UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Kubota North America Corporation,
Petitioner

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IPR2025-00169
U.S. Patent No. 9,321,386

PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104

U.S. Patent No. 9,321,386

(Claims 50-63, 68-69, and 80-85)

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 '386 Patent....26
VII. Prosecution history of the '386 Patent....28
A. Original Prosecution....28
B. Reexamination Proceedings (90/013,915) (90/014,109) (90/014,124)....31
C. Prosecution History Summary....32
VIII. Effective priority date of the '386 patent....33
IX. Claim construction....33
X. Identification of how the claims are unpatentable....34
A. Challenged Claims....34
B. Statutory grounds for challenges....34
C. Ground 1....34
1. KR996 (EX1005)....34
2. JP705 (EX1006)....36
3. Reasons to combine KR996 and JP705....37
4. Claim 50....42

5. Claim 51 65
6. Claim 52 66
7. Claim 53 68
8. Claim 54 70
D. Ground 2 : KR996, JP705, Bares, and Beltrami 72
1. Bares (EX1010) 72
2. Beltrami (EX1008) 74
3. Reasons to combine KR996 and JP705 75
4. Reasons to combine KR996-JP705 and Bares (KR996-JP705-Bares) 75
5. Reasons to combine KR996-JP705-Bares and Beltrami 78
6. Claim 55 83
7. Claim 56 115
8. Claim 57 116
9. Claims 58-59 119
10. Claim 60 120
11. Claim 61 121
12. Claim 62 122
13. Claim 63 123
14. Claim 68 123
15. Claim 69 125
16. Claim 80 126
17. Claim 81 130

18. Claim 82 133

19. Claim 83 134

20. Claim 84 137

21. Claim 85 137

XI. Conclusion 139

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. 9,321,386 ("'386 Patent") concerning whether the '386 Patent is unpatentable over certain prior art. This declaration is a statement of my opinions on issues relating to the patentability of Claims 50-63, 68-69, and 80-85 ("the Challenged Claims") of the '386 Patent. 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 '386 Patent:

a) U.S. Patent No. 9,321,386 (the '386 Patent) (EX1001);

b) relevant portions of the prosecution history of the '386 Patent ("'386 File History"), EX1002, EX1029, EX1030, EX1031

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) JP 2004 017705 ("JP705") listing inventor Yoshitake Yamaguchi *et al*. (EX1006); filed June 13, 2002; published January 22, 2004.

e) U.S. Patent No. 6,832,659 ("Bares") (EX1010), filed October 30, 2002 and issued December 21, 2004.

f) 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:

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

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

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

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

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

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

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

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

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

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

Award, and the 2002 California Transportation Foundation's Tranny Award. Additional awards, honors and professional activities include: Fellow of the American Society of Mechanical Engineers (ASME), 2007 American Society of Mechanical Engineers' Machine Design Award for lifetime contributions to the mechanical design field, 2005 American Society of Mechanical Engineers' Robert E. Abbott Award for contributions to design engineering, Technical Editor of the international journal Mechanics Based Design of Structures and Machines, Chair of the Design Engineering Division of the American Society of Mechanical Engineers, and Vice President – Systems and Design of the American Society of Mechanical Engineers. I have also received the Society of Automotive Engineers' Ralph R. Teetor Award.

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

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

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

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

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

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

design and analysis including those articles listed in EX1036.

III. LEVEL OF ORDINARY SKILL IN THE ART

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

18. I understand that the ’386 Patent was filed April 21, 2015 and 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 ’386 Patent as of February 20, 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 '386 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 '386 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 '386 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 '386 Patent includes patents and printed publications in the relevant art that predate the proper priority date of the alleged invention recited in the '386 Patent.

23. 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.

24. 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.

25. 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.

