

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Kubota North America Corporation,
Petitioner

IPR2025-00170
U.S. Patent No. 9,975,750

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

TABLE OF CONTENTS

I.	Introduction.....	5
II.	Qualifications and Professional Experience.....	8
III.	Level of Ordinary Skill in the Art	12
IV.	Relevant Legal Standards	13
V.	Background Technology.....	16
VI.	Overview of the '750 Patent.....	26
VII.	Prosecution history of the '750 Patent.....	29
VIII.	Effective priority date of the '750 patent	32
IX.	Claim construction.....	33
X.	Identification of how the claims are unpatentable.....	33
A.	Challenged Claims	33
B.	Statutory grounds for challenges.....	33
C.	Ground 1	34
1.	KR996 (EX1005)	34
2.	Claim 1	36
3.	Claim 2	55
4.	Claim 3	58
5.	Claim 4	59
6.	Claim 5	61
7.	Claim 6	62
8.	Claim 7	63

9.	Claim 8	66
10.	Claim 9	67
11.	Claim 10	67
12.	Claim 11	68
13.	Claim 12	68
14.	Claim 13	69
15.	Claim 14	71
16.	Claim 15	73
17.	Claim 17	75
18.	Claim 18	76
D.	Ground 2 : KR996 and Bares	77
1.	Bares (EX1010).....	77
2.	Reasons to Combine KR996 and Bares (KR996-Bares)	79
3.	Claim 16	82
4.	Claims 1-18	86
E.	Ground 3 : KR996, Bares, and Beltrami	89
1.	Beltrami (EX1008).....	89
2.	Reasons to combine KR996 and Bares	90
3.	Reasons to combine KR996-Bares and Beltrami.....	90
4.	Claim 19	95
5.	Claim 20	125
6.	Claim 21	126

7.	Claim 22	128
8.	Claim 23	128
9.	Claim 24	129
10.	Claim 25	129
11.	Claim 26-27	129
12.	Claims 28-29	130
13.	Claim 30	131
14.	Claim 31	131
15.	Claim 32	132
16.	Claim 33	132
17.	Claim 34	132
18.	Claim 35	133
19.	Claim 36	134
XI.	Conclusion	137

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. **9,975,750** (“’750 Patent”) concerning whether the ’750 Patent is unpatentable over certain prior art. This declaration is a statement of my opinions on issues relating to the patentability of Claims 1-36, which are all claims of the ’750 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 ’750 Patent:

- a) U.S. Patent No. **9,975,750** (the ’750 Patent) (EX1001);

b) relevant portions of the prosecution history of the '750 Patent

("'750 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)
EX1018	International Organization for Standardization (ISO) 3411 (2007)
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 '750 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 '750 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 '750 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 '750 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 '750 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 '750 Patent includes patents and printed publications in the relevant art that predate the proper priority date of the alleged invention recited in the '750 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 '750 Patent or any assignee of the '750 Patent that any secondary considerations are relevant to my obviousness analysis of any Challenged Claim of the '750 Patent. I have briefly reviewed the allegations by the assignee of the '750 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.

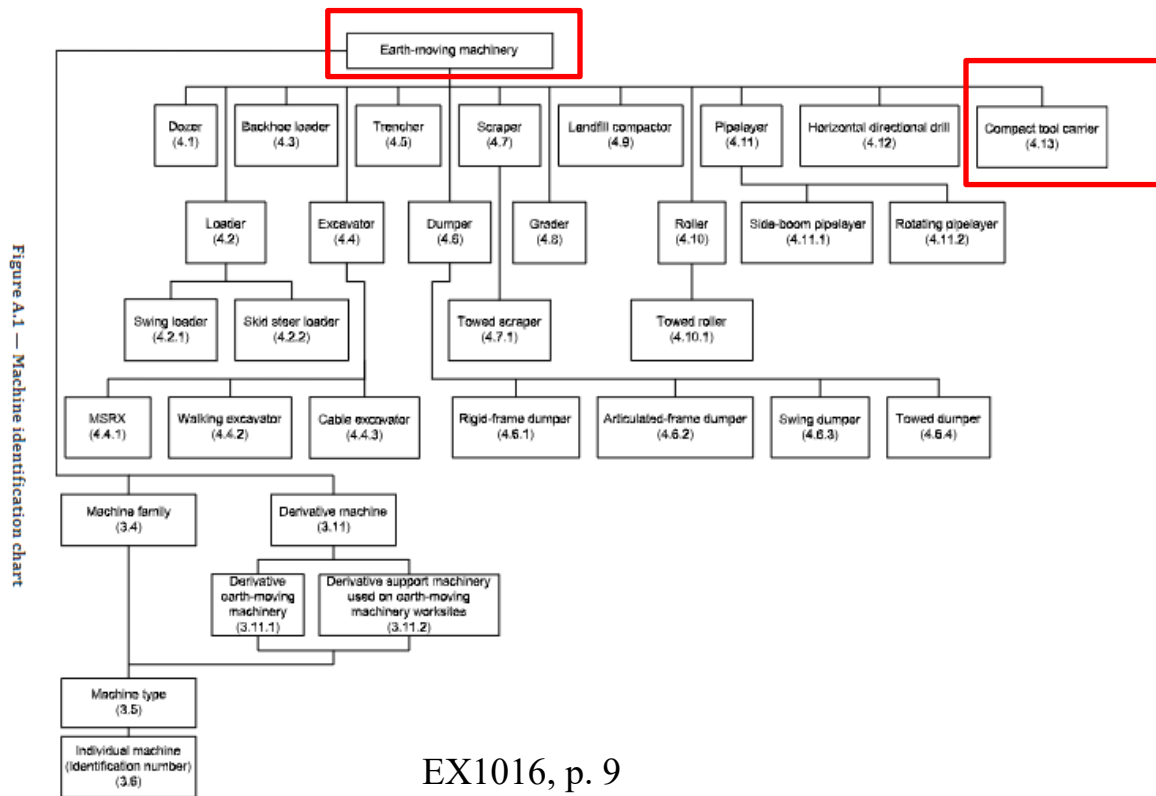
V. BACKGROUND TECHNOLOGY

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 '750 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 '750 Patent is directed to a “compact tool carrier.” A compact tool carrier, as illustrated in the '750 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 '750 Patent, like at least KR996

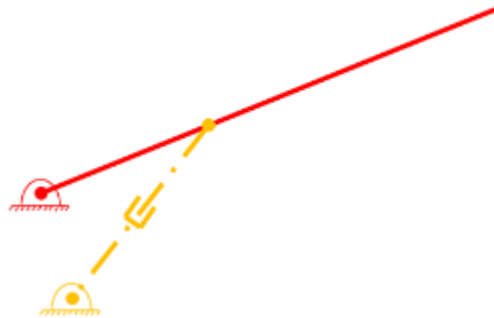
(EX1005), McIlwraith (EX1007), Bares '568 (EX1009), Bares (EX1010), Azure

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

machinery.¹

Loader Mechanism:

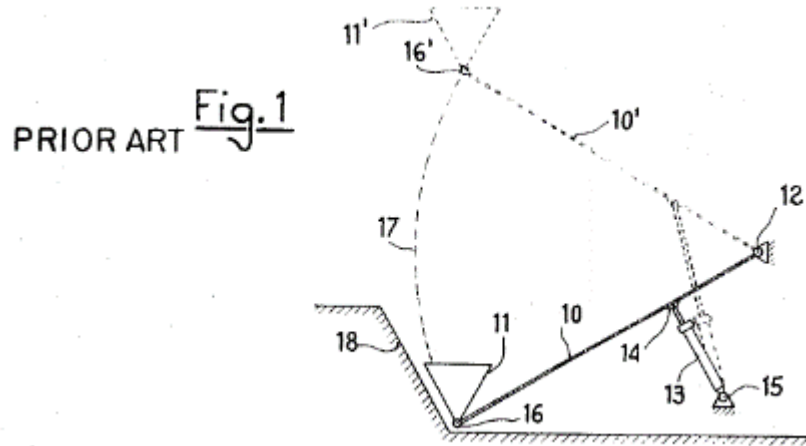
31. A loader or lift arm is attached to the carrier to provide for tools such as a bucket to perform the functionality of the equipment. One of the simplest well-known mechanisms providing motion for the loader arm is illustrated kinematically below. This may also be described as a two-bar or radial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



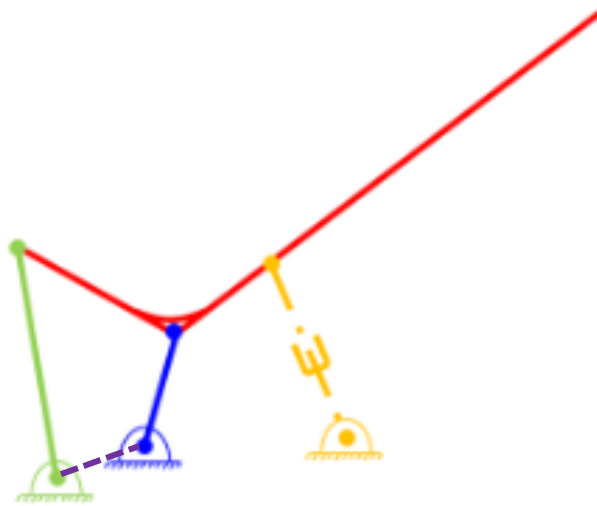
EX1008, FIG. 1

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.



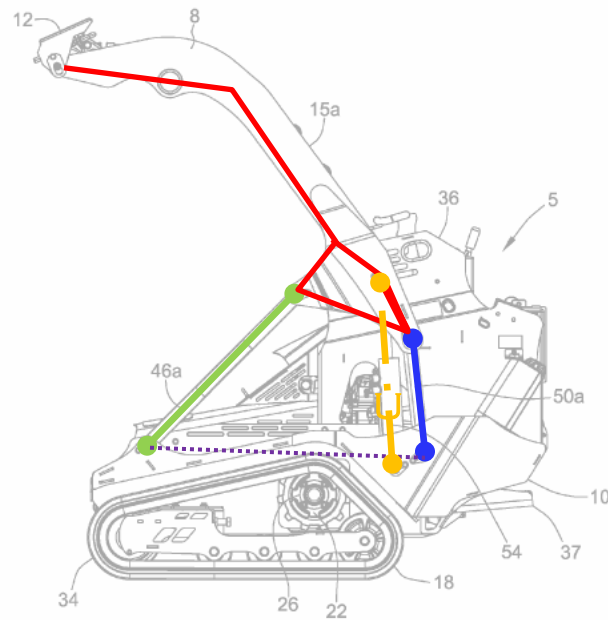
34. The four-bar mechanism is used for 3 different types of design cases: function generation, motion generation and path generation. For function generation, one link (e.g., either the green or blue link illustrated above) is defined as the “crank” and the other link (e.g., the other one of the green 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.*

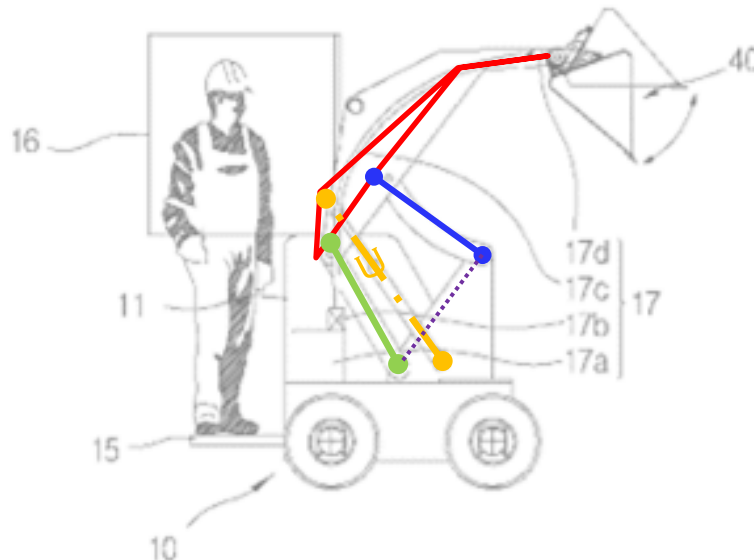
36. When designing a mechanism such as a four-bar mechanism for an application, one may approach the design by providing known link dimensions and calculating the output motion, which is referred to as a kinematic analysis. Or conversely, in a dimensional synthesis, the link dimensions may be calculated 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 '750 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 '750 Patent's FIG. 3:



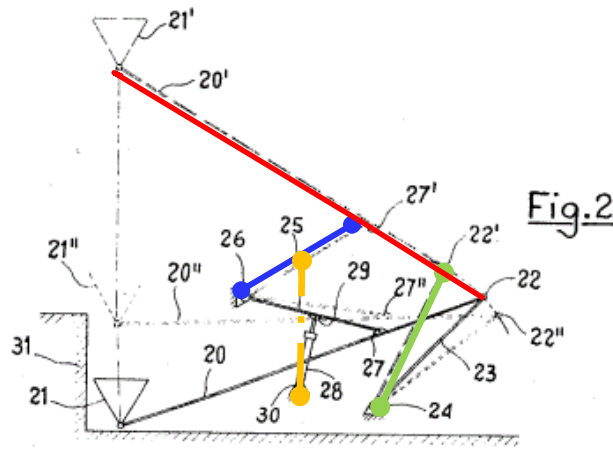
EX1001, FIG. 3
(annotated)

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.



EX1008, FIG. 2
(annotated)

See also, Beltrami (EX1008), FIG. 3.

VI. OVERVIEW OF THE '750 PATENT

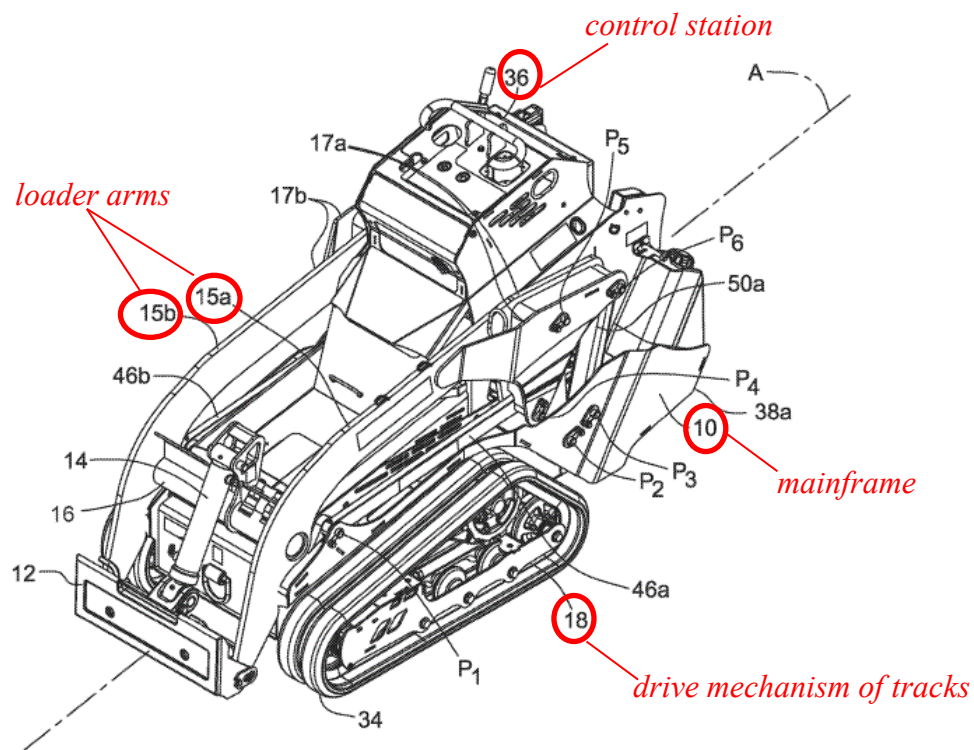
40. The '750 Patent issued May 22, 2018 and was subject to a reexamination proceeding with certificate issued resulting in the '750 Patent having claims 1-36. The '750 Patent claims priority to U.S. Patent No. 9,321,386 ("386 Patent"), which I have also provided a declaration regarding.

41. The '750 Patent relates to compact tool carriers having a loader (with two arms) designed for operation by an operator standing at the rear of the carrier. '750 Patent (EX1001), 1:15-31. In its background, the '750 Patent asserts compact tool carriers “may be distinguished from much larger conventional skid

steers in which an operator is seated in the operating position.” EX1001, 1:34-38.

Tools such as buckets, augers, and the like may be provided as front-mounted attachments. ’750 Patent (EX1001), 1:31-33.

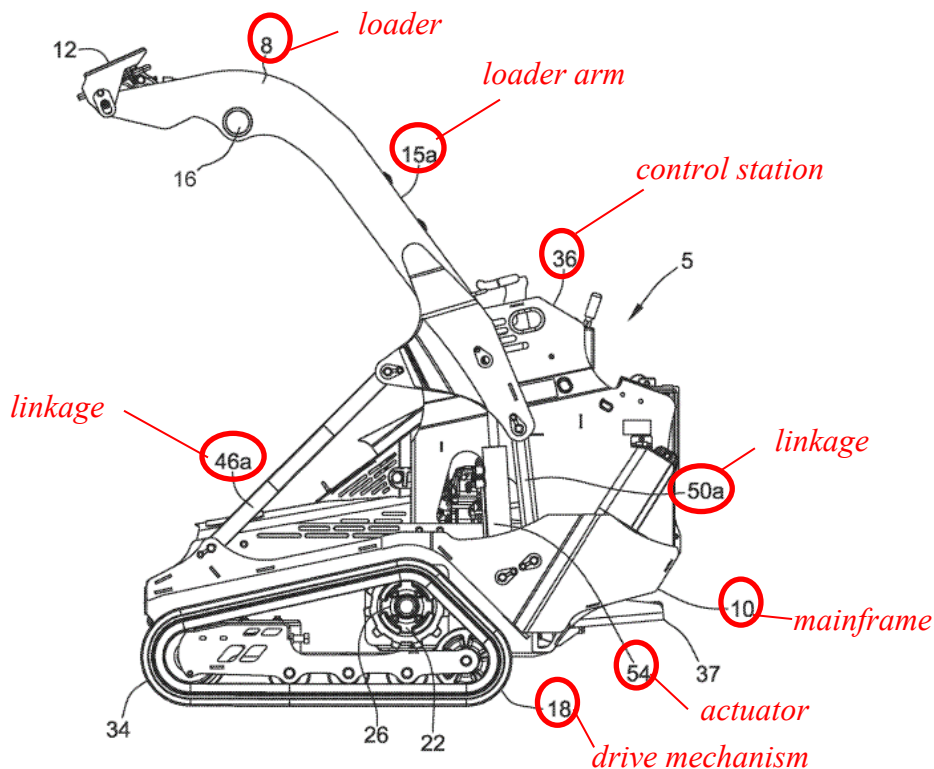
42. FIGS. 1 and 3 are illustrative of a compact tool carrier 5 including a loader 8 having loader arms 15a, 15b and mainframe 10. ’750 Patent (EX1001), 2:45-54. A drive mechanism 18 may include tracks 34 (as shown) or wheels and control station 36 provides operator controls for propelling and raising/lowering the loader 8. ’750 Patent (EX1001), 3:21-4:3.



**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. '750 Patent (EX1001), 4:13-16. Each loader arm is attached to a respective side of the mainframe by linkages 46a/50a and an actuator 54. '750 Patent (EX1001), 4:13-44. 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. '750 Patent (EX1001), 2:26-31.

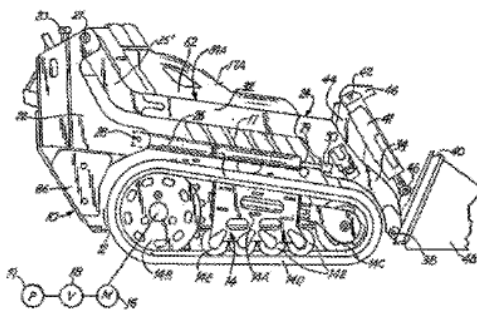


**EX1001, FIG. 3
(annotated)**

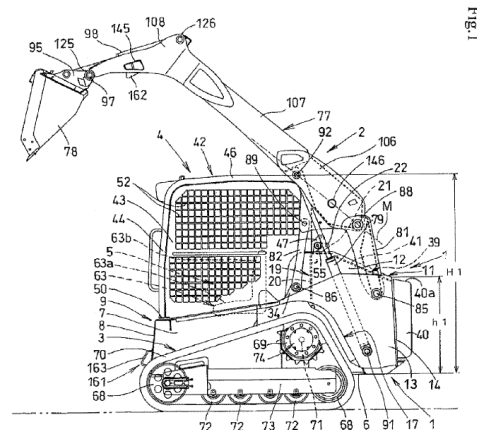
VII. PROSECUTION HISTORY OF THE '750 PATENT

44. I have briefly reviewed the prosecution history of the '750 Patent. I understand rejections overcome during prosecution and reexamination of the '750 Patent fall into two types: [1] an obviousness framework combining a compact tool carrier with a vertical lift loader disclosed on a larger equipment, and [2] rejections based on Ulinski, the “only reference of record which uses linkages to indirectly attach loader arms to a standing or walk-behind machine to achieve vertical lift.” EX1029, p. 9.

45. In an example of type [1], Yasuda (EX1022) combined with Bares '568 (EX1009) replacing Bares '568 radial lift arm with Yasuda's vertical lift arm, or vice-versa. EX1002, pp. 164-166.



EX1009, FIG. 1

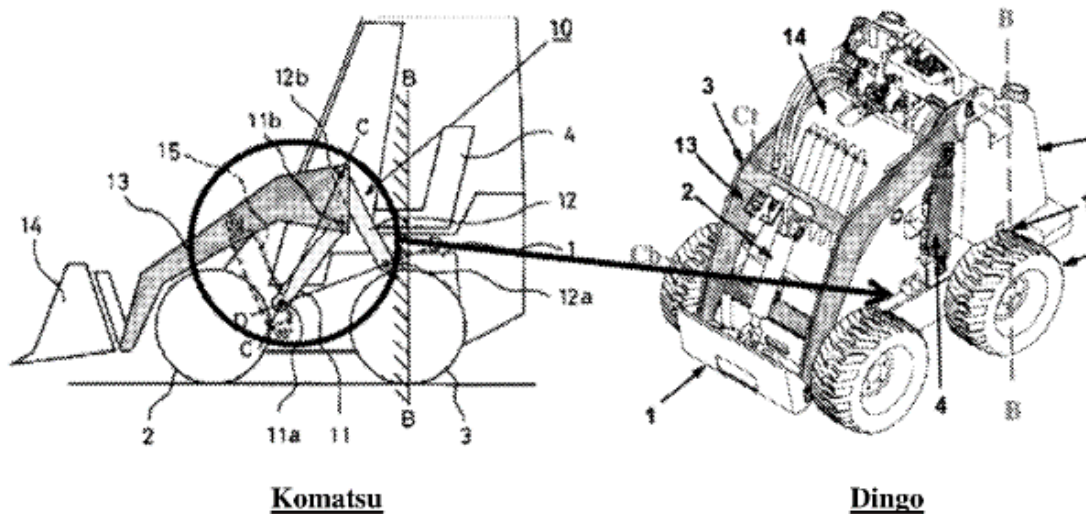


EX1022, FIG. 1

In response, Applicant argued against the combination due to the different

equipment types and introduced claims with an “operator platform” and relative position of features (*e.g.*, engine) arguing Bares ’568/Yasuda combination fails due to operator safety issues resulting from the operator’s location. EX1002, pp. 199-201.

