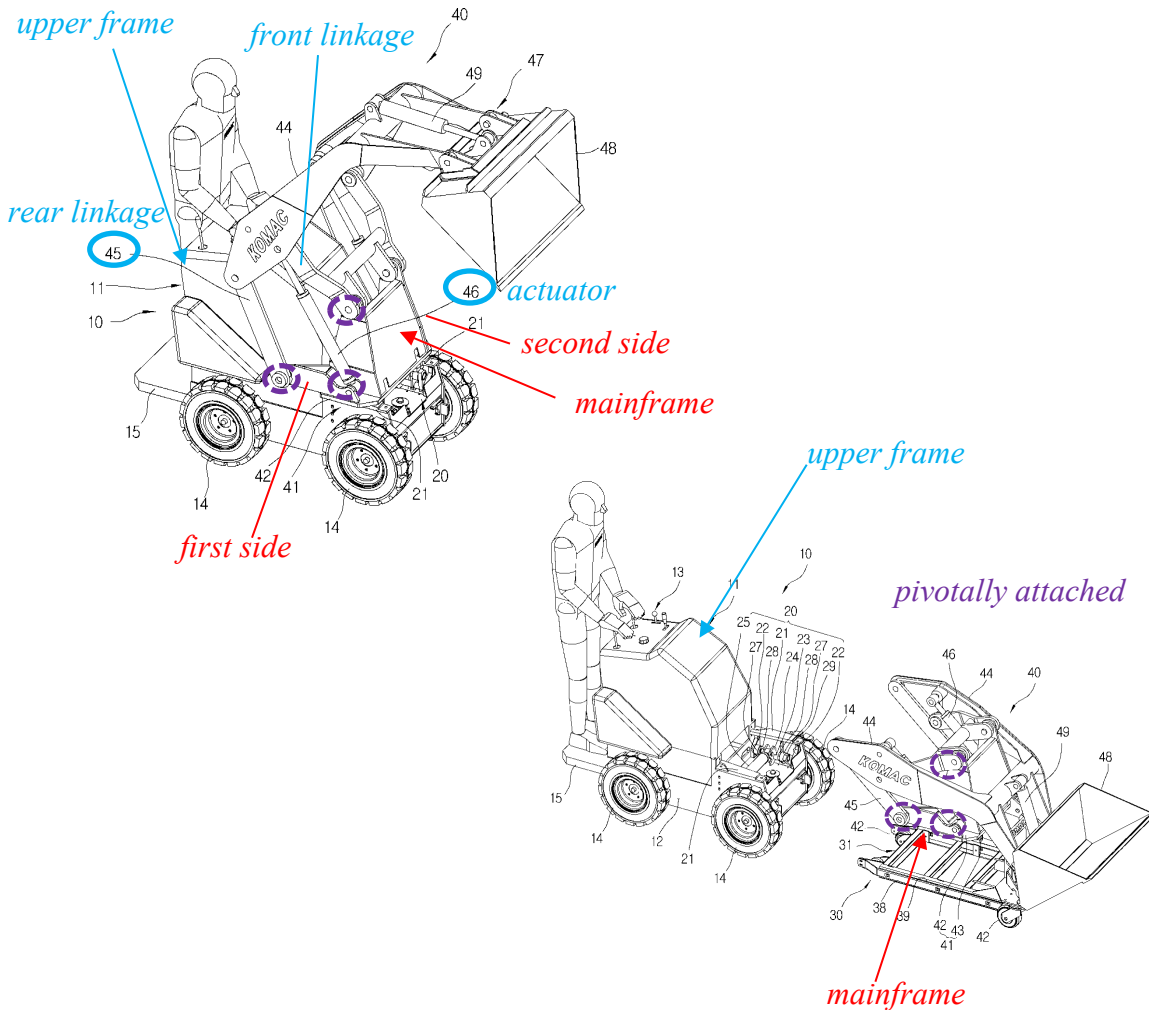
232. Thus, claim 21 is obvious in light of KR996, Bares, and Beltrami.

10. Claim 22

[22] *The loader apparatus as set forth in claim 21 wherein the mainframe has a first side and a second side, the rear linkage, actuator and front linkage each being pivotally attached to the first side of the mainframe.*

233. KR996 teaches this element.

234. KR996-Bares-Beltrami render obvious claim 21 and the KR996 *mainframe* has a *first side* and a *second side* where each of the two linkages and actuator of claim 19 each are pivotally attached to the first side.