26. I am not aware of any allegations by the named inventor of the ’386 Patent or any assignee of the ’386 Patent that any secondary considerations are relevant to my obviousness analysis of any Challenged Claim of the ’386 Patent. I have briefly reviewed the allegations by the assignee of the ’386 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

27. 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 ’386 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

28. As explained in the summary of the patent below, the ’386 Patent is directed to a “compact tool carrier.” A compact tool carrier, as illustrated in the ’386 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:

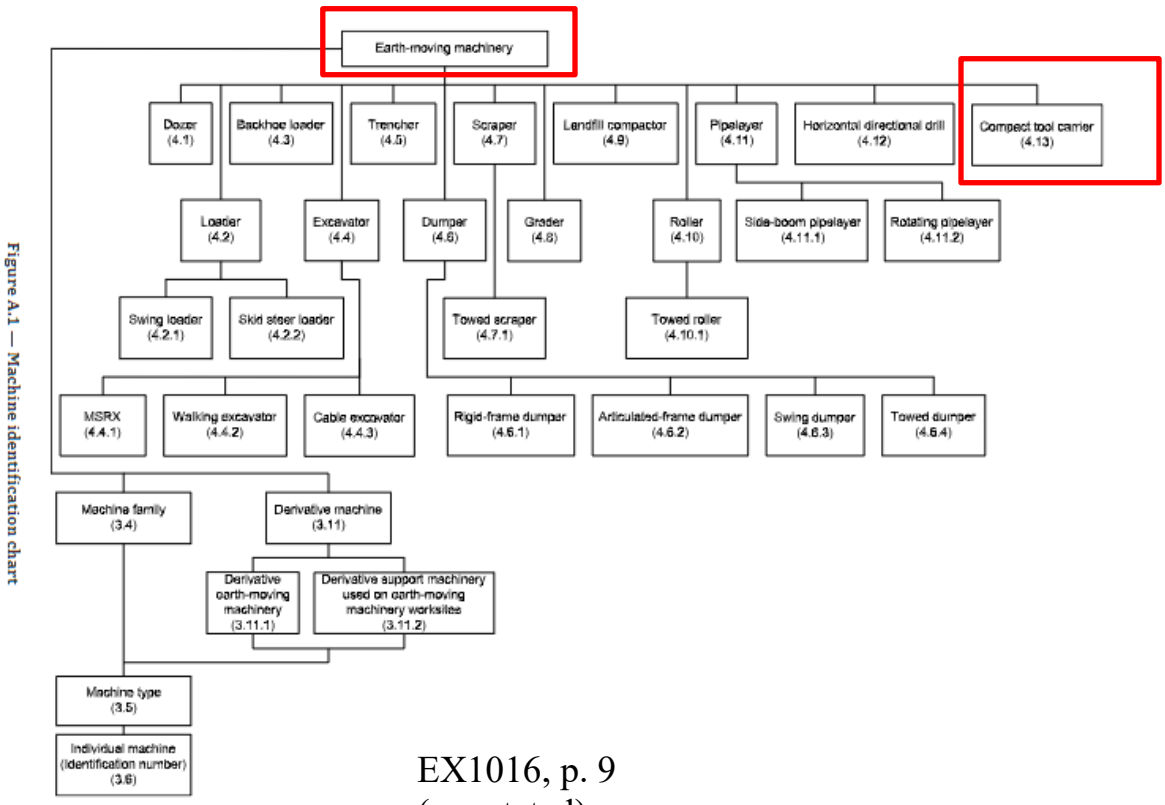


Figure A.1 — Machine identification chart

EX1016, p. 9
(annotated)

29. 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 ’386 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]