46. The reexamination proceeding relied upon a similar combination of compact tool carrier of the third-party requester (Toro’s Dingo) and a vertical lift disclosed on larger equipment (Komatsu):



EX1029, p. 379

47. During the reexamination proceeding, I understand the Examiner withdrew the rejection stating “[Toro] over the course of several years and through multiple modifications of the Dingo series of CULs, did not find it obvious to employ a vertical lift loader arm arrangement on a CUL” and when they did “they

chose to design an entirely new mainframe and vertical lift loader mechanism” rather than rely on the prior art loader. EX1029, pp. 10-11. The Examiner also stated the ’750 Patent inventor declaration “show[ed] that designing a vertical lift having a four-bar linkage requires considerable experimentation and a combination such as of Dingo and Komatsu would not have been obvious at least because it would require undue experimentation.” EX1029, p. 12.

48. As to type [2], Applicant amended its claims to avoid Ulinski’s loader which differs in its actuator attachment (i.e., to a bell crank rather than directly to an arm) and use of “shared” pivot points. EX1002, pp. 97-111. Amendments to prosecution claim 21, including claim 1, are illustrative:

21. (Currently amended) A compact tool carrier configured for standing operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

a loader having an arm, the loader being adapted to carry a tool;

a mainframe for supporting the loader, the mainframe having a first side and a second side, the loader being free from direct attachment to the mainframe;

a first linkage pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point;

a second linkage pivotally attached to the first side of the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point;

an actuator directly pivotally attached to the first side of the mainframe at a fifth pivot point and directly pivotally attached to the loader arm at a sixth pivot point, the fifth pivot point being distinct from the first pivot point and the third pivot point;

a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier;

an operator platform for standing operation of the operator controls of the control station; and

an engine disposed forward of the operator platform relative to the longitudinal axis.

22. (Previously presented) The compact tool carrier as set forth in claim 21 wherein the mainframe incorporates a single weldment.

EX1002, pp. 97-98.

49. In contrast to those invalidity positions previously presented, I discuss a primary reference, KR996, that shows it was known in the art to provide, in a single embodiment, a compact tool carrier having a vertical lift loader implementing a four-bar mechanism.

VIII. EFFECTIVE PRIORITY DATE OF THE '750 PATENT

50. I have been told to assume that the '750 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

51. It is my understanding that in order to properly evaluate the '750 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

52. This declaration is directed to claims 1-36 of the '750 Patent.

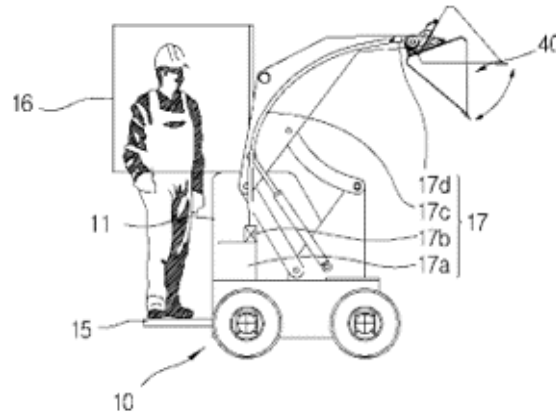
B. Statutory grounds for challenges

Grounds	Claims	Basis
#1	1-15, 17, 18	35 U.S.C. §§102/103 over KR996
#2	1-18	35 U.S.C. §103 over KR996 and Bares
#3	19-36	35 U.S.C. §103 over KR996, Bares, and Beltrami

C. Ground 1**1. KR996 (EX1005)**

53. 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, 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].

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



KR996 (EX1005), Fig. 21

54. 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 mainframe 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.



[1.0] A compact tool carrier configured for standing operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:

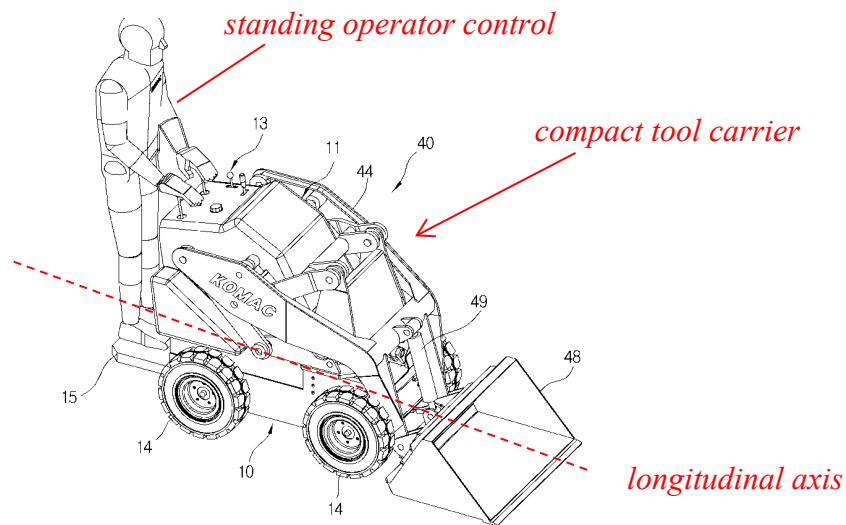
56. KR996 describes a self-propelled vehicle (*a compact tool carrier*)³

capable of carrying interchangeable equipment for building deconstruction work providing maneuverability in small spaces having the functionality of a mini skid loader with an attachment of a bucket. KR996 (EX1005), Abstract, [0001]-[0012]. The vehicle is a *compact tool carrier* as it has the same configuration as described

³ In this declaration, claim terms are generally italicized for ease of reference.

in the '750 Patent (*see, e.g.*, Fig. 1). And a POSITA would recognize that the KR996 vehicle also falls under the “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.

57. KR996’s compact tool carrier is configured for *standing or walk-behind operator control* and has a *longitudinal axis*. KR996 at Fig. 8 is illustrative:



EX1005, Fig. 8 (portion)
(annotated)

See also, KR996 (EX1005), [0033] (“foldable safety step is installed on the lower rear part of the vehicle, allowing the operator to board”), [0049].

58. This is the same configuration for operator control as provided in the '750 Patent. '750 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 while ‘walk-behind operation’ generally refers to operation in which the operator stands on the surface supporting the compact tool carrier 5.”). *See also*, my discussion at ¶¶29-30 above.

59. A POSITA would readily appreciate the KR996 vehicle has *a mass of less than about 1500 kg* based on its illustrations, suitable tasks, and operator position. This is because KR996 describes its functions as “building interior demolition,” “effective operations for fruit farming, gardening, and landscaping,” “suitable for narrow spaces.” KR996 (EX1005), [0002]. And the standing operator platform suggests a light-weight carrier, illustrated with a scale with respect to a human.

60. Further, recognized standards covering the KR996 vehicle define a weight of *less than about 1500 kg*, as recognized by the '750 Patent. EX1016, Organization for Standardization (ISO) 6165 (2012), p. 7 states compact tool carriers having an operator standing platform are less 1500 kg. EX1015, Society of Automotive Engineers (SAE), J2752 June 2010, p. 2 confirms “an operating mass

of less than 1500 kg.” *See also*, ’750 Patent (EX1001) in its Background Section (1:19-26) that states “tool-mounted machines that are capable of working in tight spaces for utility...[and are] walk-behind units of include a platform on which the operator may stand during use [] are **generally defined** [as] having **an operating mass of less than 1500 kg.**”⁴ Thus, a POSITA would recognize a benefit to keeping the weight of KR996 vehicle less than 1500 kg to comply with the relevant standards as well as provide a maneuverable vehicle.

61. To the extent that is it required, a POSITA would have found it obvious to make the KR996 vehicle *less than 1500 kg* to better perform its functions requiring maneuverability for quick and efficient operations and to be in line with the standards. Light weight frames are well known. EX1006. Thus, KR996 teaches a vehicle that provides the *compact tool carrier* of [1.0].

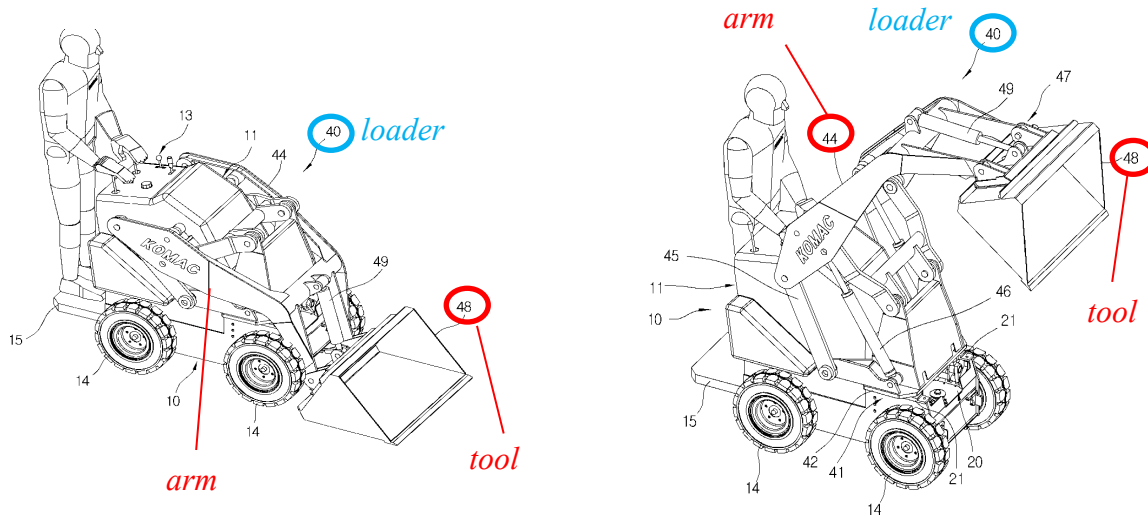
[1.1] *a loader having an arm, the loader being adapted to carry a tool;*

62. KR996 teaches this element.

63. KR996 provides *a loader* including loader unit 40, which is moveable between down to vertically raised positions, having a boom 44 (*an arm*). KR996 (EX1005), (57), [0016], [0036], [0040], [0054], [0131]. The loader unit 40 is *adapted to carry a tool*, as a bucket 48 (*a tool*) is attached to its boom 44. KR996

⁴ All bold emphasis in quotations is added.

(EX1005), claim 1, [0054], [0074]-[0075], Figs. 8-9. The bucket is a *tool* just as described in the '750 Patent. EX1001, 1:28-31 (“tools such as buckets, augers...and the like.”)



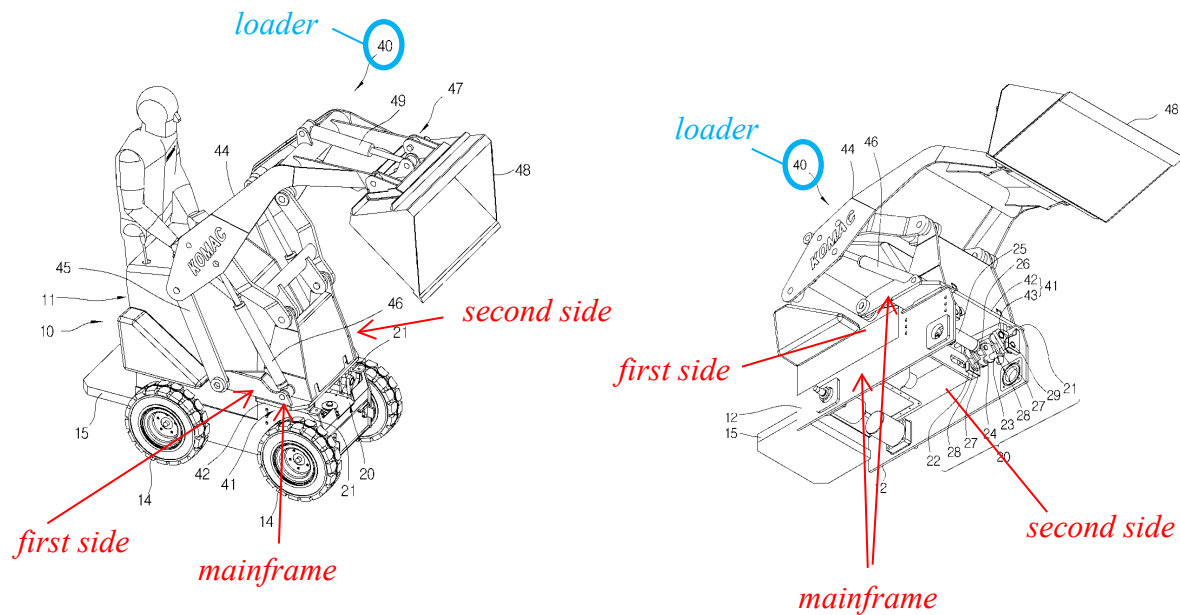
**EX1005, Fig. 8 (portion) and Fig. 9
(annotated)**

64. Thus, KR996 teaches [1.1].

[1.2a] a mainframe for supporting the loader, the mainframe having a first side and a second side,

65. KR996 teaches this element.

66. KR996's vehicle includes a *mainframe for supporting the loader* and having *first* and *second sides*. EX1005, Figs. 8-10.



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

67. KR996's mainframe is *for supporting the loader* as the loader unit 40 is attached to the mainframe by way of linkages and actuator. KR996's *mainframe* includes main body 11 and its sides 12 as well as other portions that when in operation are providing a weight-bearing frame supporting the loader unit 40, the control station 13, drive mechanism, and other identified vehicle components. *See also*, EX1005, Fig. 21. This is consistent with the '750 patent. *See* EX1001, 4:8-10 ("mainframe 10 includes brackets...through which various pivot linkages are attached"), 3:62-64.

68. KR996 provides a *mainframe* that includes main body 11 of KR996 and its sides 12 as well as other portions of KR996's illustrated vehicle such as those portions that support the loader by providing attachment to the actuator and

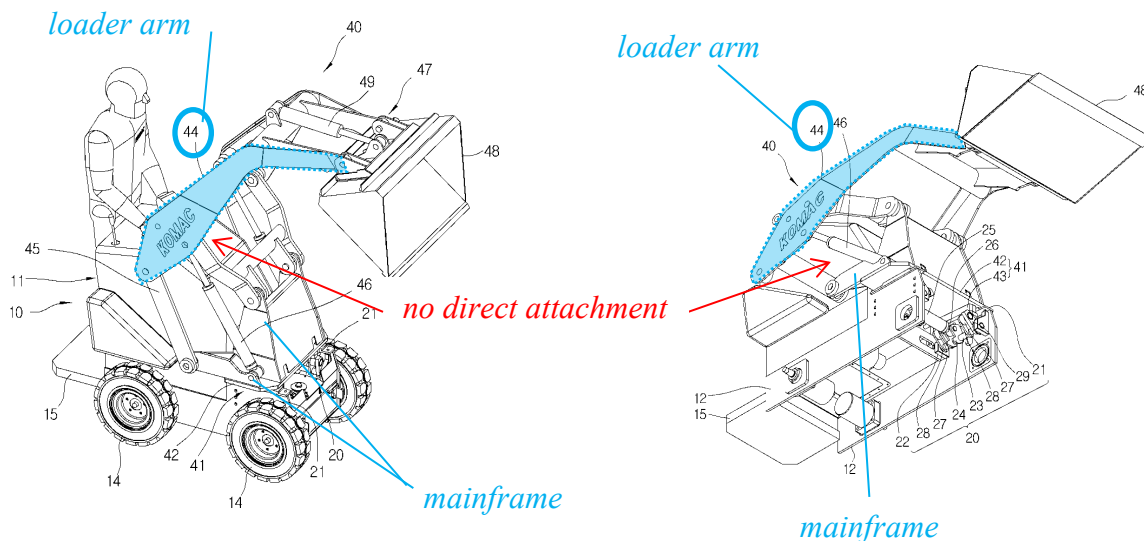
links that mount the loader to the vehicle. While KR996 describes embodiments of its frame in two portions, when in operation the mainframe of the vehicle is in one piece providing support for the loader. See also, '750 Patent, FIG. 7.

69. Thus, KR996 teaches [1.2a].

[1.2b] *the loader being free from direct attachment to the mainframe;*

70. KR996 teaches this limitation.

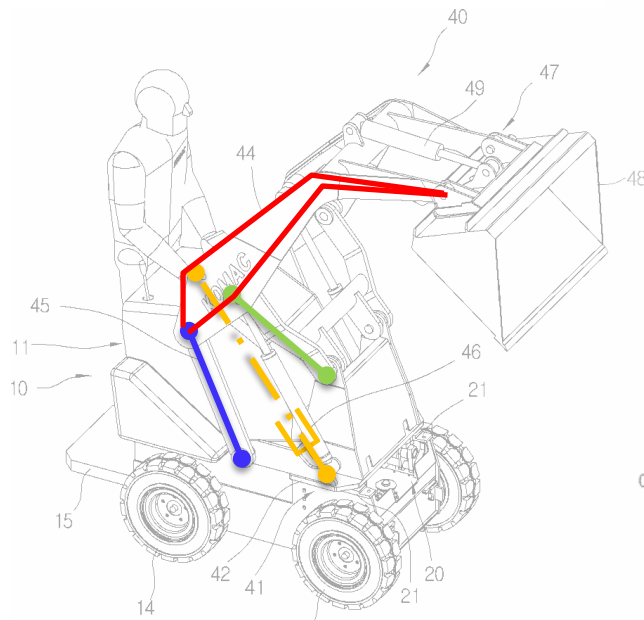
71. KR996 illustrates a vertical lift loader, which is a *loader being free from direct attachment to the mainframe*, as the loader is attached to the mainframe only through intermediary parts including the boom cylinder 46 and links 45/unlabeled, which are discussed in [1.3]-[1.5].



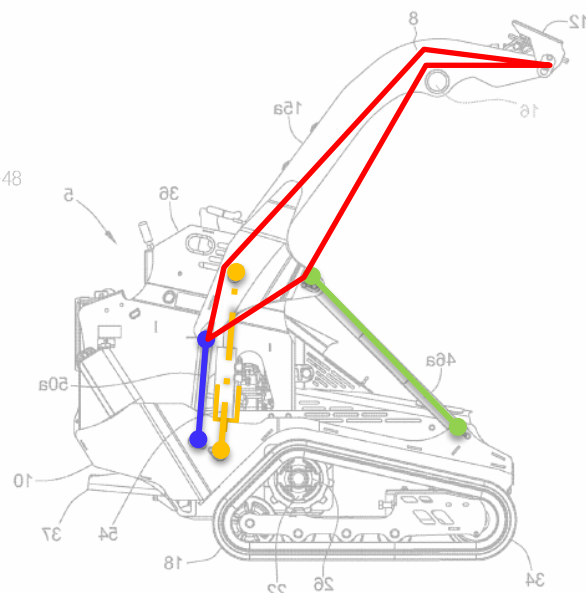
**EX1005, Figs. 9, 10
(annotated)**

72. 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 '750 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)

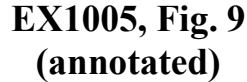


EX1001, Fig. 3
(annotated)

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

[1.3] a first linkage pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader arm at a second pivot point;

74. KR996 illustrates a link 45 (*first linkage*) pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to boom 44 (*loader arm*) at a second pivot point. EX1005, Figs. 5, 8-10, 21, [0054] (“A boom (44) connected by a link (45)...”), [0134]. Fig. 9 is illustrative:



EX1003 / Page 44 of 137
Kubota North America Corporation

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

76. 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

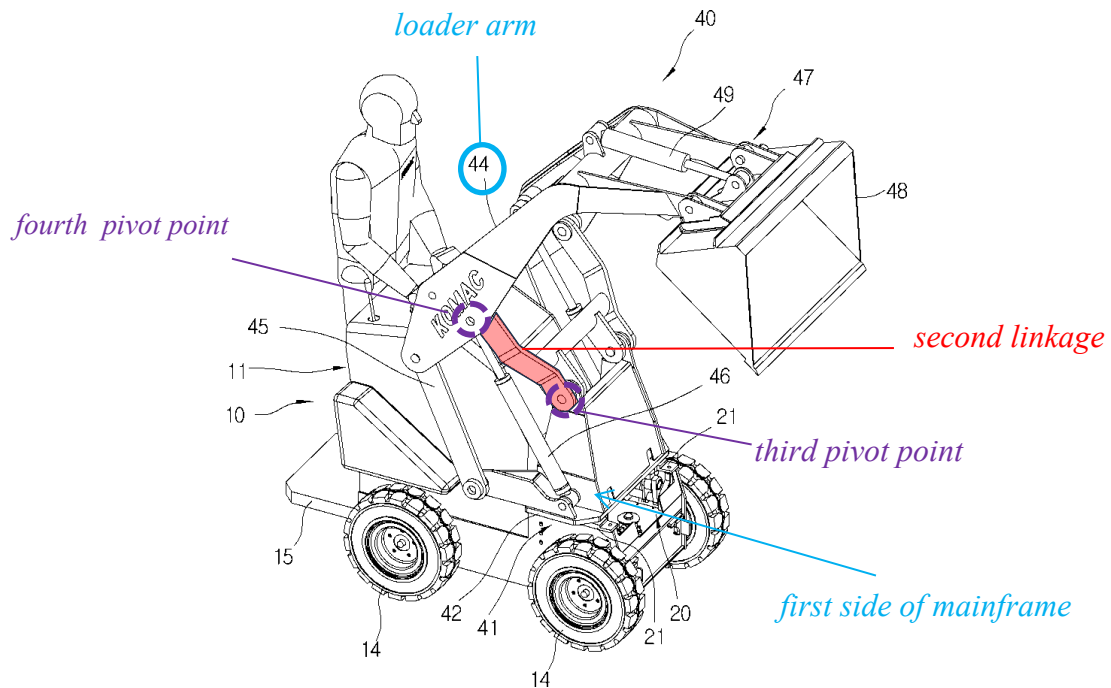
77. This is consistent with '750 Patent's disclosure of a loader linkage (e.g., a loader linkage 46a or 50a) pivotally attached to the first side of the mainframe and pivotally attached to the loader arm. *See, e.g., '750 Patent* (EX1001), FIG. 3, 4:4-28. The KR996 bracket to which the link 45 is directly attached is part of the *mainframe* as it supports the loader unit 40.