**EX1005, Fig. 9, Fig. 1
(annotated)**

235. Thus, claim 22 is rendered obvious by KR996, Bares, and Beltrami.

11. Claim 23

[23] *The loader apparatus as set forth in claim 19 wherein the loader is free from direct attachment to the mainframe.*

236. KR996 teaches this element.

237. KR996-Bares-Beltrami render obvious claim 19 and KR996, like

Beltrami, also teaches a *loader is free from direct attachment* to the mainframe as it is connected by linkages/actuator implementing a four-bar mechanism. *See* [1.2], the loader support analysis applying equally to the *mainframe*. Thus, claim 23 is rendered obvious by KR996, Bares, and Beltrami.

12. Claim 24

[24] *The loader apparatus as set forth in claim 19 wherein the mainframe incorporates a single weldment.*

238. This element is at least obvious as attaching components of a mainframe using welding was a known fastening method. Thus, KR996-Bares-Beltrami render obvious claim 19 and KR996 also renders obvious a *mainframe to incorporate a single weldment* as discussed in [3]. Thus, claim 24 is rendered obvious by KR996, Bares, and Beltrami.

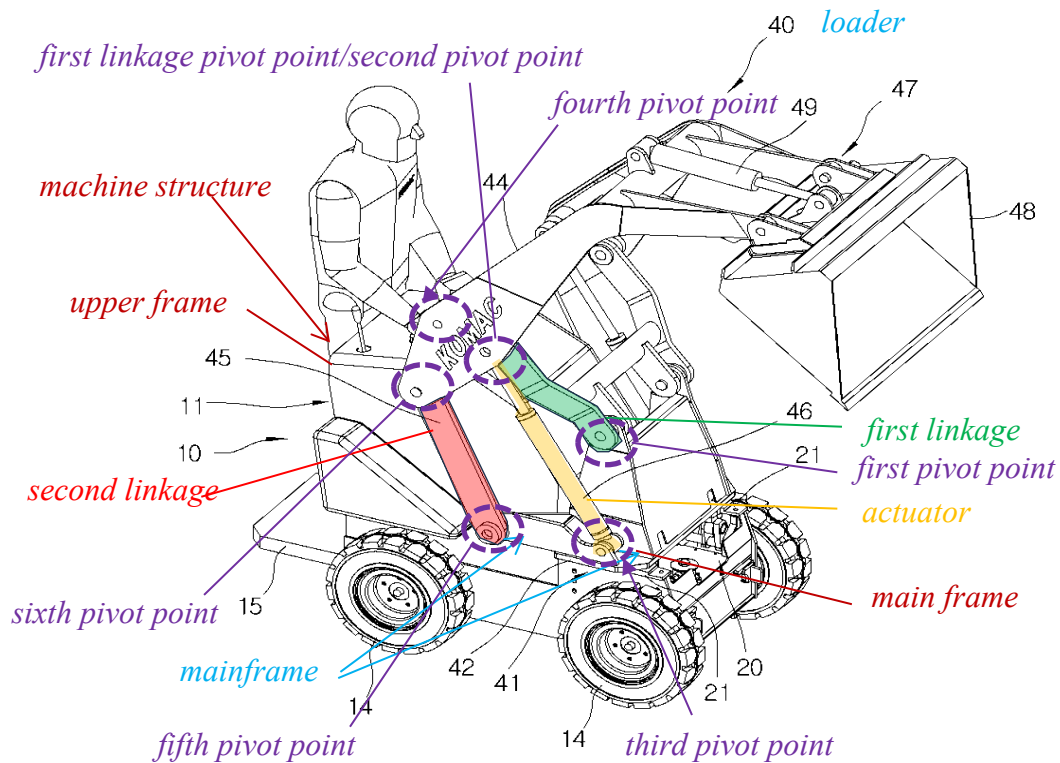
13. Claim 25

239. Claim 25 recites the same limitations as previously discussed, with different terminology for the linkages and numerical identifiers for the pivot points. Corresponding portions are referenced below, and a mapping of exemplary Fig. 9 of KR996 is provided for ease of reference of the terminology of claim 25.