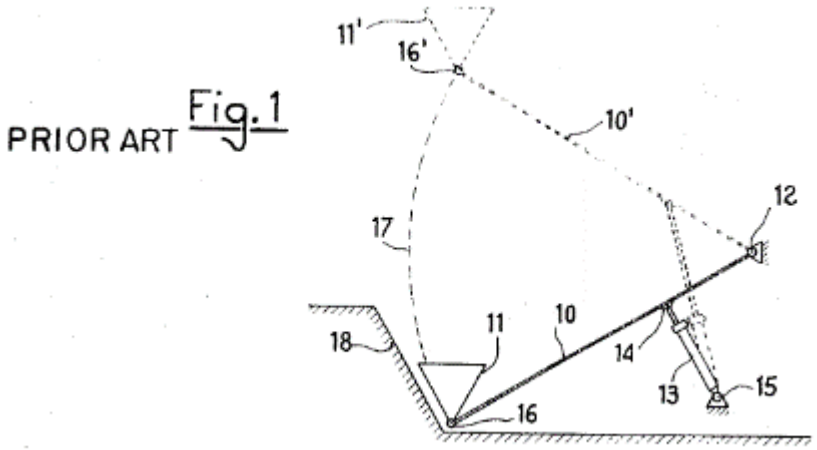
Loader Mechanism:

30. 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.

31. 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.



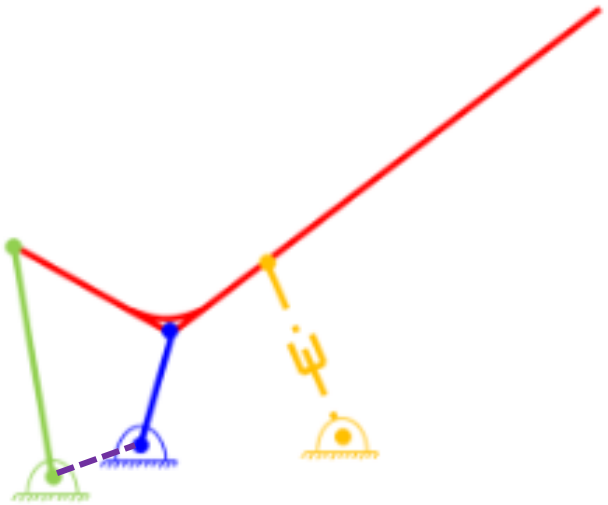
EX1008, FIG. 1

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.

32. 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.



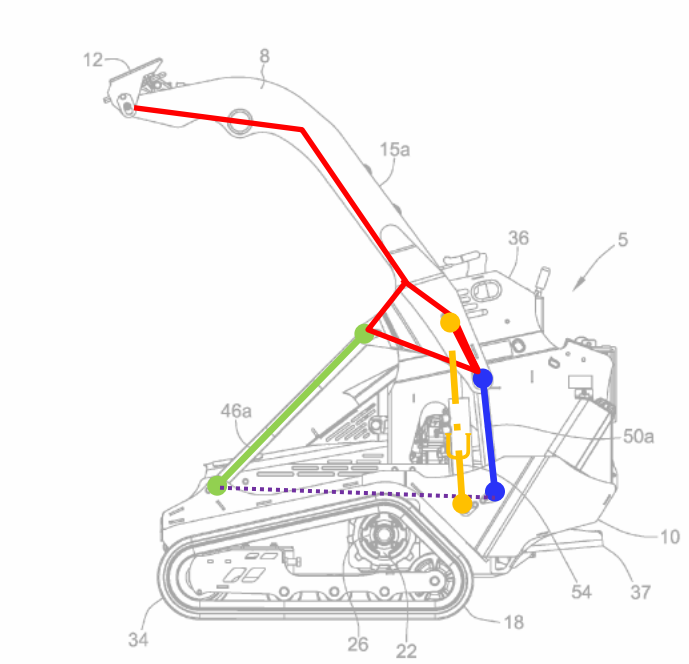
33. The four-bar mechanism is used for 3 different types of design cases: function generation, motion generation and path generation. For function generation, one link (e.g., either the green or blue link illustrated above) is defined as the "crank" and the other link (e.g., the other one of the green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

34. 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.