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

[1.4] *a second linkage pivotally attached to the first side of the mainframe at a third pivot point and pivotally attached to the loader arm at a fourth pivot point;*

79. KR996 teaches this element.

80. KR996 illustrates another link (*second linkage*) *pivotally attached to the first side of the mainframe at a third pivot point and pivotally attached to the boom 44 (loader arm) at a fourth pivot point.* EX1005, claim 1, [0054], [0134], Figs. 1-10.



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

81. There are pivot point connections, each a point of relative rotation between the linkage and each of the boom 44 and the mainframe 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 mainframe 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.

82. 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

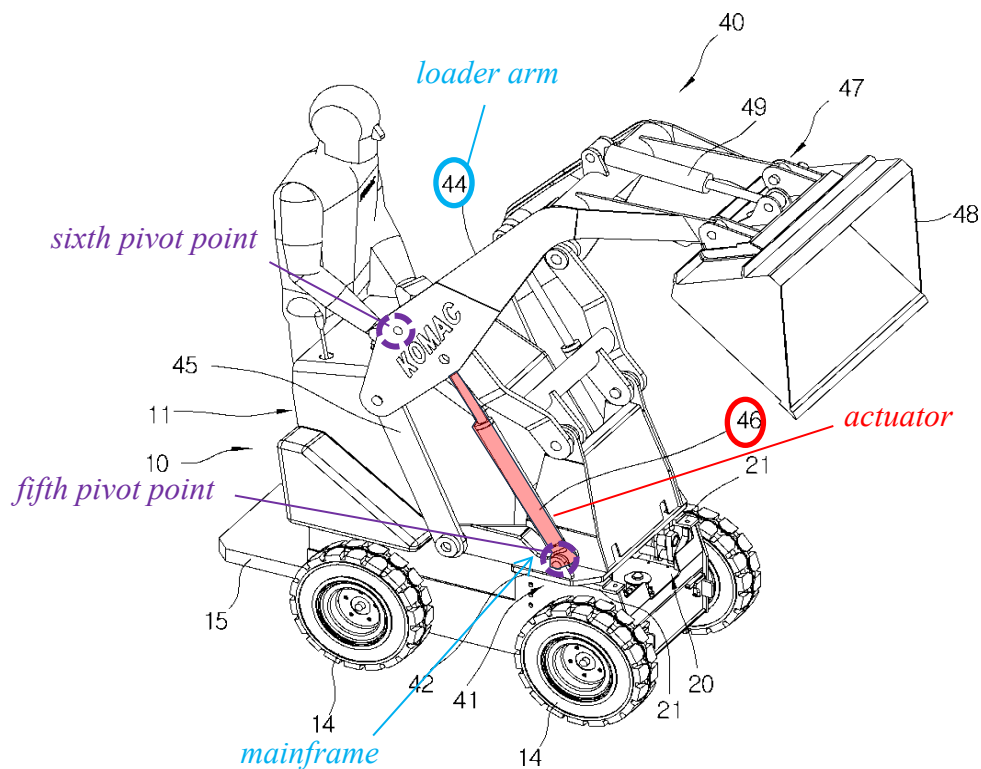
83. This is consistent with '750 Patent's disclosure of a loader linkage (e.g., a loader linkage 46a, 50a) pivotally attached to the first side of the mainframe and pivotally attached to the loader arm. *See, e.g., '750 Patent (EX1001), FIG. 3, 4:4-28.*

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

[1.5] *an actuator directly pivotally attached to the first side of the mainframe at a fifth pivot point and directly pivotally attached to the loader arm at a sixth pivot point, the fifth pivot point being distinct from the first pivot point and the third pivot point;*

85. KR996 describes boom cylinder 46 (*actuator*) that drives the boom 44 (*loader arm*). EX1005, [0054], claim 1, [0134], Figs. 7-9, 21. The boom cylinder 46 (*actuator*) is *directly pivotally attached to the first side of the mainframe at a fifth pivot point and directly pivotally attached the boom 44 (loader arm) at a sixth 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 describes an actuator 54 as a “hydraulic cylinder” as in claim 7; KR996 describes a “hydraulic cylinder” ([0003]). Fig. 9 is illustrative:



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

86. There are pivot point connections – points of rotation within mechanical systems - between the actuator and the boom 44 and the mainframe. 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 mainframe 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 mainframe as the loader 40 raises. The boom cylinder drives the movement of the boom 44. See KR996 (EX1005), Figs. 8-9.

87. 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.

88. KR996 also discloses that the boom cylinder 46 (actuator) is *directly* connected to the boom 44 (*loader arm*). There is no intervening component, just like in the ’750 Patent. KR996 also discloses *the fifth pivot point being distinct from the first pivot point and the third pivot point* as each of the links and actuator are attached at different points on the mainframe shown in the annotated figures of [1.3], [1.4], [1.5]. See EX1005, Figs. 8-9.

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

[1.6] a control station having operator controls for propelling the compact tool carrier forward and for raising and lowering the loader, the control station being mounted toward the rear of the compact tool carrier;

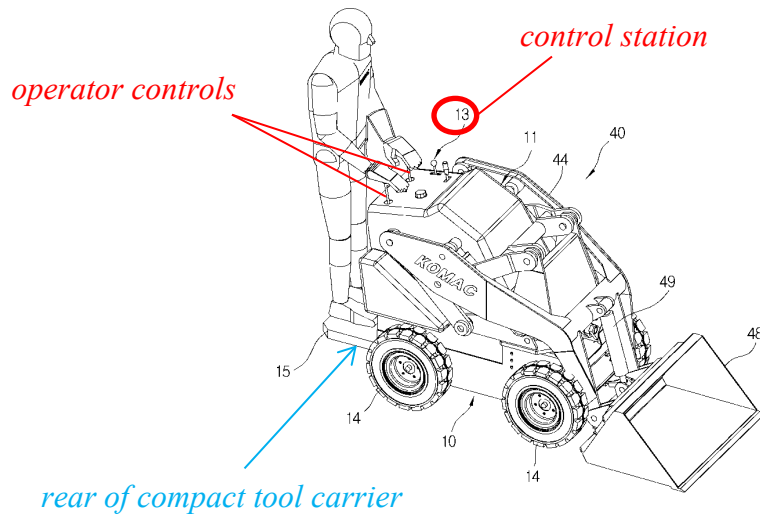
90. KR996 teaches this element.

91. KR996 describes a control unit 13 (*control station*) *having operator*

controls to “operate the equipment while the worker is on board at the rear.”

EX1005, [0042], Figs. 1, 8-9. The control unit 13 has *operator controls* for *propelling the compact tool carrier forward*. EX1005, Abstract (“when the vehicle moves forward and separates from the front side of the vehicle when the vehicle moves backward”), [0016]-[0017], [0072]. The control station 13 also controls the *raising and lowering* of the boom 44 (arm of *loader*): “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)**.” EX1005, [0072]. Operating the loader is raising and lowering it.

92. The control station 13 is *mounted toward the rear* of the vehicle (*compact tool carrier*). EX1005, Figs. 8-9, 21, [0016] (“The construction equipment...includes a vehicle with a control unit **installed** operate the equipment while a worker is on board at the rear.”)

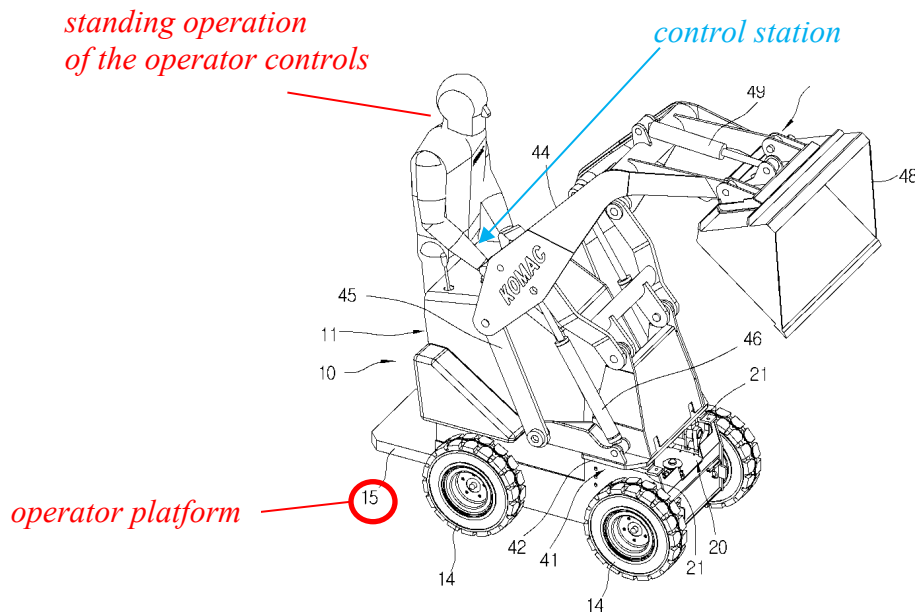


**EX1005, Fig. 8 (portion)
(annotated)**

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

[1.7] an operator platform for standing operation of the operator controls of the control station; and

94. KR996 describes a safety step 15 (*operator platform*) for *standing operation of the operator controls* of the control unit 13 (*control station*). EX1005, Figs. 1, 7-10, 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].

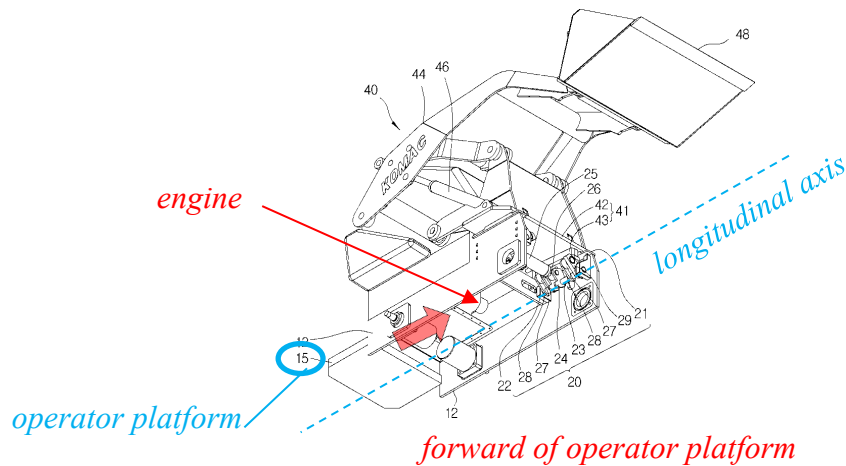


**EX1005, Fig. 9
(annotated)**

95. Thus, [1.7] is taught by KR996.

[1.8] *an engine disposed forward of the operator platform relative to the longitudinal axis.*

96. KR996's vehicle includes an *engine* disposed forward of the safety step 15 (*operator platform*) *relative to the longitudinal axis*. Fig. 10 is illustrative:



**EX1005, Fig. 10
(annotated)**

See also, Fig. 12, claims 1, 2, [0002]-[0005] showing the vehicle is self-propelling, which would be provided by an engine. The engine, as illustrated by KR996 is confirmed by EX1014, a Korean patent publication having the same inventor, assignee, and directed to a substantially similar “green building deconstruction work” vehicle and further illustrating an engine. EX1014, (54), FIG. 3.

97. Further, the *purpose* of KR996’s vehicle is for traveling across and maneuvering around a supporting surface while the operator is on the safety step 15. EX1005, [0002], [0016]. And it would be recognized that the vehicle of KR996 has an engine disposed within its frame to provide energy to propel the vehicle while the operator rides. Therefore, certainly, power is provided to the KR996

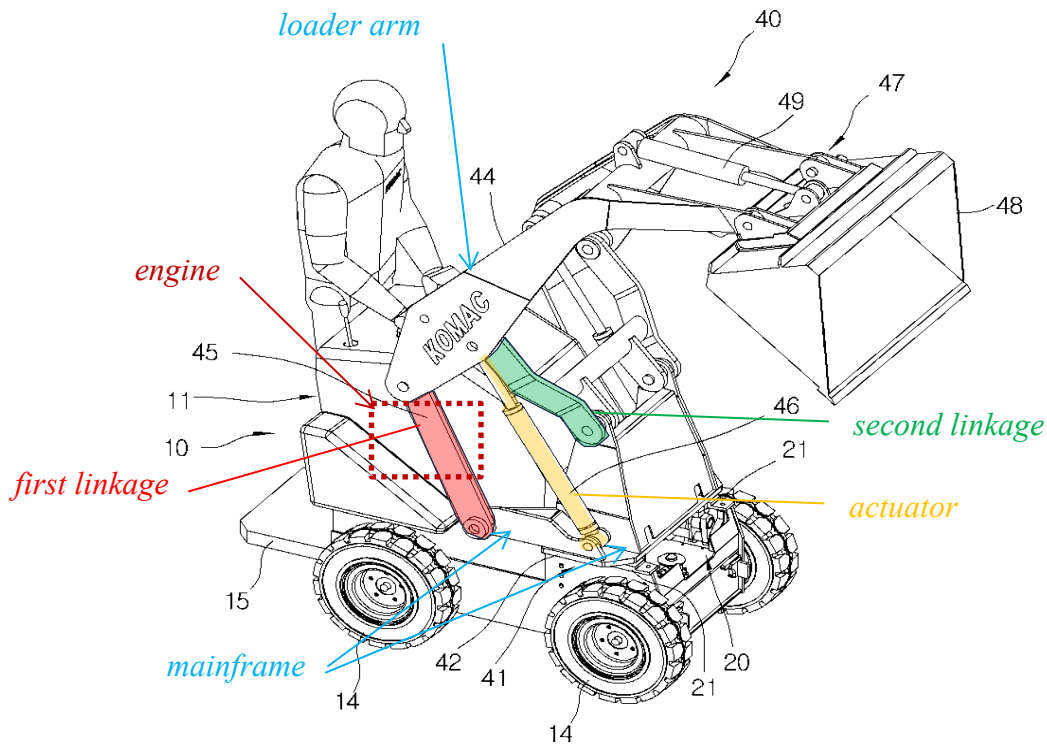
vehicle to propel it forward. There are well-known choices to provide this power:

(1) an engine with benefits of power, speed, well-established and widespread availability, (2) electric power, which needs a battery taking long to charge; (3) solar power, which is dependent upon the environment; (4) operator-powered (limited in speed and distance based on operator). KR996, with its ride-on platform, does not suggest operator (e.g., human)-power, nor suggest solar or electric power. Further, a POSITA would recognize an engine is a commonly implemented power source for these types of vehicles. *See, e.g.*, ISO 6165 (EX1016), p. 7 (“self-propelled”), SAE J2752 (EX1015), p. 4 suggesting “engine” components; Azure (EX1013), [0003] “Walk-behind power machines such as wide-area lawn mowers and compact utility skid-steer loaders have been in use for some time. These vehicles generally include a frame having an engine that not only powers drive members, but an optional implement such as a cutting deck or trencher as well.”); EX1009 (Bares ’568), 2:32-48 (“a small loader indicated generally at 10 is a walk behind powered loader ...driven by an internal combustion engine 45...”).

98. Thus, [1.7] is taught by KR996. I also discuss the engine of Bares below.

99. Therefore, KR996’s vehicle providing stand-behind operation from a step 15 (*operator platform*) with a boom 44 (*loader arm*) attached to its mainframe

by links 45/unlabeled (*first and second linkages*) and boom cylinder 46 (*actuator*) teaches and renders obvious claim 1.



EX1005, Fig. 9
(annotated)

3. Claim 2

[2] The compact tool carrier as set forth in claim 1 wherein the mainframe incorporates a single weldment.

100. KR996 teaches or renders obvious claim 1 and further describes this limitation. The '750 Patent does not define a “single weldment,” but does, with respect to a different component, contrast a “single weldment” with use of “fasteners (e.g., nuts and bolts).” See EX1001, 2:56-58.

101. POSITA would have found it obvious to form one or more portions of the mainframe 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. There are numerous examples of implementing a welding technique in substantially similar compact tool carriers. Bares 659, 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 typical. See Yasuda (EX1022) 4:50-11:25 discussing “welding.” See also, EX1006 discussing a suitable mainframe [0020] (“general mounting means such as welding or the like,”) [0016] (“enabling welding work to be stably performed, easily and efficiently,”)

102. 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 enabling welding work to be stably performed, easily and efficiently. [0016].

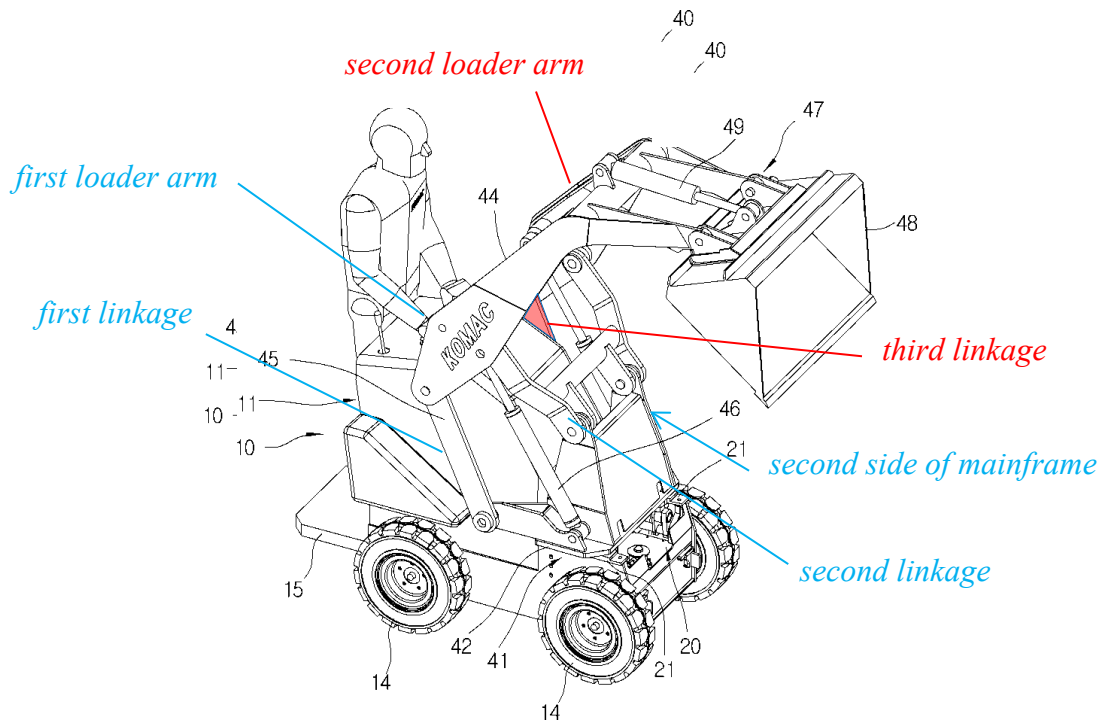
103. To the extent Patent Owner argues certain components of the mainframe are required to be coupled by a weldment, POSITA would have been motivated to form KR996’s mainframe consisting of a *single weldment* because the fastening method was well within their skill set and provides benefits discussed 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...”)

104. Thus, claim 2 is rendered obvious by KR996.

4. Claim 3

[3] *The compact tool carrier as set forth in claim 1 wherein the loader arm is a first loader arm the loader comprising a second loader arm and the compact tool carrier comprising a third linkage pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.*

105. KR996 teaches or renders obvious claim 1 and further describes the boom 44 (*loader arm*) of [1.1] is a *first loader arm*. KR996 also describes another boom 44 (*second loader arm*) connected to a *second side* of the vehicle frame ([1.2a]) also through a four-bar mechanism including another link 45 (*third linkage*). EX1005, Figs. 1, 8-11. The link 45 (*third linkage*) is *pivotally attached* to the boom 44 (*second loader arm*) and the *second side of the mainframe*, just the same as discussed for the first side [1.3].



EX1005, Fig. 9
(annotated)

KR996 Figures, such as Figs. 1, 5, 11, confirm the two sides of the vehicle have the same loader mechanism configuration including link 45 (*third linkage*) is *pivotally attached* to the *second side of the mainframe* and the second boom 44 (*second arm*) just as discussed [1.3]. 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.

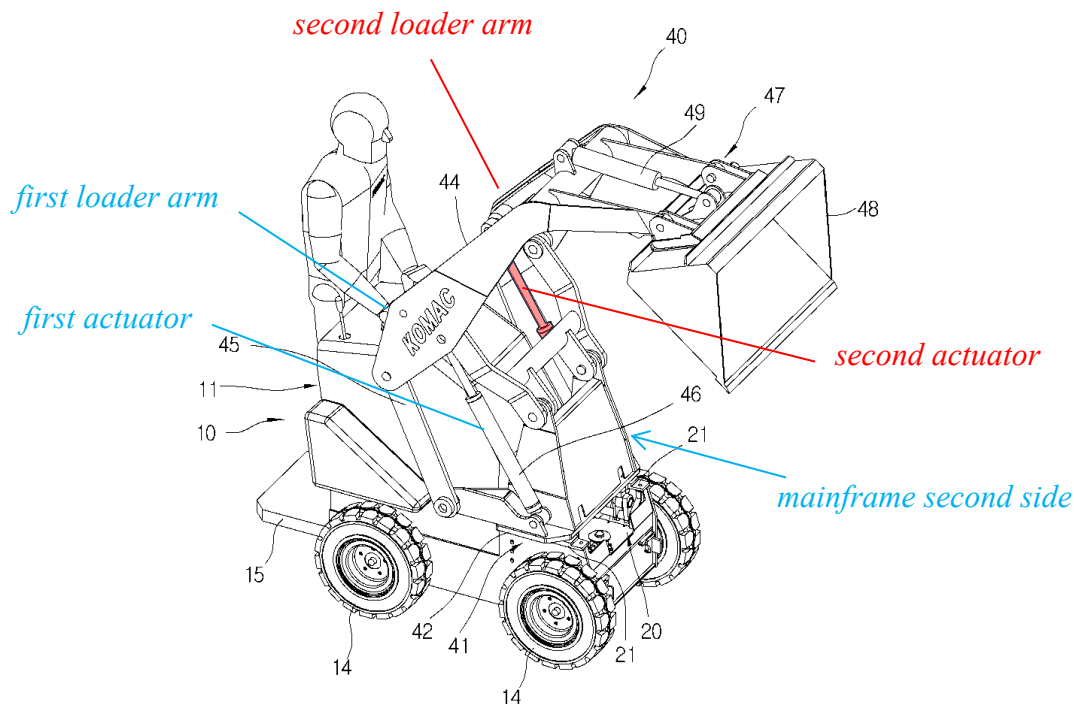
106. Thus, KR996 teaches claim 3.

5. Claim 4

[4] *The compact tool carrier as set forth in claim 3 wherein the actuator is a first actuator, the compact tool carrier comprising a second actuator, the second*

actuator being pivotally attached to the second side of the mainframe and pivotally attached to the second loader arm.