		See the analysis for:
[25.0]	<i>A loader apparatus for standing or walk-behind operator control and comprising:</i>	[7.0]

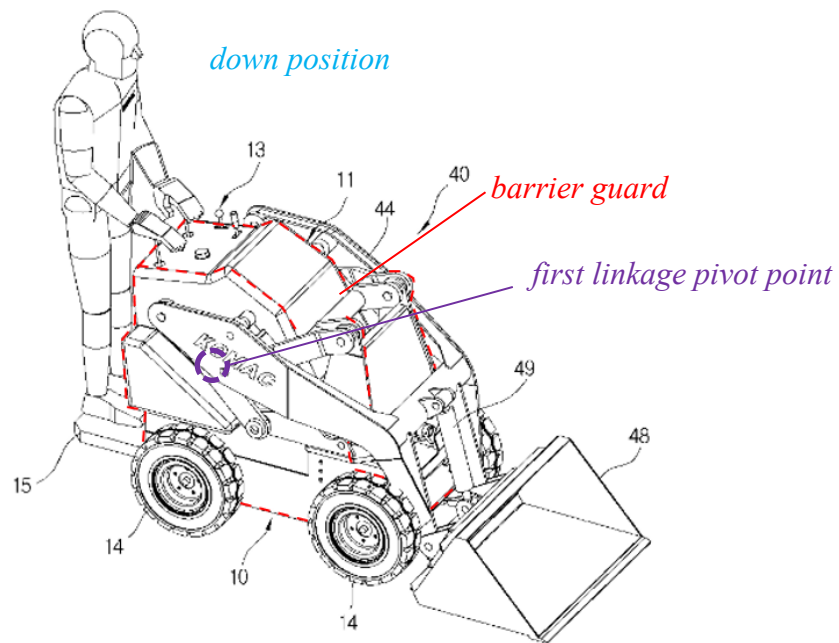
[25.1]	<i>a machine structure comprising a mainframe and an upper frame, the machine structure defining a barrier guard;</i>	[19.1a]-[19.1b]
[25.2]	<i>a control station having operator controls toward a rear of the loader apparatus;</i>	[7.1] including control unit 13 (<i>control station</i>)
[25.3]	<i>an actuator pivotally attached to the mainframe;</i>	[7.5] including boom cylinder 46 (<i>actuator</i>)
[25.4]	<i>a first linkage pivotally attached to the mainframe;</i>	[7.4] including a forward link (<i>first linkage</i>)
[25.5]	<i>a second linkage pivotally attached to the main frame;</i>	[7.6a] including link 45 (<i>second linkage</i>)
[25.6a]	<i>a loader adapted to carry a tool, the loader being moveable between a down position and a vertically raised position,</i>	[7.2] loader unit 40 including boom 44
[25.6b]	<i>the first linkage being pivotally attached to the mainframe at a first pivot point and being pivotally attached to the loader at a first linkage pivot point, the first linkage pivot point being a second pivot point,</i>	[7.4] forward linkage of KR996 and analysis to rigid frame applying to <i>mainframe</i>
[25.6c]	<i>the actuator being pivotally attached to the mainframe at a third pivot point and being pivotally attached to the loader at a fourth pivot point,</i>	[7.5] boom cylinder 48 and analysis to rigid frame applying to <i>mainframe</i>
[25.6d]	<i>the second linkage being pivotally attached to the mainframe at a fifth pivot point and being pivotally attached to the loader at a sixth pivot point, wherein:</i>	[7.6a] link 45 of KR996 and analysis to rigid frame applying to <i>mainframe</i>

[25.6e]	<i>in the down position, the first linkage pivot point is disposed within the barrier guard; and as the loader travels from the down position to the vertically raised position, the first linkage pivot point is (1) disposed within the barrier guard and/or (2) disposed forward of the barrier guard; and</i>	below
[25.7]	<i>a drive mechanism for propelling the loader apparatus over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the loader apparatus having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the loader apparatus being separated by a vertical distance D1,</i>	[14.6a] including Bares' tracked assembly (drive mechanism) having a drive sprocket 144 (drive sprocket) combined with KR996
[25.8]	<i>the rotational axis R and each of the first, third and fifth pivot points being separated by a vertical distance, the vertical distance between the rotational axis R and the first pivot point being less than 1.5 times D1, the vertical distance between the rotational axis R and the third pivot point being less than 1.5 times D1, and the vertical distance between the rotational axis R and the fifth pivot point being less than 1.5 times D1.</i>	[14.c] including Beltrami's teachings of lowering pivot point attachments to the mainframe of KR996