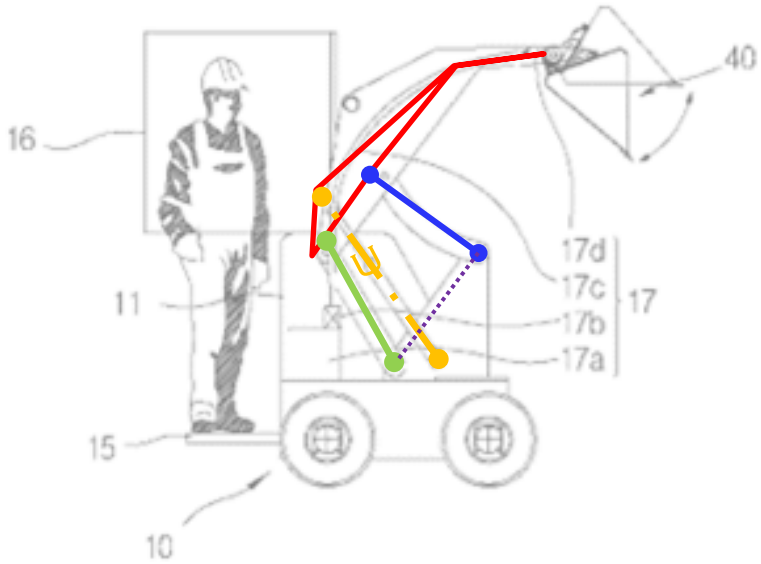
35. When designing a mechanism such as a four-bar mechanism for an application, one may approach the design by providing known link dimensions and calculating the output motion, which is referred to as a kinematic analysis. Or conversely, in a dimensional synthesis, the link dimensions may be calculated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

36. 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 ’386 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 ’386 Patent’s FIG. 3:



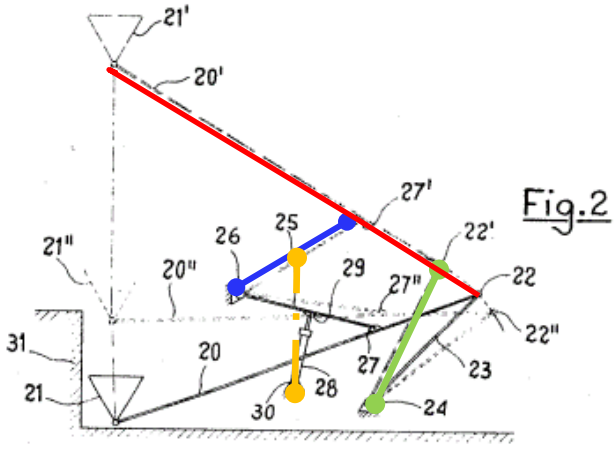
EX1001, FIG. 3
(annotated)

37. 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. 21



KR996 (EX1005), FIG. 21
(annotated)

38. 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.



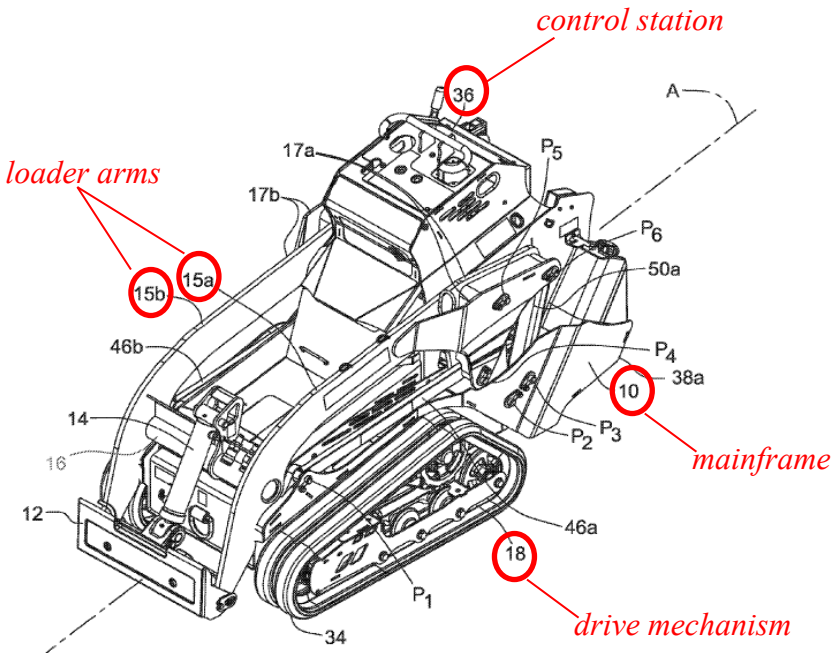
EX1008, FIG. 2
(annotated)