107. KR996 teaches or renders obvious claim 3 and further describes the boom cylinder 46 (*actuator*) of [1.5] is a *first actuator*. KR996 also describes another boom cylinder 46 (*second actuator*) driving a second boom 44 (*second loader arm*) and attached to a *second side of the mainframe*. EX1005, Figs. 1, 8-11. Fig. 9 is an exemplary illustration of boom cylinder 46 (*second actuator*) *pivotally attached to the second side of the mainframe and the second boom 44 (the second loader arm)*:



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

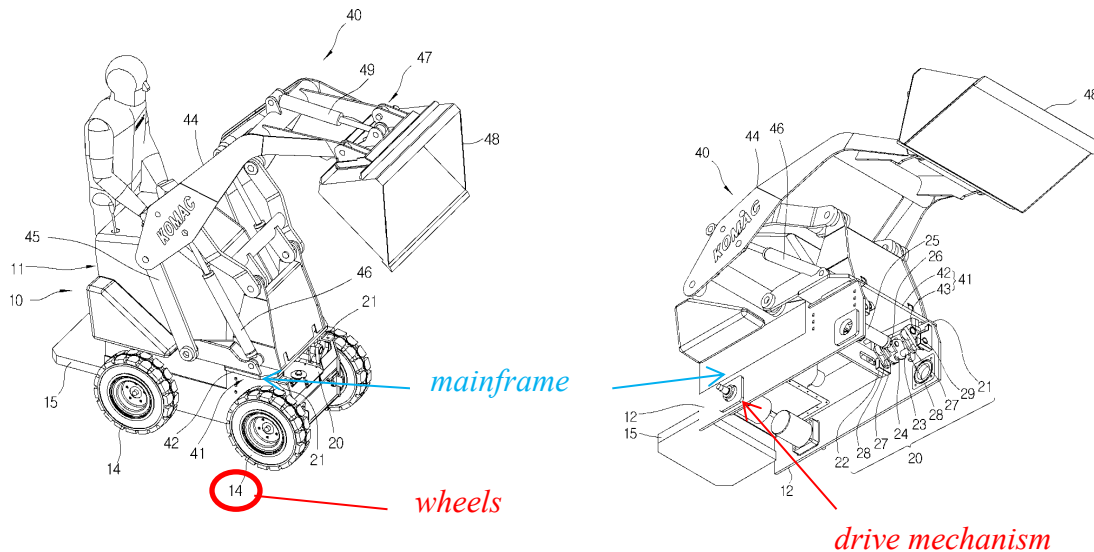
KR996 Figures, such as Figs. 1, 5, 11, confirm the two sides of the vehicle have the same loader mechanism configuration including boom cylinder 46 (*actuator*) is *pivotally attached to the second side of the mainframe* and the boom 44 (*second arm*) just as discussed [1.5]. And a POSITA would recognize providing substantially the same structure of both sides of the vehicle to provide a balance in weight.

108. Thus, KR996 teaches claim 4.

6. Claim 5

[5] *The compact tool carrier as set forth in claim 1 comprising a drive mechanism comprising tracks or wheels, the drive mechanism being attached to the mainframe.*

109. KR996 teaches or renders obvious claim 1 and further describes *a drive mechanism* including “wheels (14)” (*wheels*). EX1005, [0042], Figs. 1, 8-10. The *drive mechanism is attached to side plate 12* a portion of KR996’s *mainframe*.



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

This is the same configuration as the '750 Patent. EX1001, 2:2-6 (“The drive mechanism is attached to the mainframe about a rotational axis.”)

110. Thus, KR996 teaches claim 5.

7. Claim 6

[6] *The compact tool carrier as set forth in claim 1 comprising a drive mechanism propelled by the engine.*

111. KR996 teaches or renders obvious claim 1 and describes *a drive mechanism* including wheels 14 and *engine* as shown in [5] and [1.8], respectively. EX1005, [0042], Figs. 8-10, 12. The *drive mechanism* is *propelled by the engine* as this is a standard vehicle operation. See, e.g., Bares explains its drive mechanism is *for propelling the loader apparatus over a supporting surface*. See EX1010, 2:37-

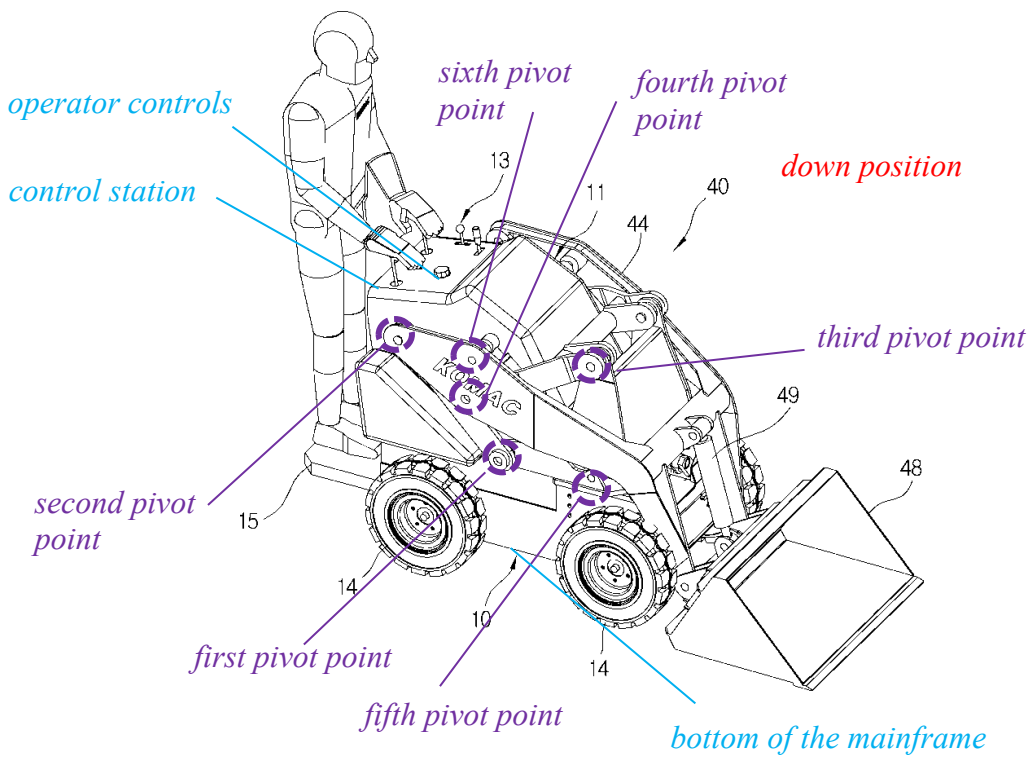
39 (“**[ground drive] assembly** [] on each side of the loader for **propelling the loader in forward** and reverse directions.”), 5:18-43 (“to power the unit and propel it over the ground.”); EX1009, FIGS. 1-2, 2:34-47; Azure (EX1013), [0003] (“Walk-behind power machines such as [] compact utility skid-steer loaders have been in use for some time. These vehicles generally include a frame having **an engine** that not only **powers drive members**, but an optional implement...”))

112. Thus, KR996 teaches claim 6.

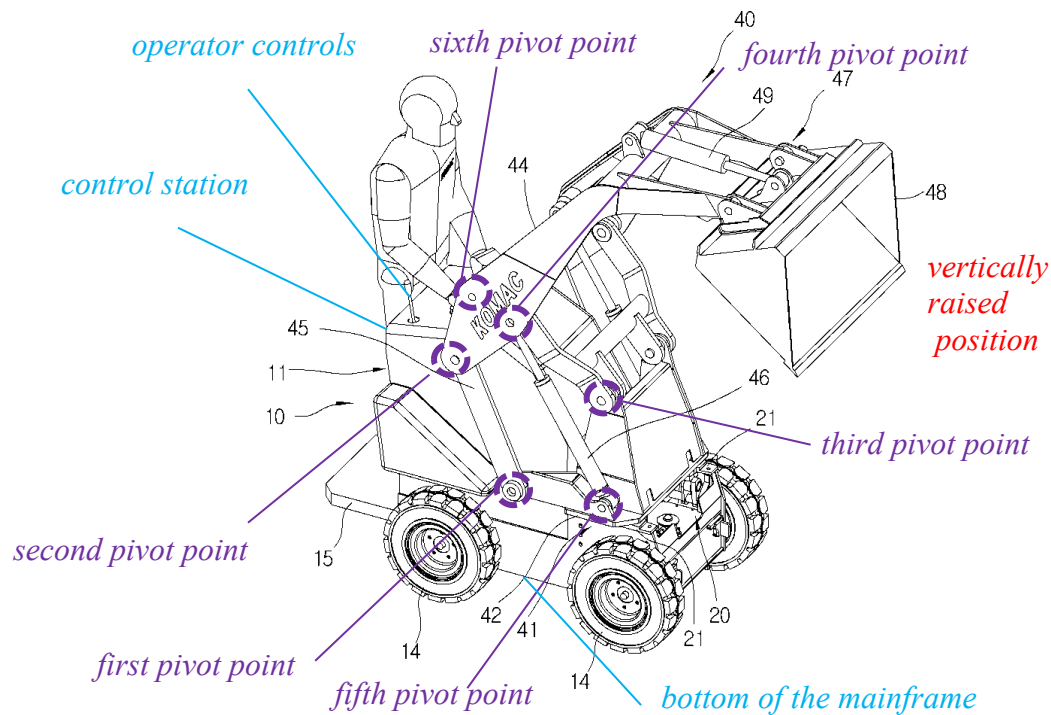
8. Claim 7

[7] The compact tool carrier as set forth in claim 1 wherein each of the first, second, third, fourth, fifth and sixth pivot points is, individually, (1) disposed between the operator controls and a bottom of the mainframe or (2) disposed forward of the operator controls as the loader moves from a down position to a vertically raised position.

113. KR996 teaches or renders obvious claim 1 and further describes, as the loader unit 40 (*loader*) moves from a down position (Fig. 8) to a vertically raised position (e.g., Fig. 9), the *first, second, third, fourth, fifth, and sixth pivot points* of claim 1 are *individually* (1) *disposed between the operator controls* of control unit 13 and a *bottom of the mainframe* or (2) *disposed forward of the operator controls* of control unit 13.



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



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

114. As each of the *down* and *vertically raised position[s]* disclose at least one of the two options, the pivot points are also as claimed as the loader moves between the points. This is because as the loader moves, the non-stationary pivot points move forward of the operator controls. *See also*, EX1005, Fig. 21. Further, there is no extent of lift required by the “vertically raised position.” *See, e.g.*, EX1005, Figs. 7, 13, which show in a *vertically raised position*, the pivot points to the loader arm are below the operator controls.

115. To the extent Patent Owner argues KR996’s figures are insufficiently recognized as being to scale as to explicitly provide for claimed arrangement, the

configuration would have been obvious to implement in KR996's vehicle. First, plain inspection of the KR996 figures suggests just this configuration. EX1005, Figs. 7-9, 21. Second, the operator controls are described as being at a rear of the vehicle to be accessible by the operator on safety step 15 and thus, generally the equipment is forward of the controls. 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. I discuss this in detail below in Ground 3 including with reference to claim 19.

116. Thus, KR996 teaches claim 7.

9. Claim 8

[8] *The compact tool carrier as set forth in claim 1 wherein the loader arm incorporates a single weldment.*

117. This element is taught by or obvious in light of KR996.

118. KR996 teaches or renders obvious claim 1 including the boom 44 (*loader arm*) in [1.1]. KR996 figures suggest boom 44 is formed as a *single weldment* (e.g., without fasteners illustrated). Further, POSITA would have found it obvious to form boom 44 (*loader arm*) incorporating a *single weldment* for substantially similar reasons as discussed above with reference to [2] as this is merely a design choice in the method of forming the component.

119. Thus, claim 8 is rendered obvious by KR996.

10. Claim 9

[9] *The compact tool carrier as set forth in claim 1 further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller.*

120. This element is taught by KR996.

121. KR996 teaches or renders obvious claim 1 and describes its *compact tool carrier* includes a *tool* in [1.1], which is a “bucket (48)” (*bucket*) attached to boom 44 of loader 40 (*loader*). EX1005, claim 1, [0054], [0074]-[0075].

122. Thus, KR996 teaches claim 9.

11. Claim 10

[10] *A method for operating the compact tool carrier as set forth in claim 1, the method comprising standing on the operator platform and operating the control station to propel the compact tool carrier forward and/or raise or lower the loader.*

123. This element is taught by KR996.

124. KR996 renders obvious the *compact tool carrier* of claim 1 and also discloses *a method for operating* it. See EX1005, claim 8, [0033] (“allowing the operator to board and alight from the vehicle **when driving it**”), [0042] (“a control unit (13) to **operate the equipment while the worker** is on board at the rear”), [0049] (“so that the operator can board the vehicle (10) when driving”). As discussed in [1.7], KR996 describes safety step 15 (*operator platform*) on which the operator stands when operating the vehicle including when operating control unit 13 (*control station*) to *propel* the vehicle forward and/or *raise or lower* the

loader unit 40 (*loader*). EX1005, [0042] (“The vehicle (10) is equipped with a **control unit (13) to operate the equipment while the worker is on board at the rear**”); [0072] (“[T]he control unit (13) of the vehicle (10) can be operated to operate the loader unit (40).”)

125. Thus, KR996 teaches claim 10.

12. Claim 11

[11] *The compact tool carrier as set forth in claim 1 wherein no more than three linkages and actuators are attached to the first side of the mainframe.*

126. This element is taught by KR996.

127. KR996 teaches or renders obvious claim 1 and further illustrates three linkages and actuators ([1.3]-[1.5]) and *no more than three linkages and actuators attached to the first side of the mainframe*. This is consistent with ’750 Patent use of three linkages/actuators to support the loader. EX1001, FIG. 1, 4:14-34 (forward/rear linkages 46a/50a and actuator 54), while other components such as drive mechanism 18 are “attached to the mainframe 10” (3:21-22).

128. Thus, KR996 teaches claim 11.

13. Claim 12

[12] *The compact tool carrier as set forth in claim 1 wherein a single actuator is attached to the first side of the mainframe.*

129. This is taught by KR996 to the same extent as shown in the ’750 Patent.

130. KR996 teaches or renders obvious claim 1 and further describes, as in [1.5], a boom cylinder 46 (*actuator*) attached to the first side of the mainframe, which is *a single actuator attached to the first side of the mainframe*. See EX1005, Figs. 8-9.

131. Thus, KR996 teaches claim 12.

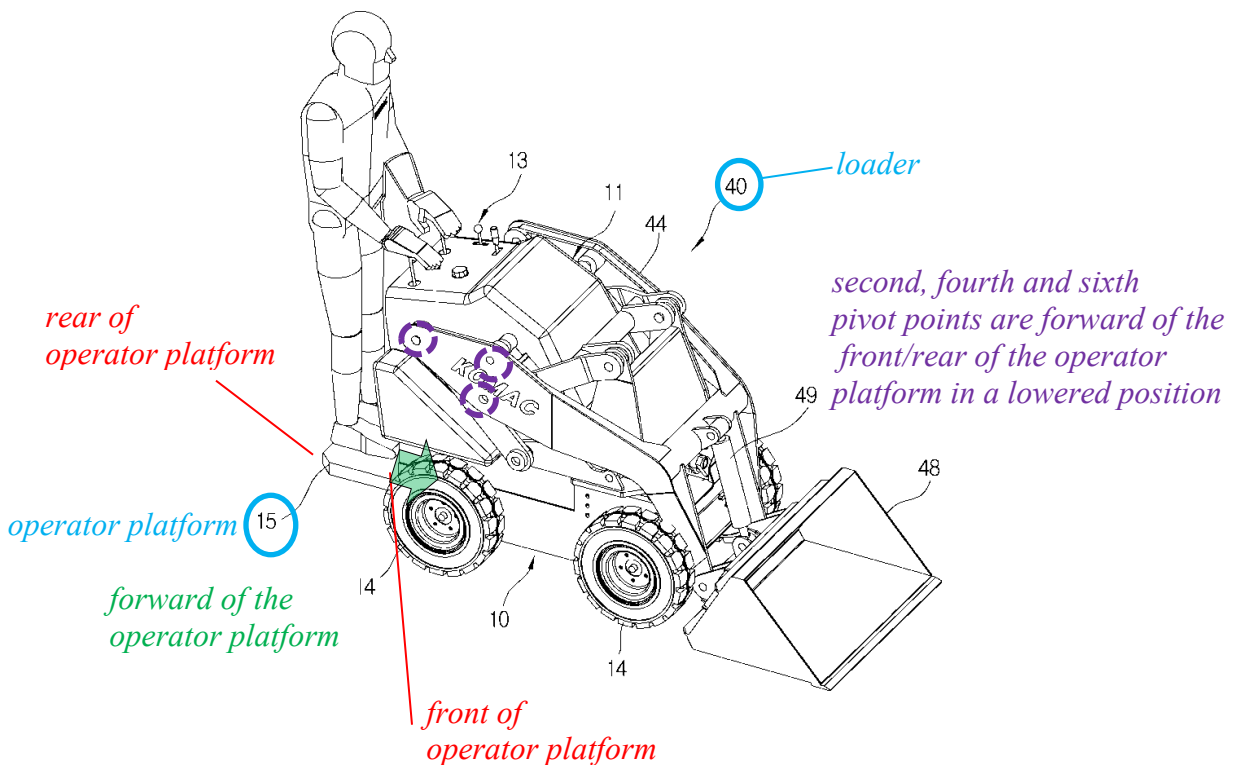
14. Claim 13

[13] *The compact tool carrier as set forth in claim 1 wherein the loader is moveable between a down position and a vertically raised position, the operator platform having a rear and a front relative to the longitudinal axis, the second pivot point, fourth pivot point, and sixth pivot point being disposed forward of the rear and front of the operator platform when the loader travels from the down position to the vertically raised position.*

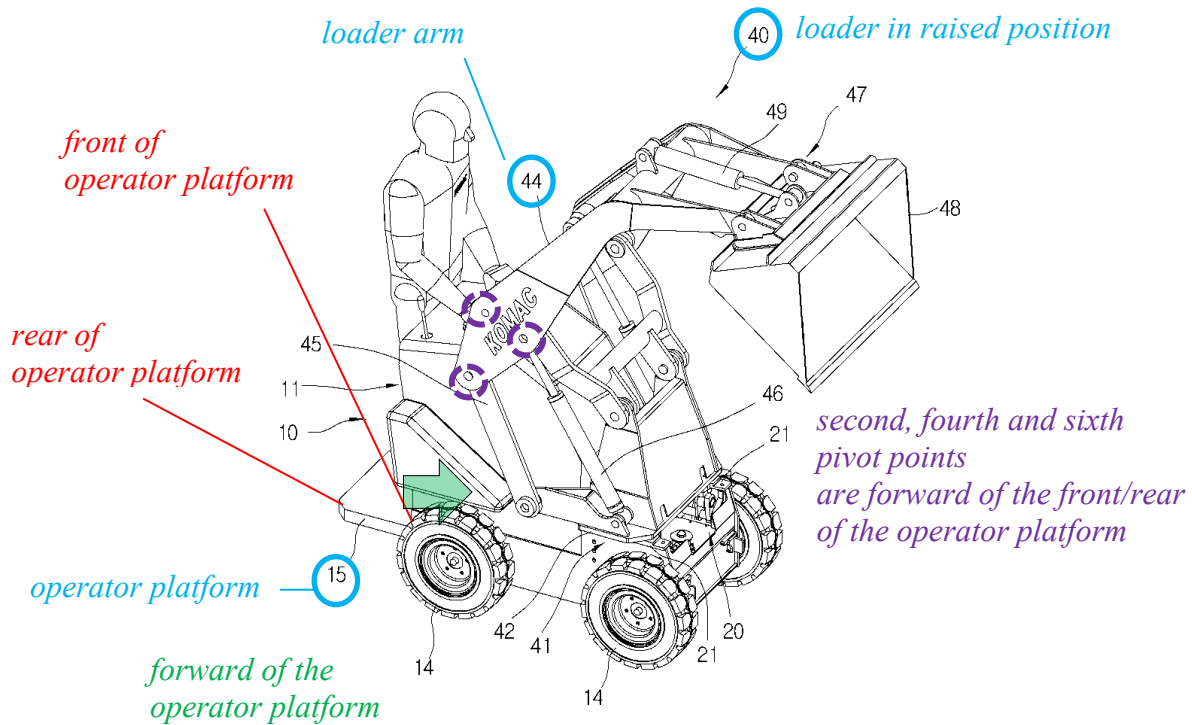
132. KR996 teaches this element.

133. KR996 teaches or renders obvious claim 1 and further describes the loader unit 40 (*loader*) of [1.1] is *moveable between a down position* (Fig. 8) and a *vertically raised position* (e.g., Fig. 9).

134. The safety step 15 (*operator platform*) of [1.7] has *a rear and a front relative to the longitudinal axis*, as annotated below. And KR996 also discloses that the *second, fourth and sixth pivot points* of [1.3]-[1.5] are *disposed forward of the rear and front of the operator platform when the loader travels from the down position to the vertically raised position*. Figs. 8-9 are illustrative:



EX1005, Fig. 8 (portion)
(annotated)



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

135. As the pivot points are so located at the down position and the vertically raised position, so are they located as claimed when the loader travels between said positions. *See also*, EX1005, Figs. 7, 12-13, 21.