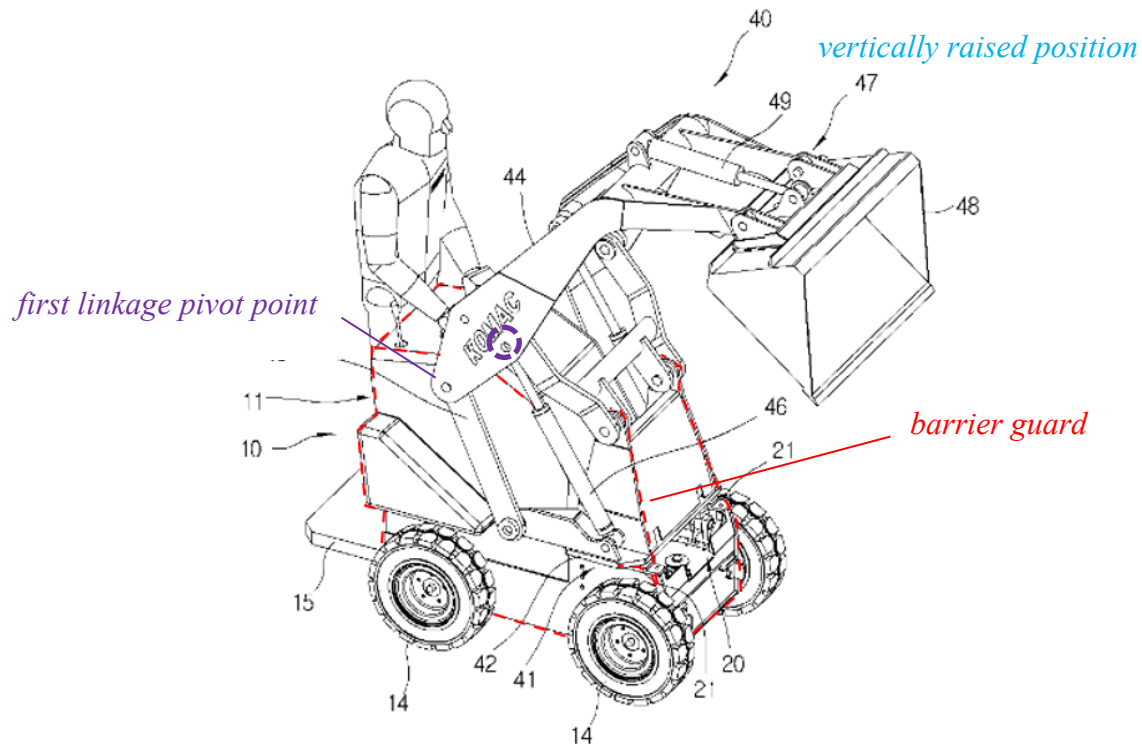


EX1005, Fig. 9
(annotated)

240. KR996 illustrates in a down position (Fig. 8), the *first linkage pivot point* between the boom 44 (arm of loader) and the link is disposed within the barrier guard; and as the loader travels from the down position (Fig. 8) to a vertically raised position (e.g., Fig. 9), this point is (1) *disposed within the barrier guard* as it raises (e.g., Fig. 7) and/or (2) *disposed forward of the barrier guard* (see, e.g., Fig. 9).



**EX1005, Fig. 8 (portion)
(annotated)**



**EX1005, Fig. 9
(annotated)**

241. Further, the referenced pivot point is also forward of the safety fence 16, which is between the operator and the loader unit 40. EX1005, Fig. 21. This continues to be the configuration applying the teachings of Beltrami to lower the pivot point connections with the frame.

242. Thus, claim 25 is rendered obvious by KR996, Bares, and Beltrami.

14. Claim 26

[26] The loader apparatus as set forth in claim 25 wherein the mainframe incorporates a single weldment.

243. KR996-Bares-Beltrami render obvious the apparatus of claim 25 and it would have been obvious to form KR996's *incorporat[ing] a single weldment* as

discussed in [3], the loader support analysis applying equally to the *mainframe*.

Thus, claim 26 is rendered obvious by KR996, Bares, and Beltrami.

15. Claim 27

[27] *The loader apparatus as set forth in claim 25 wherein the loader is free from direct attachment to the mainframe.*

244. KR996-Bares-Beltrami render obvious the loader apparatus of claim 25 and KR996, like Beltrami, describes the *loader is free from direct attachment to the mainframe* as in [1.2], the loader support analysis applying equally to the *mainframe*. This is because KR996 (and Beltrami) are four-bar mechanisms connected to the mainframe by linkages and driven by an actuator as discussed above. Thus, claim 27 is rendered obvious by KR996, Bares, and Beltrami.

XI. CONCLUSION

This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: 11/13/24

A handwritten signature in cursive script, reading "Steven A. Velinsky", is positioned above a solid horizontal line.

Steven Alan Velinsky