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

VI. OVERVIEW OF THE '386 PATENT

39. The '386 Patent relates to compact tool carriers having a loader (with two loader arms) designed for operation by an operator standing towards or at the rear of the carrier. '386 Patent (EX1001), 1:12-28. In its background, the '386 Patent asserts its compact tool carriers "may be distinguished from much larger conventional skid steers in which an operator is seated in the operating position." '386 Patent (EX1001), 1:32-36. A variety of interchangeable tools may be provided as front-mounted attachments such as buckets, augers, and the like. '386 Patent (EX1001), 1:28-31.

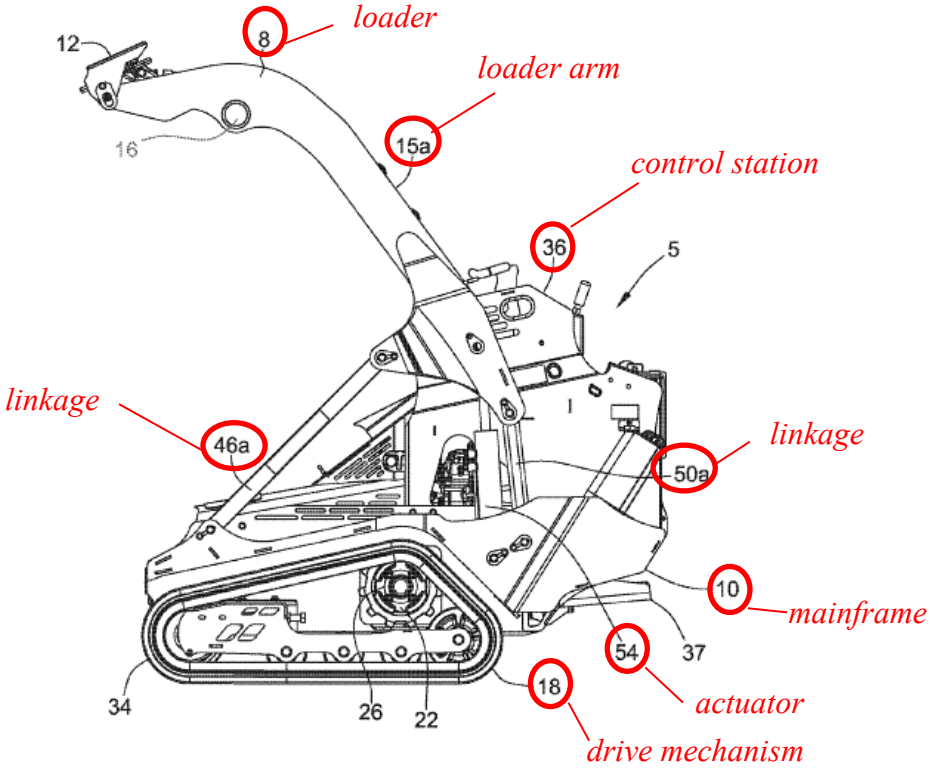
40. FIGS. 1 and 3 are illustrative of a compact tool carrier 5 including a loader 8 having loader arms 15a, 15b and supported by a mainframe 10. '386 Patent (EX1001), 2:44-46. A drive mechanism 18 is attached to the mainframe 10 and may include tracks (as shown) or wheels. '386 Patent (EX1001), 3:20-30. And a control station 36 provides controls for propelling the carrier forward and raising and lowering the loader 8 operated by a user at the rear of the equipment. '386 Patent (EX1001), 3:31-61.