136. Thus, KR996 teaches claim 13.

15. Claim 14

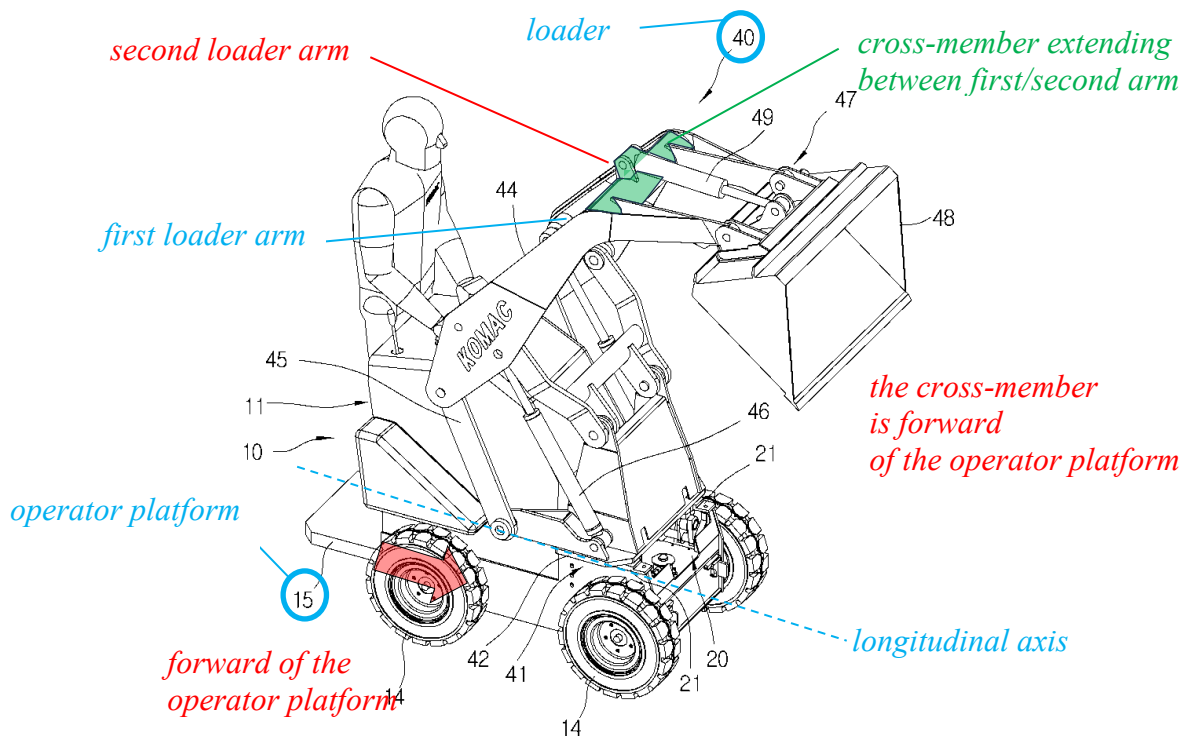
[14] *The compact tool carrier as set forth in claim 1 wherein the loader is moveable between a down position and a vertically raised position, the arm of the loader being a first arm and the loader comprising a second arm and at least one cross-member that extends from the first loader arm to the second loader arm, wherein each cross-member is disposed forward of the operator platform relative to the longitudinal axis in the vertically raised position of the loader.*

137. KR996 teaches or renders obvious claim 1 and further describes these elements.

138. KR996's loader unit 40 (*loader*) of [1.1] is *moveable between down* (Fig. 8) and *vertically raised position[s]* (e.g., Figs. 7, 9). The boom 44 (*arm of the loader*) attached to the first side of the mainframe, as shown in [1.1], is a *first arm* and another boom 44 (*second arm*) is attached to the *second side of the mainframe* (see [3]). EX1005, Figs. 7-9.

139. KR996 illustrates a cross-member (*at least one cross-member*) that extends from boom 44 (*first loader arm*) to another boom 44 (*second loader arm*) as annotated below. EX1005, [0054], Figs. 1, 5, 7-9.

140. KR996 illustrates its *cross-member is disposed forward of the safety step 15 (operator platform) relative to the longitudinal axis in the vertically raised position* (e.g., Fig. 9, [0101]) of loader unit 40. Fig. 9 is illustrative:



EX1005, Fig. 9
(annotated)

141. Thus, claim 14 is taught by KR996.

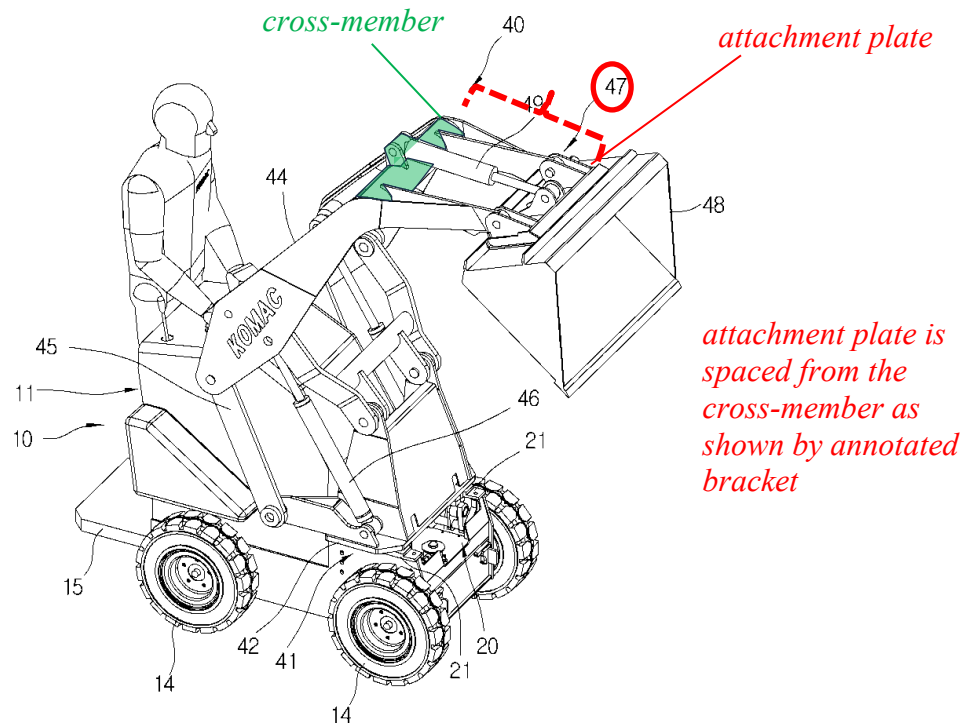
16. Claim 15

[15] *The compact tool carrier as set forth in claim 14 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.*

142. KR996 teaches or renders obvious claim 14 and also teaches this element.

143. KR996 illustrates a bucket attachment 47 (*attachment plate*) for removably attaching bucket 48 (*tool*) to the boom 44 of the vehicle (*the compact tool carrier*): “At the end of the boom (44), a **bucket attachment (47)** is installed,

and a **bucket (48) is coupled** to the bucket attachment (47)[.]” EX1005, [0054]. KR996 illustrates the cross-member of [14] is *spaced from* the bucket attachment 47 (*attachment plate*).



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

144. The tool/bucket is *removably attach[ed]* as KR996 illustrates embodiments with the bucket attached and detached. *Compare* Figs. 5-6 with bucket 48 removed and Figs. 8-9 with bucket 48 attached, [0040] (“bucket removed”). Further, this capability of an attachment plate was well-known in the art and a recognized as a capability of the bucket attachment such as bucket attachment 47. Bares (EX1009) at 3:16-21 discusses “lift arms curve down and pivot pins 38 are

used for mounting a quick **attachment plate** 40 to the lower ends of the forward plates of conventional design. The quick attachment plate 40 is the type normally used with the BOBCAT® skid steer loaders...bucket 48 is shown in position on the attachment plate 40, and this, too, is supported on the attachment plate 40 in a known manner.”); Azure (EX1013), which illustrates an “attachment plate 132 located at the distal front ends of the loader arms 110. To ease the task of removing and installing attachments on the loader arms 110, various quick attachment systems may be used.” [0033]. A POSITA would recognize the benefit of having a removably attached tool so that the tool can be serviced and/or replaced.

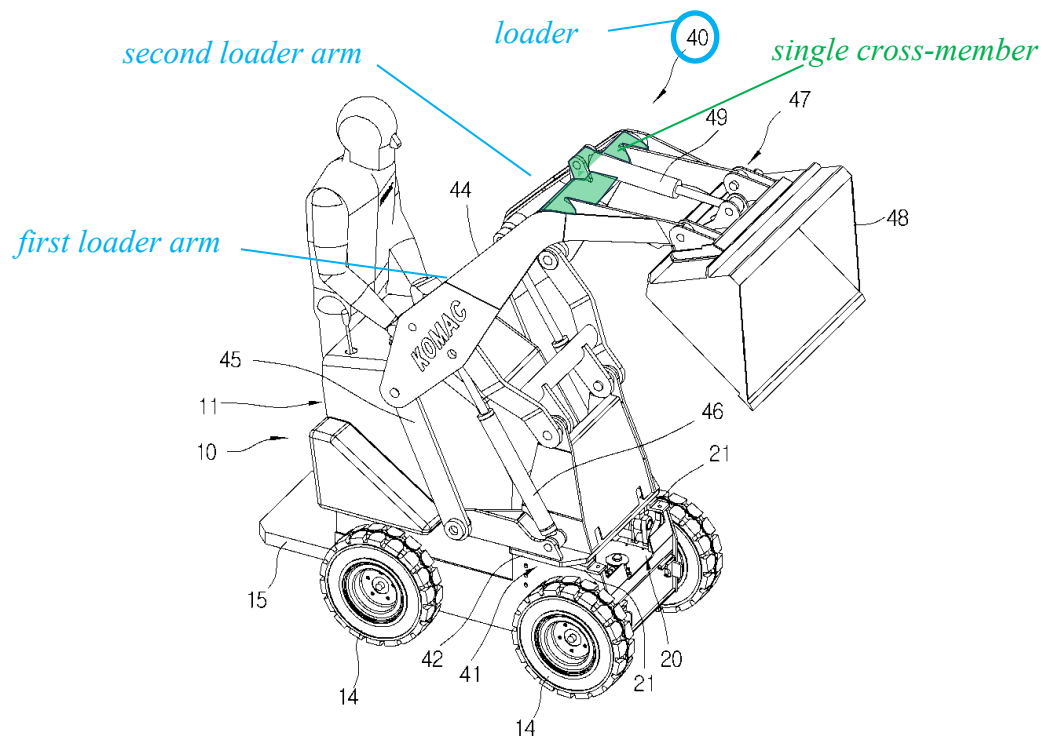
145. Thus, claim 15 is taught or rendered obvious by KR996.

17. Claim 17

[17] *The compact tool carrier as set forth in claim 14 wherein the compact tool carrier comprises a single cross-member.*

146. KR996 teaches or renders obvious claim 14 and also teaches this element.

147. KR996 illustrates *a cross-member* extending between the first and second boom 44. This cross-member is *a single cross-member* consistent with the '750 Patent (*e.g.*, FIG. 1 shows the single cross-member between loader arms, 2:54-56). Fig. 9 is illustrative:



EX1005, Fig. 9
(annotated)

148. Thus, claim 17⁵ is rendered obvious by KR996.

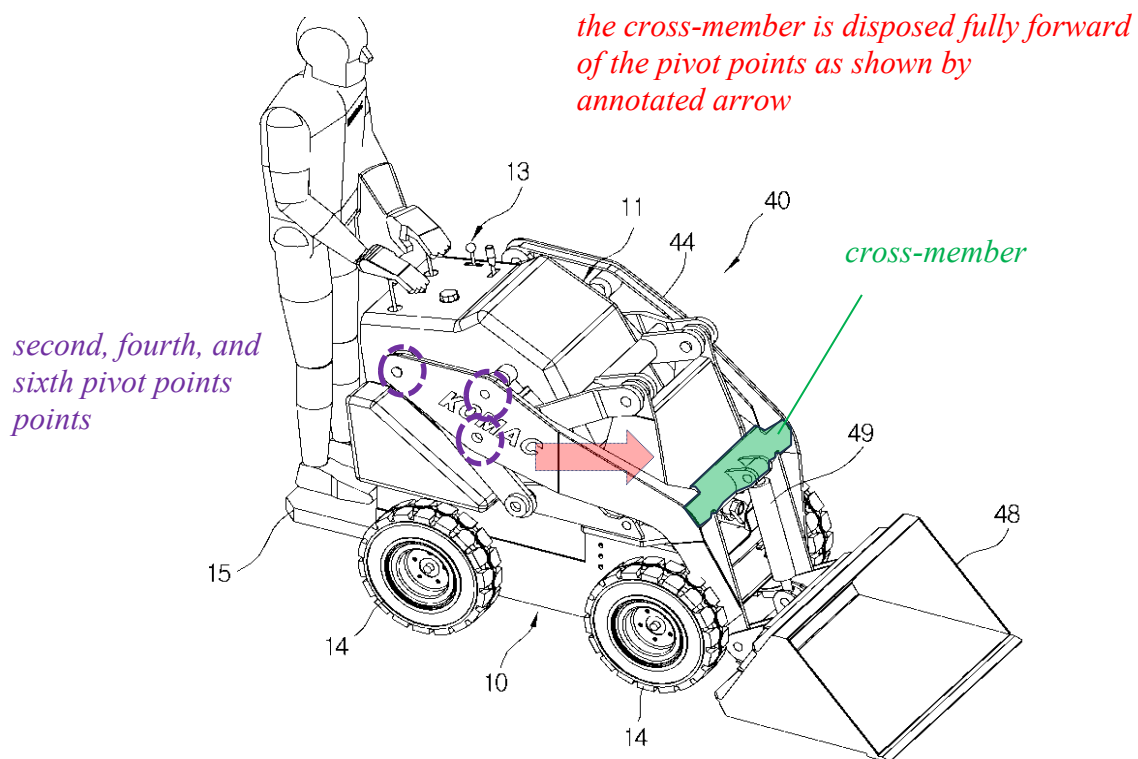
18. Claim 18

[18] *The compact tool carrier as set forth in claim 14 wherein each cross-member is disposed fully forward of the second pivot point, the fourth pivot point, and the sixth pivot point.*

⁵ For purposes of the declaration, and in line with the '750 Patent figures, I am assuming "a single cross-member" of claim 15 refers to "at least one cross-member" recited in claim 14.

149. KR996 teaches or renders obvious claim 14 and this element.

150. KR996 illustrates a cross-member as discussed above and also shows this cross-member, as illustrated in Fig. 8, is *disposed fully forward of the second pivot point, the fourth pivot point, and the sixth pivot point* of [1.3]-[1.5].



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

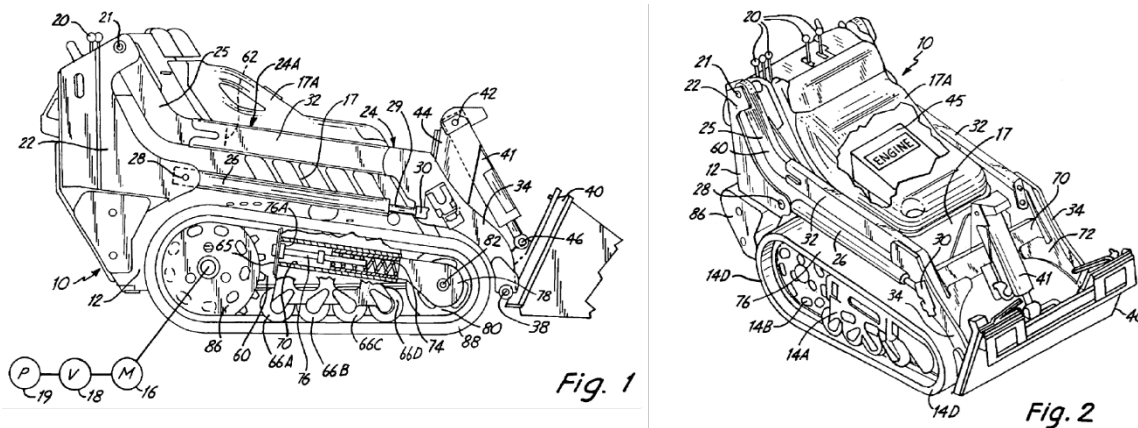
151. Thus, claim 18 is taught or rendered obvious by KR996.

D. Ground 2 : KR996 and Bares

1. Bares (EX1010)

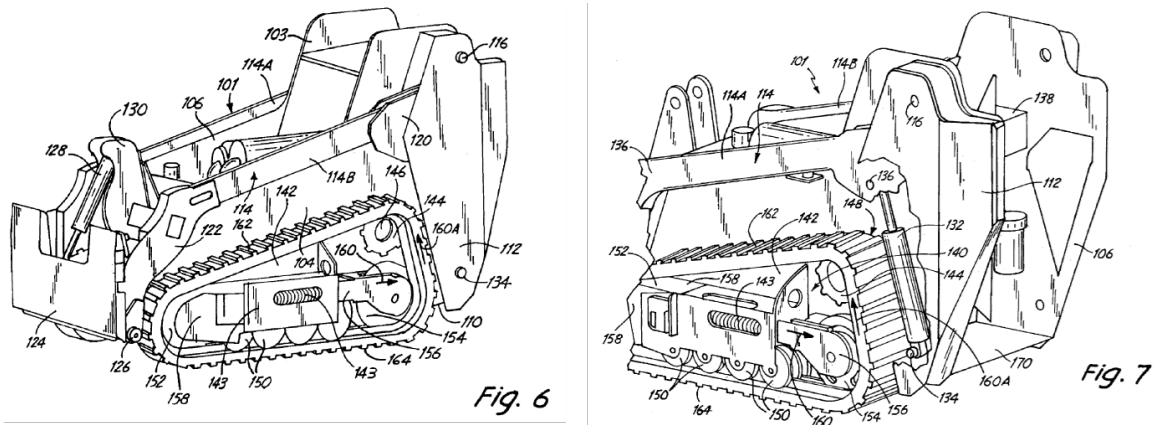
152. Bares “relates to a small...walk behind loader that is, in the form

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

153. 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. Bares also describes modified track assembly having 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

154. 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. And 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.

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

155. Bares, like KR996, is in the same field of endeavor as the '750 Patent, pertaining to working vehicles (*e.g.*, earth-moving equipment) and in particular, vehicles with a stand behind operation and a loader arm. EX1005, Abstract, [0001], FIG. 21; EX1010, 5:55-57, FIGS. 1-8; EX1001, 1:19-38, 2:61-3:5, FIG. 1. KR996, Bares, and '750 Patent are also each reasonably pertinent to a same problem faced by the inventor of configuration of loader arms and tools attached thereto to provide efficient lifting of the tool. EX1005, [0011], [0016], FIG. 21; EX1001, 1:39-41;

EX1010, 1:46-58.

156. 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.

157. Designing this vehicle type with a drive mechanism of either a wheeled assembly or a tracked assembly was a known alternative. See Rorabaugh (EX1032) (U.S. Patent Appl. 2010/0168933), [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.

158. 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.

159. 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.

160. 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. Claim 16

[16] *The compact tool carrier as set forth in claim 14 , further comprising a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket, the cross-member being disposed forward of the drive sprocket in the vertically raised position and the down position of the loader.*

161. KR996 teaches or renders obvious claim 14 and in combination with Bares renders obvious this element.

162. As discussed in [5], KR996 describes a drive mechanism including “wheels (14)” for *propelling its compact tool carrier over a supporting surface (e.g., ground)*. EX1005, [0042], Figs. 1, 8-10; [14]. It would have been obvious, as a

simple substitution for the wheeled assembly of KR996, to provide Bares' track assembly drive mechanism for the reasons discussed above.

163. Bares illustrates track assembly (*drive mechanism*) for *propelling* a small loader vehicle. EX1010, Figs. 1, 8, 2:36-37, 3:24-32, 5:18-43. In an embodiment of Bares, each track assembly includes a frame 142, a drive sprocket 144 and wheels 150, 154 over which a track 148 (*track*) is mounted. EX1010, 5:18-42, FIGS. 6-8. Bares' drive sprocket 144 driven by motor 146 rotates around a rotational axis, just like in the '750 Patent. 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.”) Bares' drive mechanism as illustrated and on KR996's provides these same features.

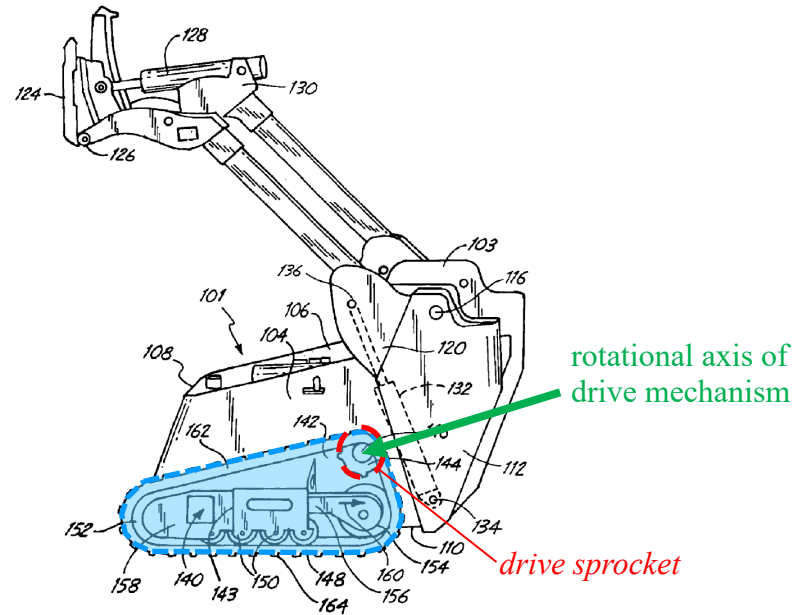


Fig. 8

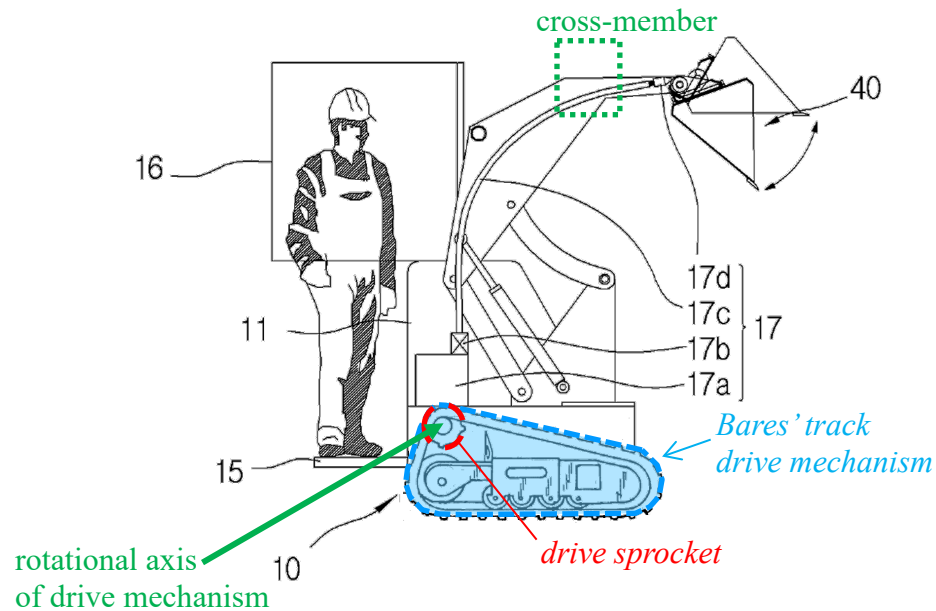
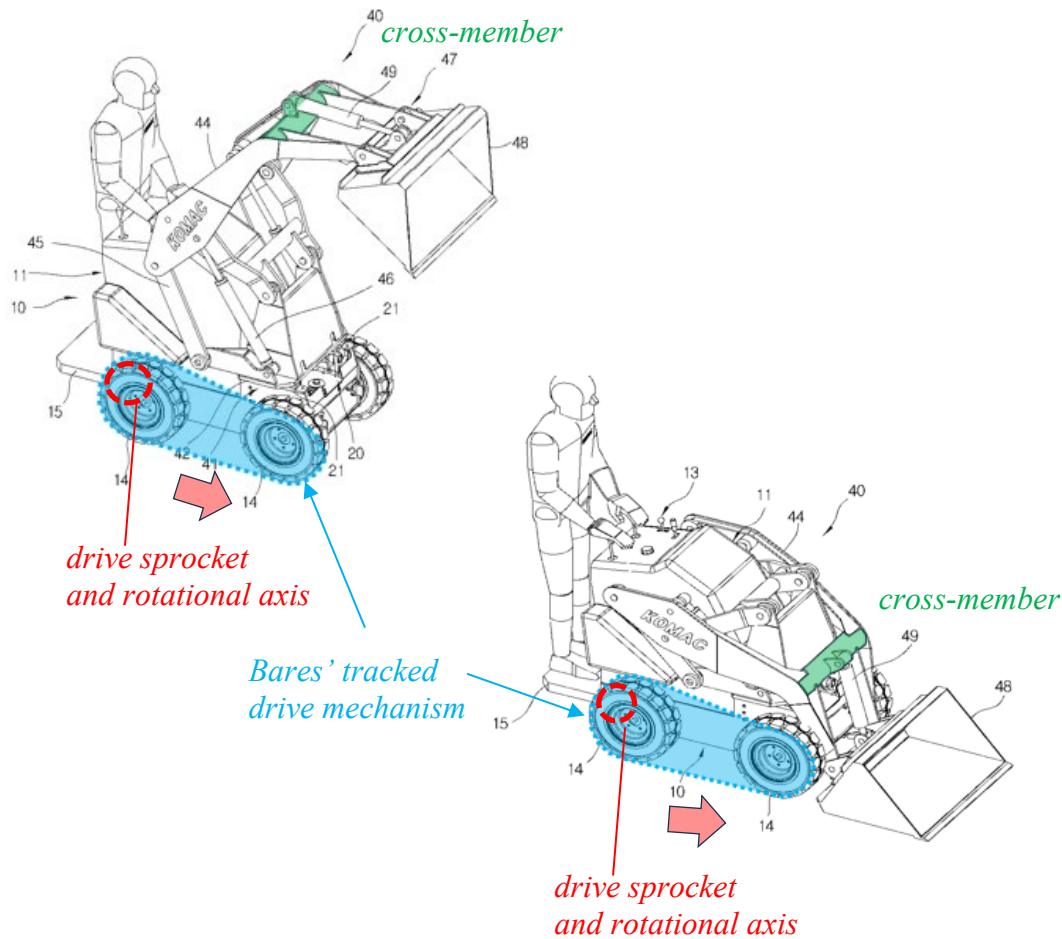
EX1010, FIG. 8
(annotated)FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

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.)