'386 Patent (EX1001), FIG. 1
(annotated)

41. The first loader arm 15a is pivotally connected to a first side 38*a* of the mainframe 10 and the second loader arm 15b is pivotally connected to a second side of the mainframe 10. '386 Patent (EX1001), 4:13-16. Each loader arm is

attached to a respective side of the mainframe by a linkage 46a, an actuator 54 (*e.g.*, a hydraulic cylinder), and a linkage 50a. '386 Patent (EX1001), 4:13-60. FIG. 1 above is illustrative of the carrier with the loader in a down position; FIG. 3 below is illustrative of the carrier with the loader in a raised position. '386 Patent (EX1001), 2:27-30. This is a vertical lift as discussed above.



'386 Patent (EX1001), FIG. 3
(annotated)

VII. PROSECUTION HISTORY OF THE '386 PATENT

A. Original Prosecution

42. In response to an office action rejecting all then-pending claims, I

understand the Applicant amended its claims to specify the loader configuration (*i.e.*, its attachment to the frame) and the operator's position in the equipment; amended claim 14 is illustrative:

14. (Currently amended) A compact tool carrier comprising:

a loader **adapted to carry a tool**;

a mainframe for supporting the loader, the mainframe having a first side and a second side, each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader**, the loader not being directly attached to the mainframe**; **[[and]]**

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

an actuator pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader;

a drive mechanism comprising tracks or wheels for propelling the **compact tool carrier** ~~**apparatus**~~ over a supporting surface, the drive mechanism being attached to the mainframe about a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and each pivot point being separated by a vertical distance, each vertical distance between the rotational axis and a pivot point being less than 1.5 times D1**; and**

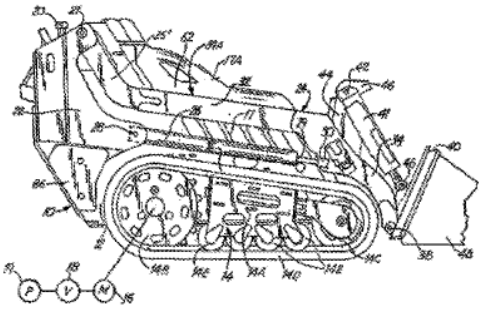
a control station having operator controls for propelling the compact tool carrier forward and for raising and/or lowering the loader, the control station being mounted toward the rear of the compact tool carrier and adapted to allow for standing or walk-behind operation.

EX1002, pp. 59-60

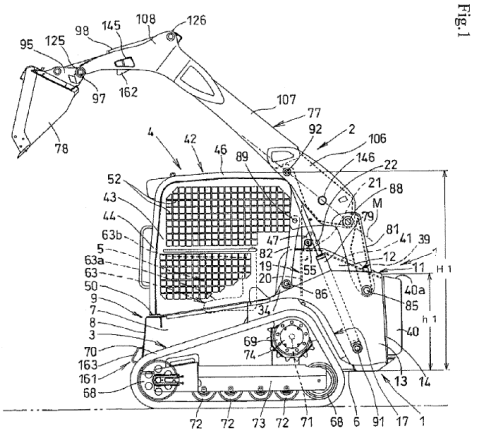
43. A final Office action then issued rejecting all claims over a combination of Yasuda (EX1022), which illustrates the claimed loader configuration including its attachment to a mainframe (i.e., a four-bar mechanism), and Bares '568 (EX1009), which illustrates equipment having a control station for

walk-behind operation (i.e., a compact utility loader). EX1002, p. 52.