164. Providing the drive mechanism of KR996 vehicle as Bares' track assembly, the predictably resulting KR996-Bares vehicle has *the cross-member being disposed forward of the drive sprocket in the vertically raised position and the down position of the loader*. This is because KR996's cross-member is *disposed forward of the rotational axis of the rear of its drive mechanism in the vertically raised position* (e.g., Fig. 9) *and the down position* (Fig. 8) *of the loader unit 40 (loader)* and thus, the cross-member is also forward of the rotational axis when provided by the *drive sprocket* in the track assembly of KR996-Bares.



EX1005, Fig. 9, Fig. 8 (portion)
(annotated including Bares' track mechanism)

165. Bares also illustrates its loader arm has a cross-member 70 between two loader arms that is *forward of the drive sprocket* and its rotational axis. See EX1010, FIGS. 6-8.

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

4. Claims 1-18

167. KR996 teaches or renders obvious each and every element of claims 1-15 and 17-18 as I discussed above in Ground 1, and KR996 in view of Bares renders

obvious claim 16 as discussed above.

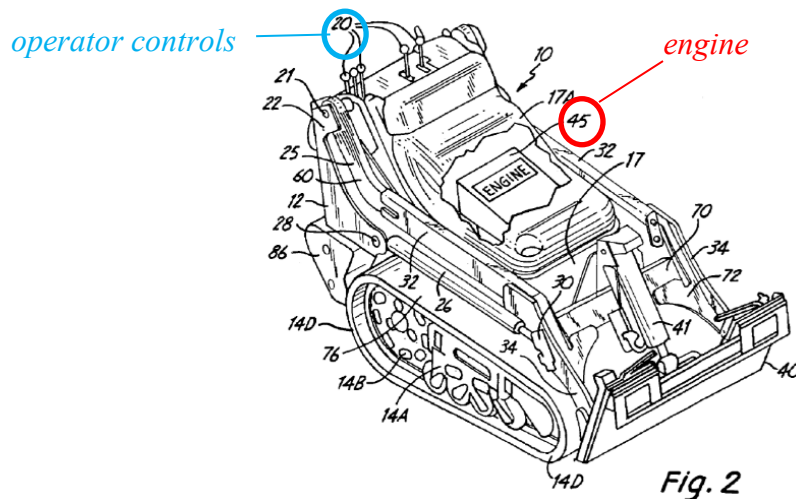
168. To the extent Patent Owner argues KR996 does not sufficiently illustrate an “engine,” KR996 in view of Bares renders claims 1-18 obvious because it would have been obvious to provide an engine such explicitly illustrated and discussed in Bares in KR996’s vehicle. In addition to the reasons to combine KR996-Bares discussed above, POSITA would have combined Bares’ engine teachings to KR996 to propel the vehicle. This is the function of an engine. There are a limited number of options to provide power to a vehicle and implementing Bares’ engine is merely applying a known and common technique to perform the same purpose of propelling a compact carrier.

169. There is a reasonable expectation of success as providing power for self-propelled vehicles by an engine was commonly implemented as I discussed above including citing similar Korean patent application describing a substantially similar carrier (EX1014, FIG. 3), standards (EX1016, p. 7, EX1017, p. 9), and other compact tool carriers, EX1013, [0003] (“Walk-behind power machines such as wide-area lawn mowers and compact utility skid-steer loaders **have been in use for some time**. These vehicles **generally** include a frame **having an engine** that not only powers drive members, but an optional implement...”), 1:33-35 (“small self-propelled loader that is designed for operation by an operator standing at the rear of the loader[.]”)

170. All elements of claims 1-15 and 17-18 are taught by or rendered obvious by KR996 as in Ground 1, elements [1.8] and [6] directed to an engine are also obvious under KR996-Bares.

[1.8] *an engine disposed forward of the operator platform relative to the longitudinal axis.*

171. As discussed above, Bares describes a substantially similar vehicle and specifically and explicitly identifies its “engine,” which is located *forward* of its operator’s position. FIG. 2 of Bares is illustrative:



**EX1010, FIG. 2
(annotated)**

172. EX1010, 2:35-47 (“The body or frame 12 supports a ground drive and support member or assembly 14 on each side of the loader for propelling the loader in forward and reverse directions through the use of drive hydraulic motors indicated schematically at 16 in FIG. 1 and also in FIG. 3. The drive motors 16 are connected

to a pump 19...driven by an internal combustion engine 45...”), 5:18-61 discussing operator controls and operator platform.

[6] *The compact tool carrier as set forth in claim 1 comprising a drive mechanism propelled by the engine.*

173. Bares explicitly describes what POSITA would readily recognize: the drive mechanism of the compact tool carrier is propelled by the engine. EX1010, 2:35-47 (“The body or frame 12 supports a ground drive and support member or assembly 14 on each side of the loader for propelling the loader in forward and reverse directions through the use of drive hydraulic motors indicated schematically at 16 in FIG. 1 and also in FIG. 3. The drive motors 16 are connected to a pump 19...driven by an internal combustion engine 45...”).

174. Thus, claims 1-18 are rendered obvious by KR996 and Bares.

E. Ground 3 : KR996, Bares, and Beltrami

1. Beltrami (EX1008)

175. Beltrami, a patent issued in June 1971, is directed to “digging and lifting device[s]” fit 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” 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. A POSITA would recognize this as a two-bar mechanism (see my discussion beginning at paragraph 30) or radial lift style loader.

176. Beltrami continues to suggest addressing drawbacks of this conventional radial lift and introduces a vertical style lift loader, where the loader arms are not directly connected to the body of the vehicle. Instead, the loader arms are attached using intermediate parts - two connecting rods (i.e., links) and a hydraulic jack (i.e., actuator) - 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. A POSITA would recognize this as a four-bar mechanism (see my discussion above at paragraph 31). Beltrami recognizes a desire to keep the pivot point connections between these intermediate parts and the 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.” EX1008, 3:35-45.

2. Reasons to combine KR996 and Bares

177. Reasons to combine KR996 and Bares are provided in Ground 2.

3. Reasons to combine KR996-Bares and Beltrami

178. KR996-Bares and Beltrami are analogous art to the '750 Patent because they are in the same field of endeavor of earth-moving machinery. EX1001, 1:19-

41; EX1005, Abstract; EX1008, 1:5-15. In fact, each of KR996 (including as modified by Bares) and Beltrami, like the '750 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 '750 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, 1:19-41; EX1005, Figs. 8-9; EX1008, 1:24-40.

179. 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.

180. 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 or less than 2 times the distance between the axis and the bottom of the mainframe, 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.

181. 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.

182. 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.

183. 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.

4. Claim 19

184. The analysis of claim 19 for Ground 4 is the same as that for claim 1 in Ground 1, with exceptions noted.

		See the analysis in
[19.0]	<i>A compact tool carrier having a longitudinal axis and comprising:</i>	[1.0]
[19.1]	<i>a loader adapted to carry a tool;</i>	[1.1] including loader unit 40 carrying bucket 48 (<i>tool</i>)
[19.2]	<i>a mainframe for supporting the loader, the mainframe having a first side and a second side, the loader being free from direct attachment to the mainframe;</i>	[1.2a], [1.2b]
[19.3]	<i>a first linkage pivotally attached to the first side of the mainframe at a first pivot point and pivotally attached to the loader at a second pivot point;</i>	[1.3] including link 45 (<i>first linkage</i>)
[19.4]	<i>a second linkage pivotally attached to the first side of the mainframe at a third pivot point and pivotally attached to the loader at a fourth pivot point;</i>	[1.4] including second link (<i>second linkage</i>)

[19.5]	<i>an actuator pivotally attached to the first side of the mainframe at a fifth pivot point and directly pivotally attached to the loader at a sixth pivot point;</i>	[1.5] including boom cylinder 46 (<i>actuator</i>)
[19.6a,b]	<i>a drive mechanism ... being less than twice D5;</i>	See below
[19.7]	<i>a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier;</i>	[1.6] including control unit 13 (<i>control station</i>), which is mounted toward the rear of the vehicle (EX1005, Figs. 8, 9).
[19.8]	<i>an operator platform for standing operation of the operator controls of the control station; and</i>	[1.7] including safety step 15 (<i>operator platform</i>)
[19.9]	<i>an engine disposed forward of the operator platform relative to the longitudinal axis.</i>	[1.8] including KR996's engine. See also analysis in Ground 2 and Bares' engine

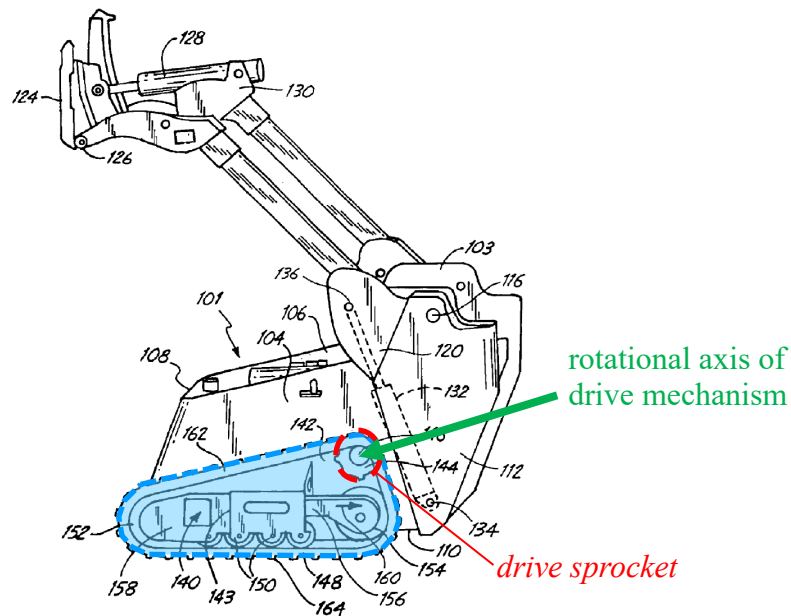
[19.6a] *a drive mechanism for propelling the compact tool carrier over a supporting surface, the drive mechanism having a drive sprocket defining a rotational axis R, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis R and the bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis R and a bottom of the first side of the mainframe being separated by a vertical distance D5,*

185. As discussed above, KR996 describes *a drive mechanism* including wheels (14). EX1005, [0042], Figs. 1, 8-10. See also, [5]. And as shown in Ground 2 claim [16], it would have been obvious to substitute the wheel assembly illustrated in KR996 with a track assembly as taught by Bares which includes a drive sprocket

144 (*drive sprocket*). The drive sprocket *defines a rotational axis R*.

186. KR996's vehicle (*compact tool carrier*) has a *bottom* at which the wheels 14 (*drive mechanism*) contact the *supporting surface* (e.g., ground). For the reasons discussed above, it would have been obvious, as a simple substitution, to provide a track assembly as the drive mechanism of the KR996 vehicle.

187. Bares illustrates track assembly (*drive mechanism*) for *propelling* a small loader vehicle. EX1010, Figs. 1, 8, 2:36-37, 3:24-32, 5:18-43. In an embodiment of Bares, each track assembly includes a frame 142, a drive sprocket 144 (*drive sprocket*) and wheels 150, 154 over which a track 148 is mounted. 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 (*drive sprocket*) driven by motor 146 rotates around *a rotational axis*, just like in the ’750 Patent. Bares’ drive mechanism as illustrated and on KR996’s provides these same features. The following figures are illustrative:



EX1010, FIG. 8
(annotated)

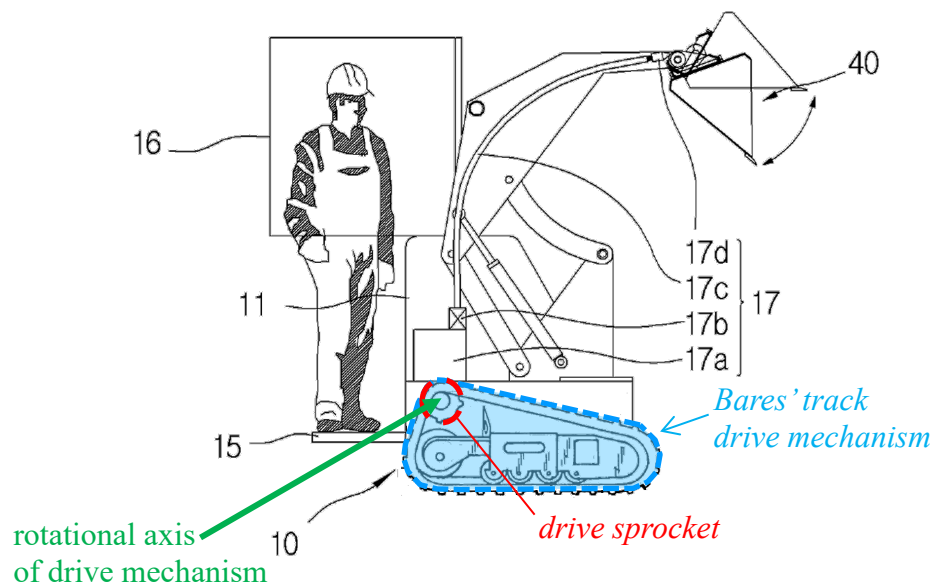


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

188. Again, Figure A is 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.)

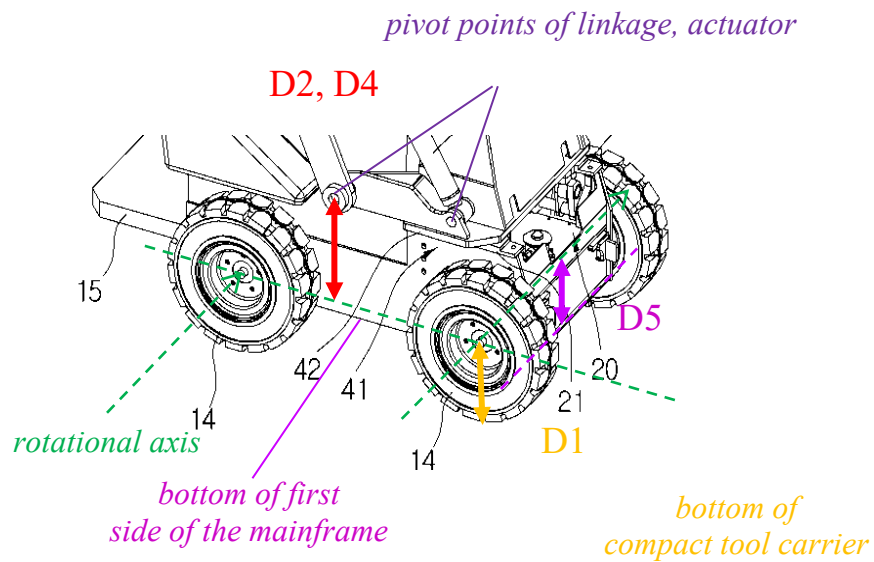
189. KR996's vehicle with Bares' track assembly has a *bottom* at which track 148 of the track assembly (*drive mechanism*) *contacts the supporting surface* (e.g., ground). The *rotational axis* and *bottom of the compact tool carrier* are separated by a *vertical distance D1*.

190. 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

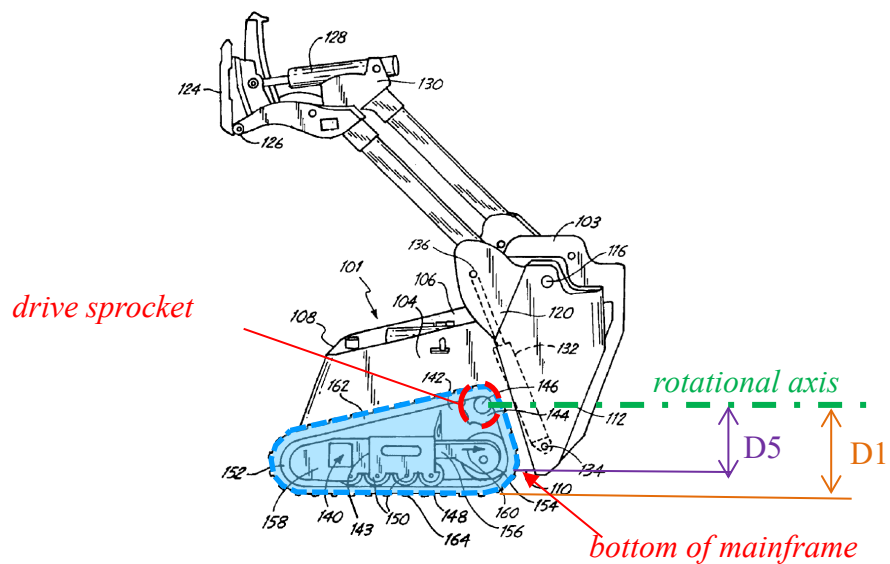
wheels. *See* Bares '568 (EX1009), FIG. 1.

191. 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.

192. Each of KR996 and Bares illustrate D1 and D5, and the distances remain in KR996-Bares. Annotated KR996 Fig. 9 is illustrative:



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



**Bares (EX1010), FIG. 8
(annotated)**

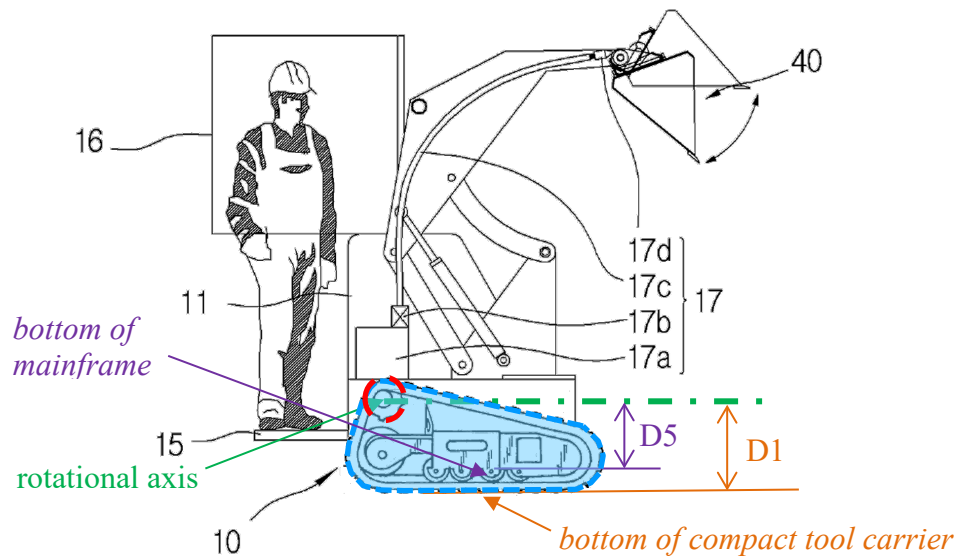


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

193. 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

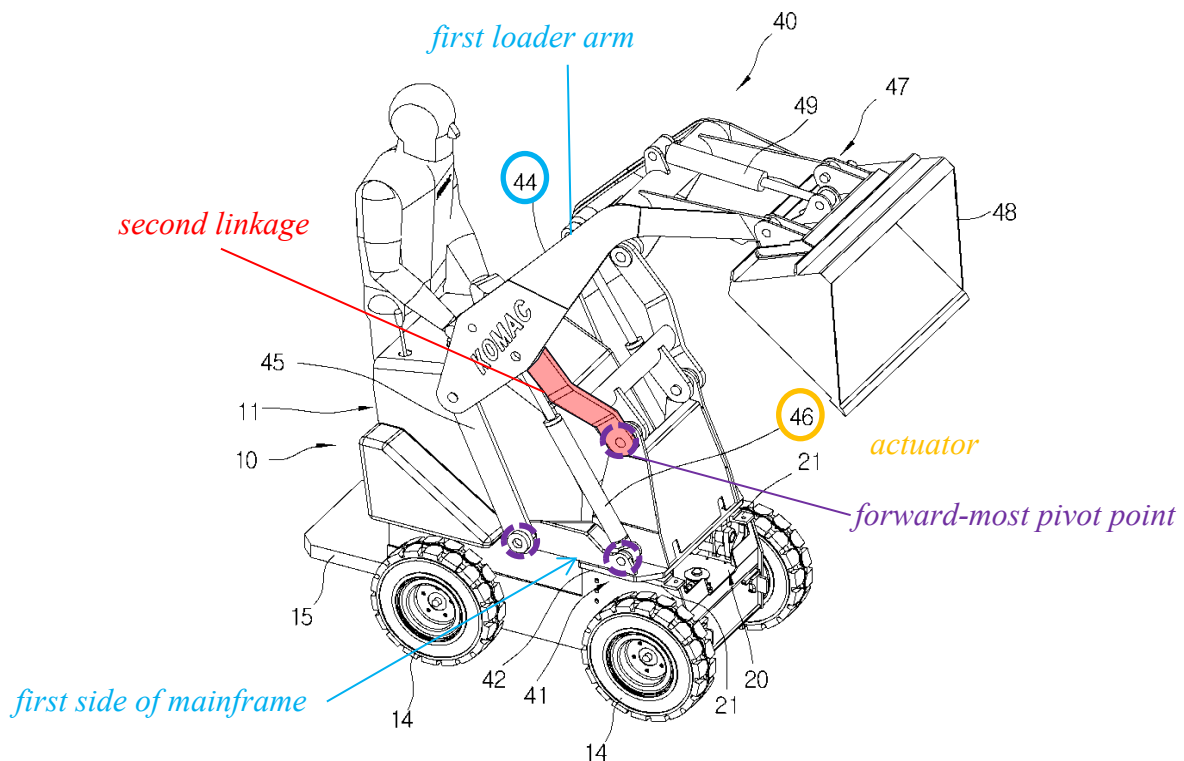
(e.g., increase in protection from damage (e.g., debris or harsh conditions) and ease of connection to drive system. Oestmann (EX1035), US 3,828,873, 1:12-14 illustrating disadvantage of a low drive sprocket “closely adjacent to ground level to thus subject it to wear and damage.” This raised sprocket 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.

194. Thus, KR996 in view of Bares teaches [19.6a].

[19.6b] 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 also being less than 1.5 times $D1$, the vertical distance between the rotational axis R and the fifth pivot point also being less than 1.5 times $D1$, the first side of the mainframe comprising a forward-most pivot point, the first pivot point, the third pivot point, or the fifth pivot point being the forward-most pivot point, the vertical distance between the rotational axis R and the forward-most pivot point being less than twice $D5$;

195. As to element [19.6b], KR996 including as modified by Bares and implementing the teachings of Beltrami teach this element.

196. First, there is a *forward-most pivot point* in the loader mechanism of KR996, which is the *third pivot point* (that of the link and the mainframe). See, e.g., EX1005, Fig. 21. See also, EX1009, Figs. 8-9, which illustrate in a perspective view either the third or fifth pivot point as the forward-most pivot point.



EX1005, Fig. 9
(annotated)

197. Second, in the KR996 vehicle there is a *vertical distance* between each of the *first, third, and fifth pivot points*, those at which the first linkage ([1.3]), second linkage ([1.4]), and actuator ([1.5]) are attached to the mainframe, respectively, and

the *rotational axis*. See EX1005, Figs. 8, 9, 21.

198. In the KR996-Bares vehicle, this configuration would also be recognized by POSITA, noting Bares' drive mechanism increases D1 and D5. KR996-Bares is illustrative:

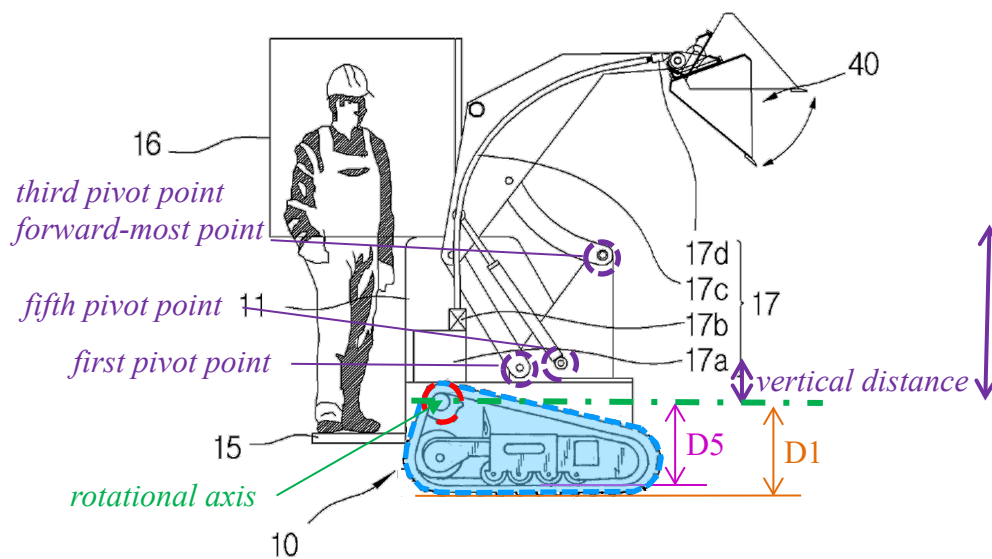


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 9 track assembly

199. The *first pivot point* and the *fifth pivot point* appear by plain inspection to be within the recited relative dimension. **Additionally**, POSITA would have recognized a benefit to configure the vertical distance between each pivot point and the rotational axis each being *less than 1.5 D1* and the *forward-most pivot point less than 2 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.

200. First, KR996 teaches the same vertical lift loader with pivot points between the same intermediary parts (linkages/actuator) as the '750 Patent. And configuring the pivot points as claimed is merely optimization within prior art conditions or through routine experimentation.

Standard Practice to Optimize Pivot Point Locations :

201. Like the '750 Patent, KR996 teaches a loader with an arm connected by pivot point connections between the same components (links/actuator) and a mainframe. That is, each of KR996 and '750 Patent illustrate a loader based on a four bar mechanism. 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.

202. 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:

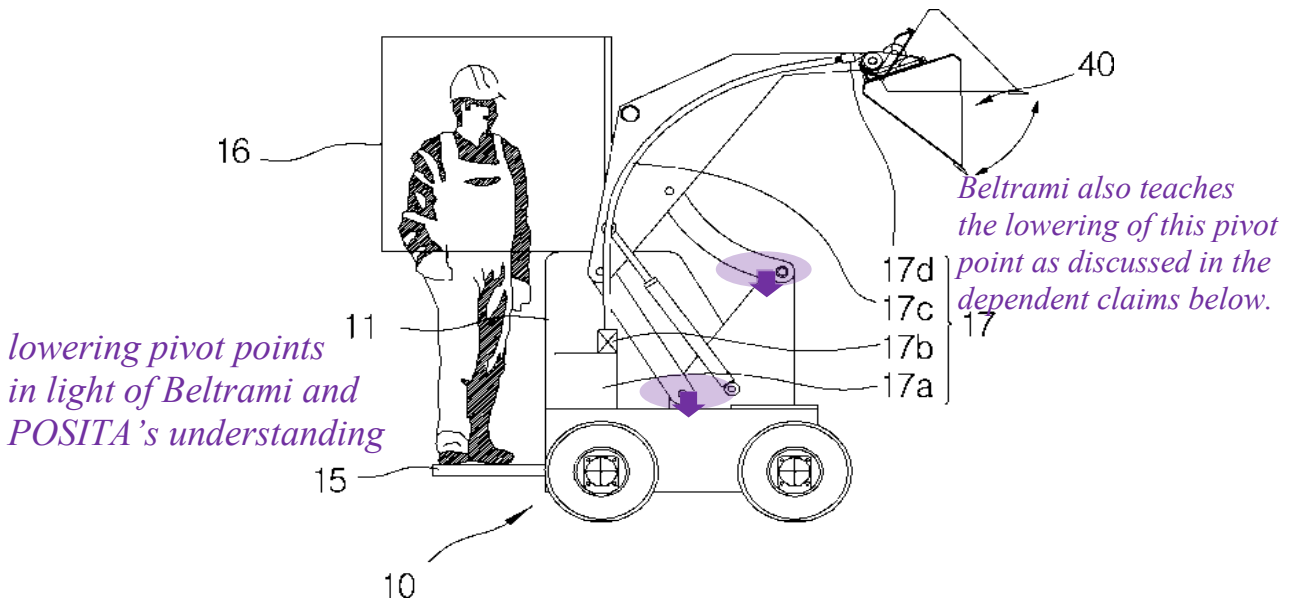
203. Beltrami also confirms that decades prior to the '750 Patent, modifying positions of the relevant pivot points affected the design goals and was a known technique in designing such a vehicle. Beltrami (EX1008), 4:25-50 (“...a substantially vertical path such as that indicated by the reference number 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...”).

204. 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 in paragraph 149. As Beltrami suggests, lowering the equipment gravity center mitigates, when raising a load, the shifting of the center of gravity to undesired heights.

205. Thus, a POSITA would have had the skillset, desire, and motivation to provide the pivot points low (*i.e.*, minimizing the distance each of the linkages and actuator are connected to the mainframe from the rotational axis). This provides, for example, a compact size mainframe and a low center of gravity of the KR996 carrier

when implementing Beltrami's suggestion of lowering the pivot points.



EX1005, Fig. 21
(annotated)

The Benefits of Providing Low Pivot Points were well understood:

206. 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 2 D5* as claimed. I have reviewed the '750 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 55. Instead, the '750 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.

'750 Patent (EX1001), 5:64-6:2 (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 '750 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 '750 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.

207. 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].

208. 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

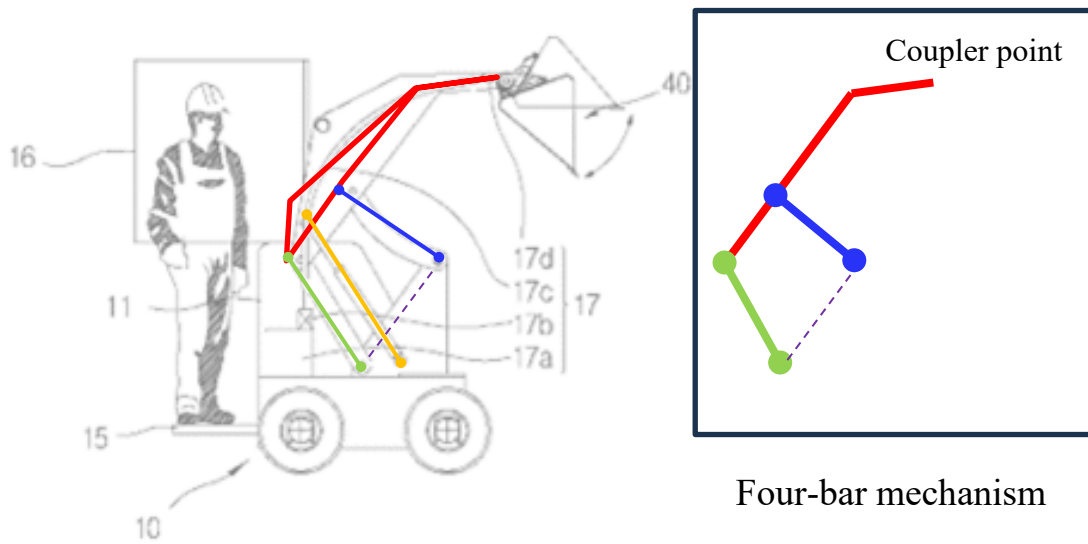
to be moved.

Implementation Details as to Lower Pivot Points – Example Embodiment

209. 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 19 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.

210. 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.

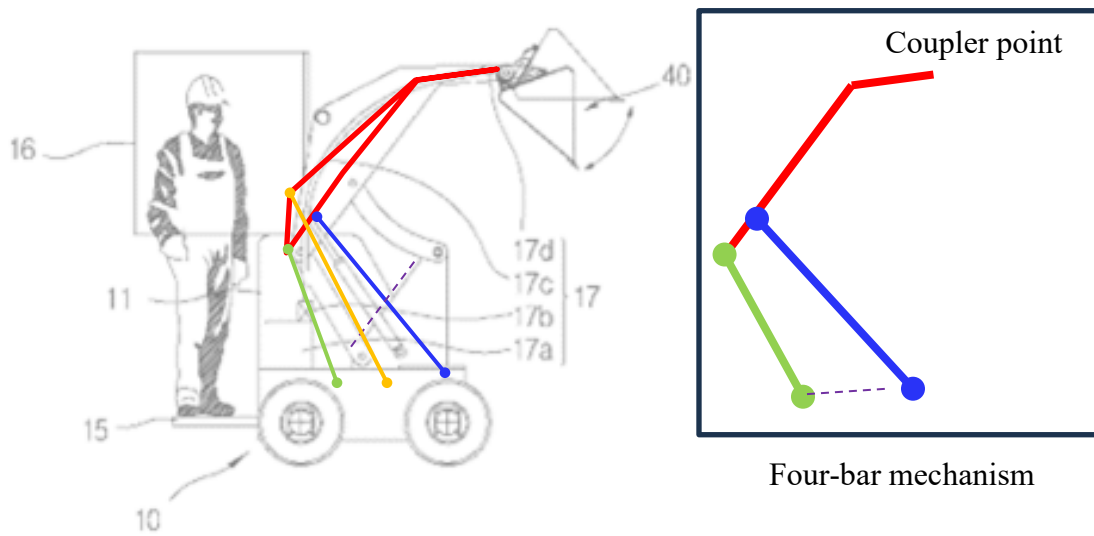
211. First, the four-bar mechanism of KR996 is illustrated by a kinematic diagram overlying the figure as provided below.



EX1005, FIG. 21
(annotated)

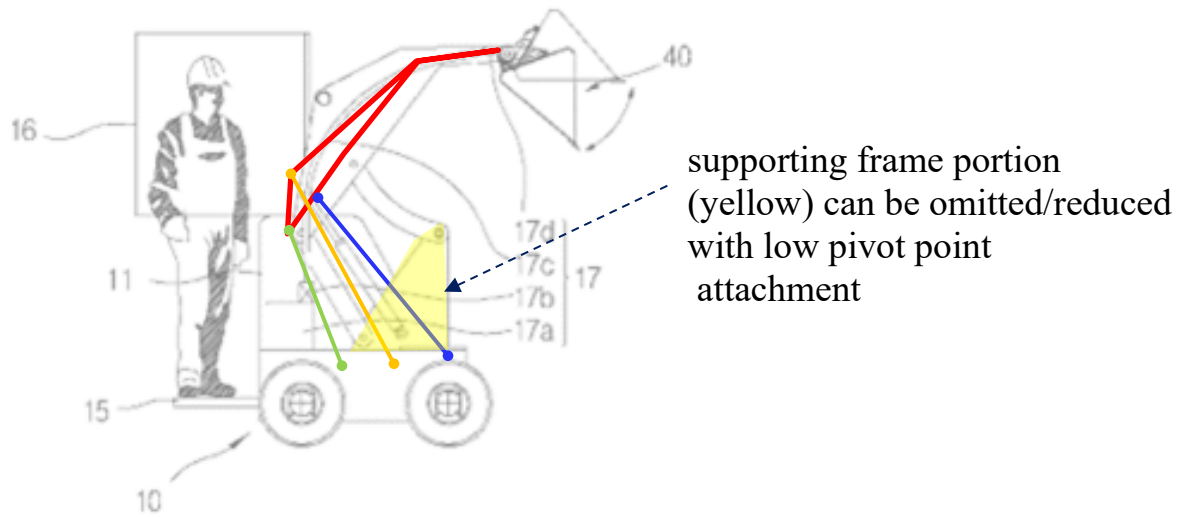
212. As I discuss above, in my experience and as readily recognized by a POSITA, the task of designing a mechanism such as a four-bar (including that to form a loader) concerns determining the linkage/actuator lengths and attachment point locations. To lower the center of gravity of the carrier in station 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.

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



EX1005, FIG. 21
(annotated)

214. 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)

215. 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:

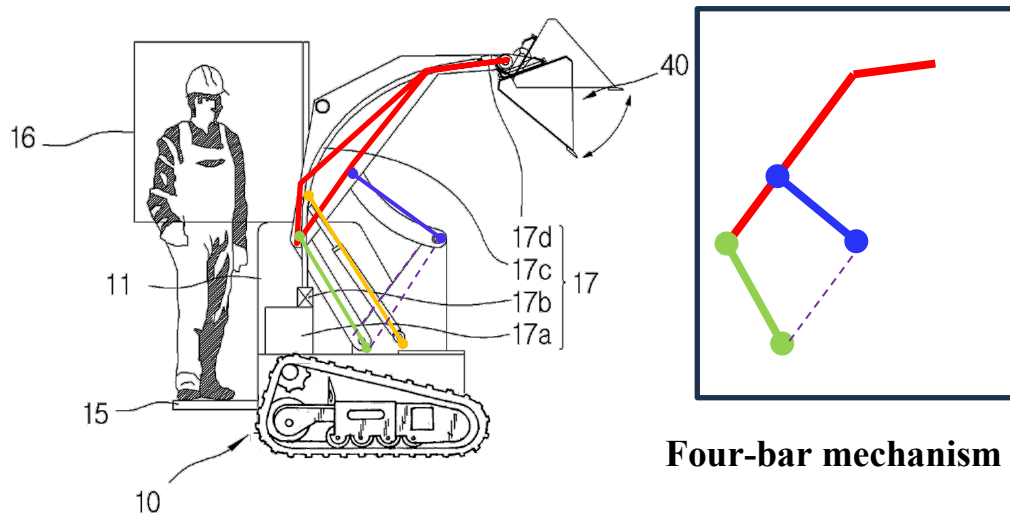


**Figure A
(annotated)**

216. 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

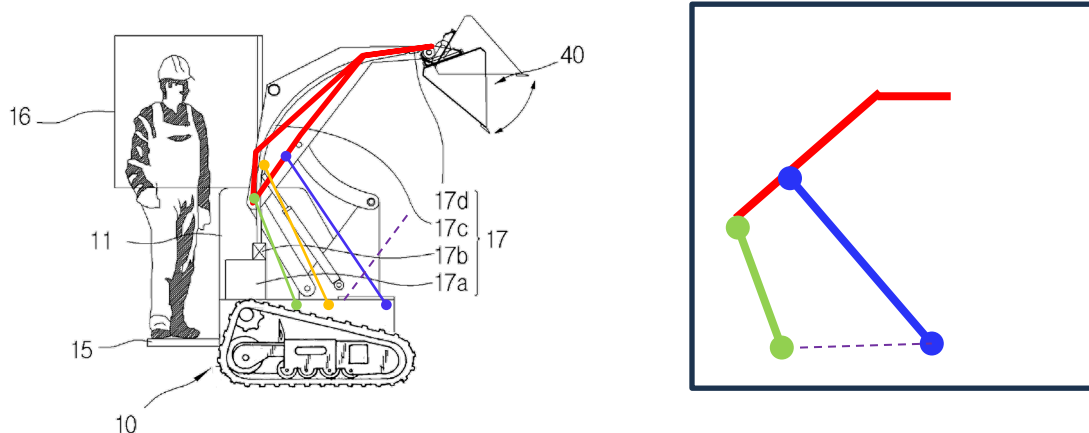


**Figure A
(annotated)
with lowered pivot points**

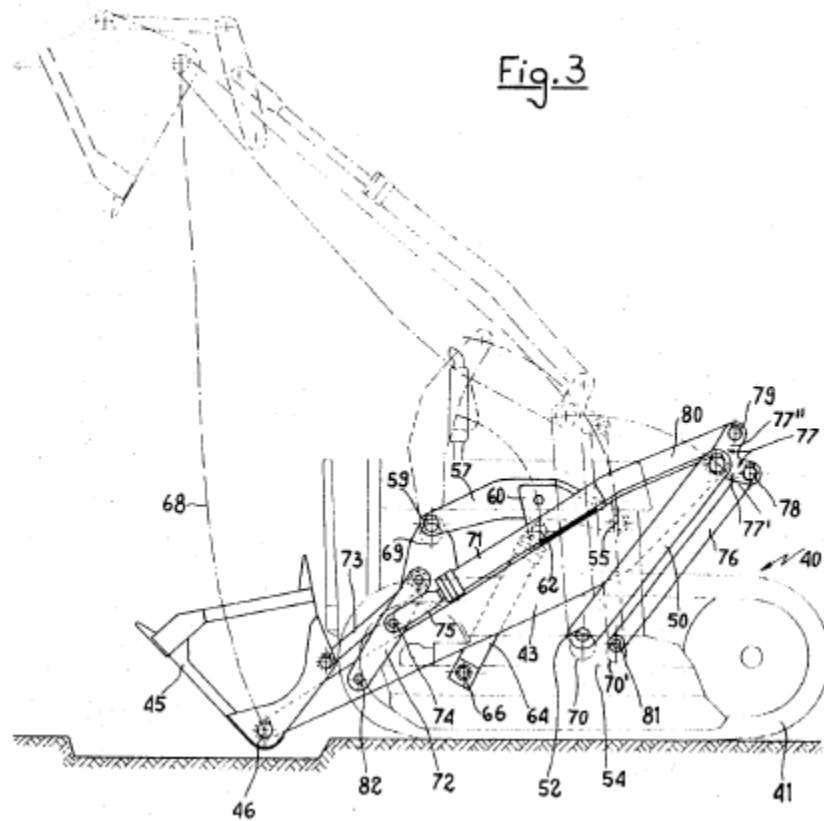
217. A POSITA would have understood in designing the application of the mechanism, specific shapes of the links may be determined. That is, the kinematics (i.e., motion) of the mechanism is dictated by the locations of the pivot points, but in the actual design, the links are not restricted to be perfectly 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.

218. EX1021 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

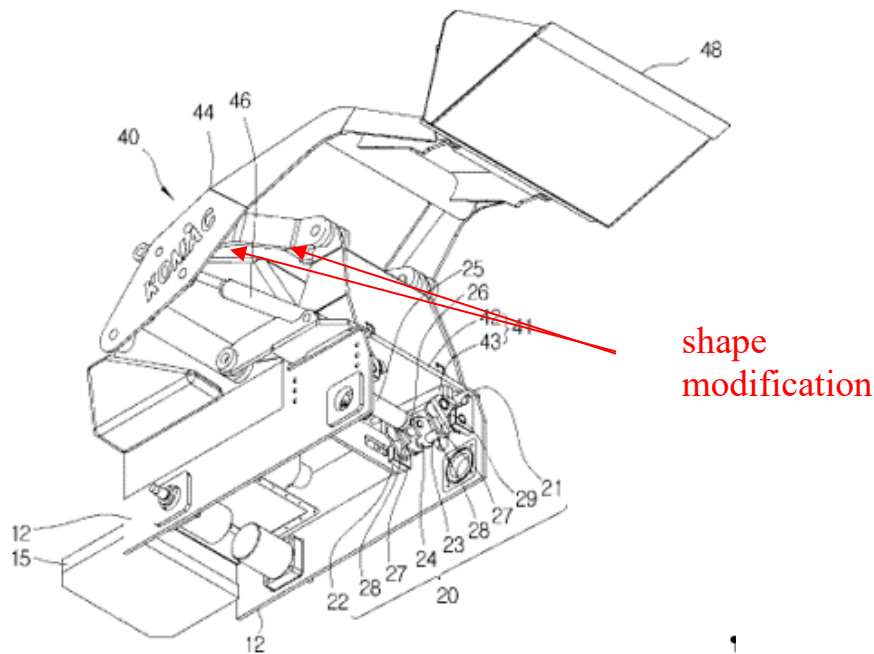
attachment above the drive mechanism such that they “will not interfere with the front and rear wheels 3, 4, with the result that the vehicle may be made compact.”

EX1021, [0035].

219. Further, configuring the vertical distances between the pivot point attachments to the mainframe to be less than 1.5 D1 and less than 2 D5, or any of the similar configurations discussed in the dependent claims that follow, 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.

220. For ease of understanding, I provide Figure A, 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.

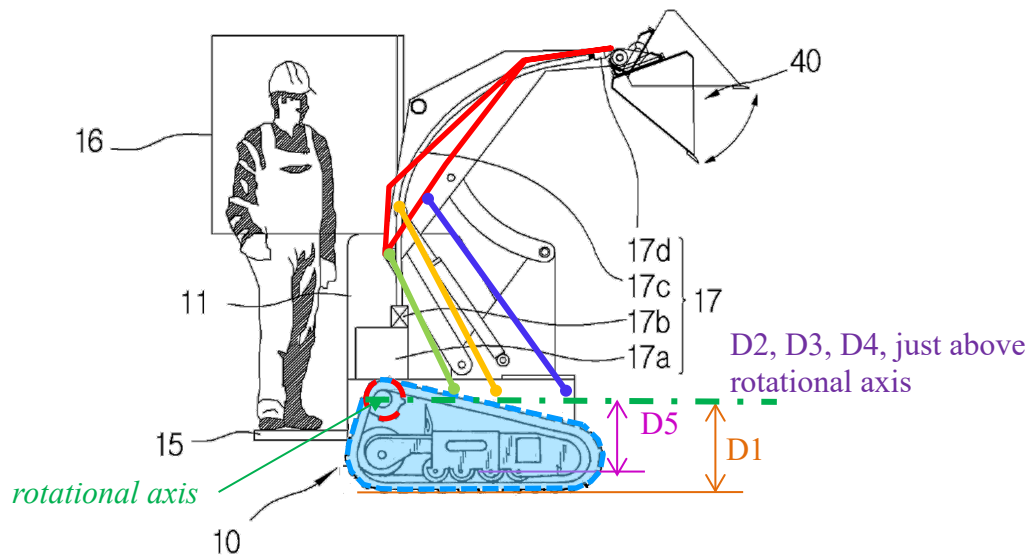


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly
and lowered pivot points

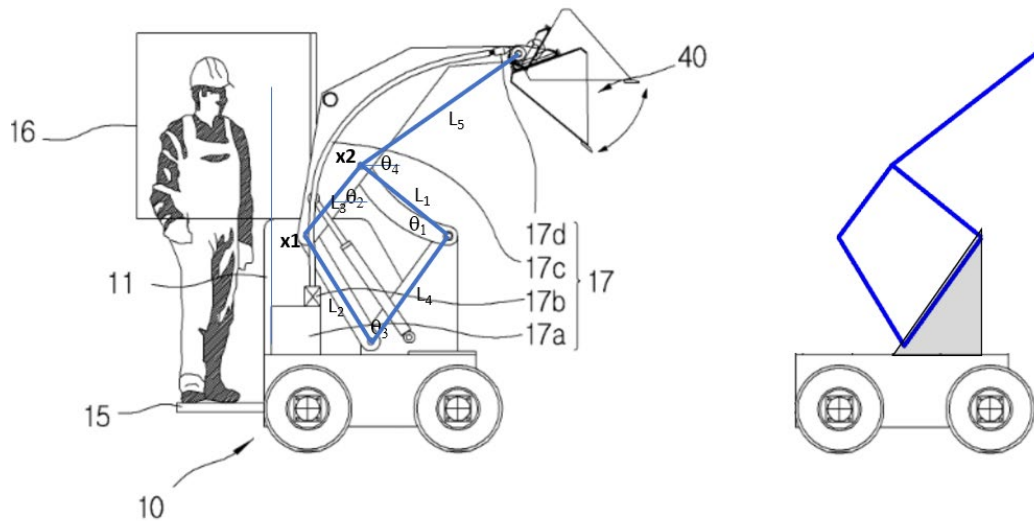
221. To further illustrate this straight-forward concept of lowering the pivot point connection of the KR996 mechanism, Appendix A of this declaration illustrates [1] a kinematic simulation of KR996 as drawn in the reference itself, and [2] a kinematic simulation of KR996 modified with the forward-most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

222. 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

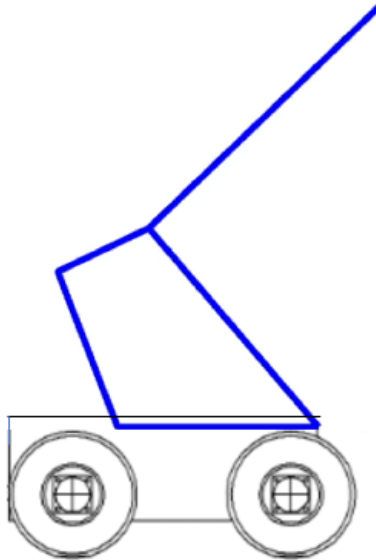
configurations. Simulation of four-bar mechanisms is based on commonly known linkage mechanics that depends upon the respective pivot point locations/linkage lengths. These mechanics are covered in general mechanics instruction. See EX1028, Chapter 2. Each linkage is treated as a rigid body connected 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.

223. 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.



224. 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.



225. 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 mainframe depending on the desired design (e.g., center of gravity, weight distribution, reach). As I note above, the need for mainframe is reduced.

226. 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.

227. 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).

228. Thus, a POSITA would have recognized not only that the location of the pivot point was a result-affecting design choice, but also that there was a desire to and benefit of keeping the pivot points relatively low (*i.e.*, minimizing vertical distance between the pivot points and rotational axis in the context of KR996-Bares) to provide for the benefits discussed above and provide the rotational axis R and each of the *first, third, and fifth pivot points* being separated by a vertical distance less than 1.5 times D1 (and less than 2 times D5).

229. Therefore, [19.6a]-[19.6b] are obvious in light of KR996 (including as modified by Bares) in view of Beltrami. And Claim 19 is rendered obvious by KR996 and Bares in combination with the teachings of Beltrami.

5. Claim 20

[20] *The compact tool carrier as set forth in claim 19 wherein the second side of*

the mainframe comprises at least two pivot points, each vertical distance between the rotational axis R and the respective pivot point being less than 1.5 times $D1$.

230. KR996-Bares in view Beltrami's teachings renders obvious claim 19 and teaches this element.

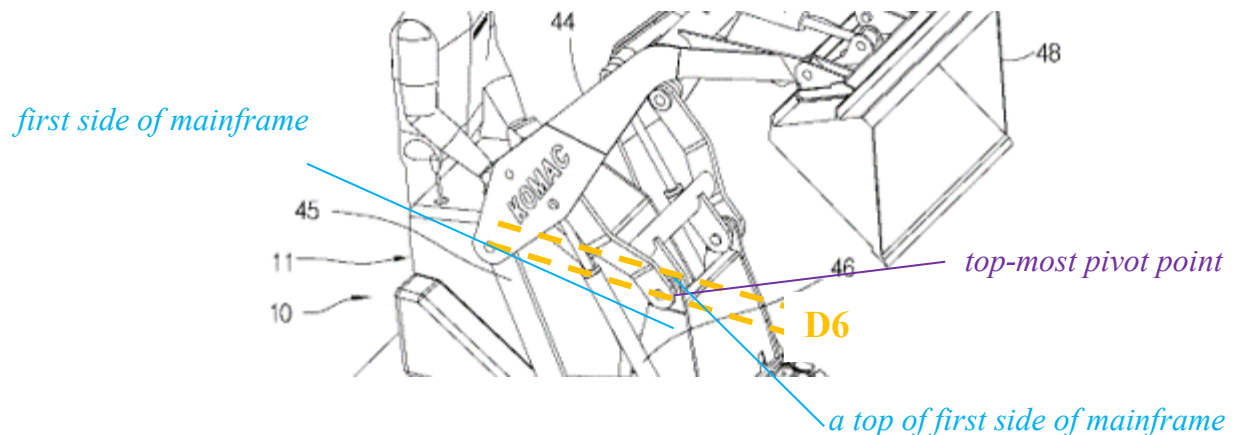
231. KR996 describes *a second side of the mainframe* as in [19.2] that mirrors the first side and similarly comprises *two pivot points* (e.g., link 45 [19.3] and boom cylinder 46 [19.5]) attachment to mainframe). And for the same reasons as discussed in [19.6], it would have been obvious to the vertical distance claimed. *See also* [3], [4], discussing pivot attachment on the *second side of the mainframe*.

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

6. Claim 21

[21] *The compact tool carrier as set forth in claim 19 wherein the first side of the mainframe comprises a top-most pivot point, the first pivot point, the third pivot point, or the fifth pivot point being the top-most pivot point, the top most pivot point and a top of the first side of the mainframe being separated by a vertical distance $D6$, $D6$ being less than about 1.5 times $D5$.*

233. KR996-Bares-Beltrami renders obvious claim 19 and KR996 also describes a second link in [19.4] that is connected to its mainframe at a *third pivot point*, which provides a *topmost pivot point* relative to each of the intermediate parts pivotably attached to the mainframe. *See* [19.4], KR996, Figs. 8, 9, 10. There is a vertical distance $D6$ between this *topmost pivot point* and a *top of the first side of the mainframe*. Fig. 9 is illustrative:



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

234. As to the claimed relative distance between D6 and D5, the figures of KR996 themselves reasonably suggest that this was a known configuration. Thus, a POSITA would have had reason to apply this configuration with respect to KR996 as modified by Beltrami as well. Further, a POSITA would recognize an advantage to minimizing the distance that the mainframe extends above the topmost pivot point in order to increase visibility for the operator, provide a low center of gravity, minimize materials and consequently expenses for forming a frame, and decrease the impact on operator visibility. See, e.g., Komatsu (EX1011), which teaches arranging points of linkages of a vertical lift arm to increase visibility and stability, [0003]-[0004], [0006]-[0009], Bares (EX1009), 3:35-41. In fact, Bares confirms

providing a pivot point 21 at the upper point on its frame. EX1010, FIG. 1, 2:49-54 (“...the pivots 21 are **at or near the uppermost part of the loader**”). Thus, POSITA would recognize to minimize D6 and provide D6 less than 1.5 times D5. POSITA would also have the knowledge to arrange components (e.g., mainframe, drive mechanism, lift mechanism) to provide suitable functionality without interference between components and providing suitable support.

235. Thus, claim 21 is rendered obvious by KR996, Bares, and Beltrami.

7. Claim 22

[22] *The compact tool carrier as set forth in claim 19 further comprising a tool attached to the loader, the tool being selected from the group consisting of a bucket, auger, fork, stump grinder, tiller and roller*

236. KR996-Bares-Beltrami renders obvious claim 19 and as discussed in [19.1] and [9], KR996 illustrates a *tool* of a bucket 48 (*bucket*) attached to the boom 44 (arm of the *loader*). Thus, KR996, Bares, and Beltrami render obvious claim 22.

8. Claim 23

[23] *The compact tool carrier as set forth in claim 19 wherein the mainframe incorporates a single weldment.*

237. KR996-Bares-Beltrami renders obvious claim 19 and it would have been obvious to provide the mainframe as *incorporat[ing] a single weldment* for the same reasons as discussed in [2]. See, e.g., EX1010, 3:45-46 discussing welding to provide for “securely held” connection, 4:8-10 discussing “unitized welded body.”

Thus, KR996, Bares, and Beltrami render obvious claim 23.

9. Claim 24

[24] *The compact tool carrier as set forth in claim 19 wherein no more than three linkages and actuators are attached to the first side of the mainframe.*

238. KR996-Bares-Beltrami renders obvious claim 19 and as shown in [19.3]-[19.5], KR996 teaches three, and no more than three, linkages and actuators attached to the first side of the mainframe. EX1005, Figs. 8, 9. Thus, KR996-Bares-Beltrami renders obvious claim 24.

10. Claim 25

[25] *The compact tool carrier as set forth in claim 19 wherein a single actuator is attached to the first side of the mainframe.*

239. KR996-Bares-Beltrami renders obvious claim 19 and the boom cylinder 46 of [19.5] is *a single actuator attached to the first side of the mainframe.* EX1005, Figs. 8-9. *See also*, [12]. Thus, KR996-Bares-Beltrami renders obvious claim 25.

11. Claim 26-27

[26, [27]] *The compact tool carrier as set forth in claim 19 wherein the vertical distance between the rotational axis R and the forward-most pivot point is less than 1.75 [1.5] D5.*

240. KR996-Bares-Beltrami renders obvious claim 19 and POSITA would have knowledge and reason to minimize the distances between the *forward-most pivot point* (that attachment in [19.4]) and the axis including to provide a low center

of gravity and minimize materials of the frame as I discussed above with reference to claim 19. The '750 Patent provides no surprising or unexpected result for any specific relationship, *e.g.*, less than 2 as in claim 19, less than 1.75 as in claim 26, or less than 1.5 as in claim 27. *See* EX1001, 5:20-32. Thus, for the same reasons as discussed above with reference to [19.6], it would have been obvious to position the *forward-most pivot point less than 1.75 and less than 1.5 D5* and claims 26 and 27 are therefore rendered obvious by KR996, Bares, and Beltrami.

12. Claims 28-29

[28, [29]] *The compact tool carrier as set forth in claim 19 wherein the vertical distance between the rotational axis R and the forward-most pivot point is less than [0.75] D1.*

241. KR996-Bares-Beltrami renders obvious claim 19 and POSITA would have knowledge and reason to minimize the distances between the *forward-most pivot point* (that point in [19.4]) and the axis including to provide a low center of gravity and minimize the frame as I discuss above with reference to claim 19. The '750 Patent provides no surprising or unexpected result for any specific relationship claimed, *e.g.*, less than 1.5 D1 as in claim 19, less than 1 as in claim 28, or less than 0.75 as in claim 29. *See* EX1001, 5: 20-32. Thus, for the same reasons as discussed above with reference to [19.6], it would have been obvious to position the *forward-most pivot point less than D1 and less than 0.75 D1* and claims 28 and 29 are rendered obvious by KR996, Bares, and Beltrami.

13. Claim 30

[30] *The compact tool carrier as set forth in claim 19 wherein the loader is moveable between a down position and a vertically raised position, the loader comprising: a first arm; a second arm; and at least one cross-member that extends from the first loader arm to the second loader arm, wherein each cross-member is disposed forward of the operator platform relative to the longitudinal axis in the vertically raised position of the loader.*

242. KR996-Bares-Beltrami renders obvious claim 19 and KR996 further teaches this element as shown in [14], which discusses *a cross-member extending from the boom 44 (first loader arm) to a second boom 44 (second loader arm) disposed forward of the safety step 15 (operator platform) in the raised position of the loader unit 40 (loader).* EX1005, Fig. 9. Thus, claim 30 is rendered obvious by KR996, Bares, and Beltrami.

14. Claim 31

[31] *The compact tool carrier as set forth in claim 30 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.*

243. KR996-Bares-Beltrami renders obvious claim 30 and KR996 further discloses a bucket attachment 47 (*attachment plate*) for attaching the bucket 48 (*tool*); the cross-member of [30] being spaced a distance from the bucket attachment 47 (*attachment plate*) as illustrated in [15]. EX1005, Figs. 8-9. Thus, claim 31 is rendered obvious by KR996, Bares, and Beltrami.

15. Claim 32

[32] *The compact tool carrier as set forth in claim 30 wherein the cross-member is disposed forward of the drive sprocket in the vertically raised position and the down position of the loader.*

244. KR996-Bares-Beltrami renders obvious claim 30 and KR996 further teaches its *cross-member* disposed forward of a rotational axis, and POSITA would have recognized the cross-member is also forward of the drive sprocket 144 of the track assembly of Bares applied to KR996 as discussed in [16]. Thus, claim 32 is rendered obvious by KR996, Bares, and Beltrami.

16. Claim 33

[33] *The compact tool carrier as set forth in claim 30 wherein the compact tool carrier comprises a single cross-member.*

245. KR996-Bares-Beltrami renders obvious claim 30 and KR996 also teaches the cross-member shown in [30] is a *single cross-member* between its loader arms. EX1005, Figs. 8-9; see also [17]. Thus, claim 33 is rendered obvious by KR996, Bares, and Beltrami.

17. Claim 34

[34] *The compact tool carrier as set forth in claim 30 wherein each cross-member is disposed fully forward of the second pivot point, the fourth pivot point, and the sixth pivot point.*

246. KR996-Bares-Beltrami renders obvious claim 30 and KR996 further teaches a *cross-member* is *disposed fully forward* of the pivot points between the

linkages/actuator and the loader arm as discussed in [18]. See EX1005, Figs. 8, 9.

Thus, claim 34 is rendered obvious by KR996, Bares, and Beltrami.

18. Claim 35

[35] *The compact tool carrier as set forth in claim 19 wherein the first and fifth pivot points are above the rotational axis and the vertical distance between the rotational axis R and each of the first and fifth pivot points is less than twice D5.*

247. KR996-Bares-Beltrami renders obvious claim 19 and KR996 in view of Beltrami also teaches lowering pivot pint connections including *the first and fifth pivot points* such that they are *less than twice D5* as discussed in [19.6].

248. KR996 also illustrates through its illustrations that it was a known configuration to provide pivot points *above the rotational axis* of the drive mechanism. See EX1005, Figs. 8-9. This configuration of the pivot point connection *above* the drive mechanism of Bares' tracks 148 (*tracks*) would continue in KR996-Bares.

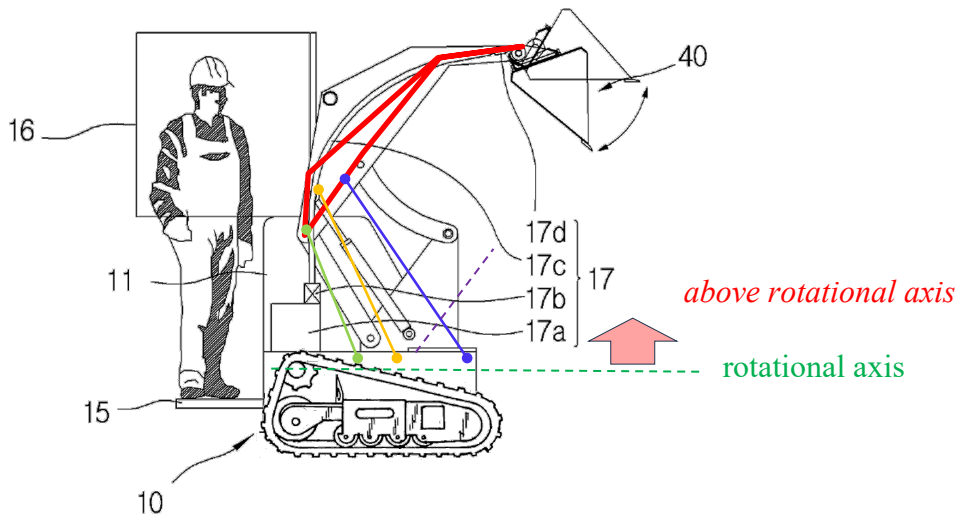


**Figure A
(annotated)
with lowered pivot points**

249. In the low configured pivot points, the pivot point between the actuator and the mainframe and the linkages and the mainframe remain above the rotational axis. See [19] above. 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].

250. Thus, claim 35 is rendered obvious by KR996, Bares, and Beltrami.

19. Claim 36

[36] *The compact tool carrier as set forth in claim 19 wherein the drive mechanism comprises tracks or wheels and the first pivot point is above the tracks or wheels and the vertical distance between the rotational axis R and the first pivot point is less than twice D5.*

251. KR996-Bares-Beltrami renders obvious claim 19 and KR996 also discloses the pivot point attachment of the link 45 (*first linkage*) is *above* the wheels 14 of KR996 (*see* Figs. 8-9). EX1005, Figs. 8-9. This configuration of the pivot point connection *above* the drive mechanism of Bares' tracks 148 (*tracks*) would continue in KR996-Bares.

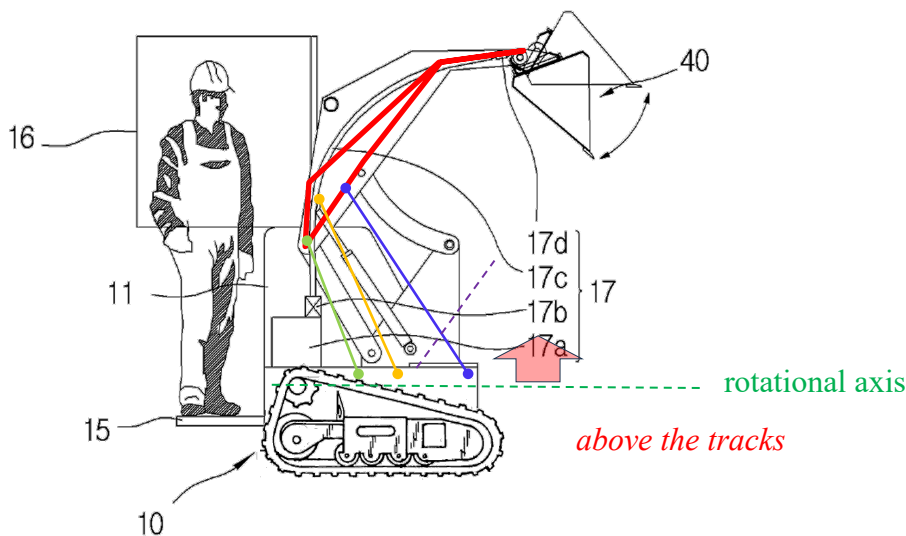


**Figure A
(annotated)
with lowered pivot points**

252. In the low configuration of pivot points, the pivot point between the linkage (link 45) and the mainframe remains above the tracks. See [19] above. 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].

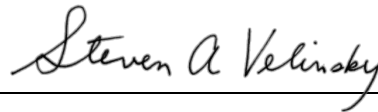
253. And as discussed in [19.6], a POSITA would have had the skill set and motivation to lower the pivot points to achieve benefits such as a lower center of gravity and smaller mainframe. Thus, it would have been obvious to provide *the first pivot point less than twice D5*. See also the discussion of D5 and the design choices to increase D5 as discussed above.

254. Thus, claim 36 is rendered obvious by KR996-Bares-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 written above a solid horizontal line.

Steven Alan Velinsky