Representative Yasuda and Bares ’568 figures are illustrative:



EX1009, (Bares ’568), FIG. 1



EX1022, (Yasuda), FIG. 1

44. Without contesting the teachings of each reference, I understand the Applicant argued against the **combination** asserting one would not look to combine a larger skid-steer machine with a cabin (Yasuda) and a small self-propelled vehicle (Bares ’568). EX1002, pp. 43-48. After the rejection was maintained, the Applicant amended the pending claims to include an *engine bracket* to support its argument that one would not have modified as proposed in the rejection as the operator position is incompatible with the engine placement. EX1002, p. 21. After an interview, a Notice of Allowance issued. EX1002, p. 5.

B. Reexamination Proceedings (90/013,915) (90/014,109) (90/014,124)

45. The '386 Patent was subject to two reexamination proceedings.[2] I understand that like in the original prosecution, these proceedings turned on whether it was obvious to combine a mini compact tool carrier (mini skid-steer) having stand-behind operation and a radial lift loader, with a loader from a larger skid-steer having an operator cabin and a vertical lift loader. Each of the proceedings were requested by the same third-party, Toro. In these *ex parte* proceedings, Patent Owner argued that such a combination fails due to physical constraints of the smaller equipment (e.g., available space, weight of loader) vis-à-vis the size of the vertical lift loader, no reasonable expectation of success of placing vertical lift loader onto the smaller equipment, and/or secondary considerations directed to the non-obviousness of placing vertical lift loader onto the smaller equipment. The Examiner, while recognizing both vertical and radial lift loaders were well-known, concluded Patent Owner's evidence showed "those of ordinary skill in the art (the engineers, developers, managers, etc. at **Toro** [the

[2] I understand that these three reexamination requests resulted in two substantive reviews of the patent as two requests, involving the same art, targeting original claims and claims added in the first reexamination (EX1029), respectively were merged. Citations are to EX1030.

Third Party Requester]…did not find it obvious to employ a vertical lift loader arm arrangement on a [compact tool carrier]" and "In particular, the Declaration of L. Hartke [**'386 Patent named inventor**] is persuasive to show that designing a vertical lift having a four-bar linkage [vertical lift configuration] requires considerable experimentation and a combination such as [vertical lift and compact tool carrier] would not have been obvious at least because it would require undue experimentation." EX1030, p. 16. Thus, the Examiner found it would not have been obvious to modify the smaller compact tool carrier to replace its radial lift loader with a vertical lift loader, disclosed in the cited art on a larger skid-steer and confirmed/allowed the claims. *Id*.

C. Prosecution History Summary

46. Thus, I understand that the Patent Owner overcame claim rejections that relied upon an obviousness framework of placing a known vertical lift style loader in line with the four-bar mechanism I discuss above, onto a known compact tool carrier. I do not rely on this framework in the present petition. Therefore, I do not offer any opinion as to the veracity of the Patent Owner's previously submitted "evidence" of such a combinations' inoperability nor the alleged indicia of non-obviousness. I do note that the KR996 reference illustrates placing a loader onto a compact utility carrier was already known in the prior art. And as I discuss above, four-bar mechanisms were implemented in a variety of contexts including a variety

of sizes and applications long before the ’386 Patent. Further, there is a predictable difference in the resulting path of the coupler point or bucket attachment when a loader is configured as radial lift (a two-bar mechanism) in comparison with such a point in a loader configured as a vertical lift (four-bar mechanism); this would have been readily recognized by a POSITA as a result of the mechanism implemented.

47. 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 ’386 PATENT

48. I have been told to assume that the ’386 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

49. It is my understanding that in order to properly evaluate the ’386 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

50. This declaration is directed to claims 50-63, 68-69, and 80-85 of the ’386 Patent.

B. Statutory grounds for challenges

Grounds	Claims	Basis
#1	50-54	35 U.S.C. § 103 over KR996 and JP705
#2	55-63, 68-69, 80-85	35 U.S.C. § 103 over KR996, JP705, Bares, and Beltrami

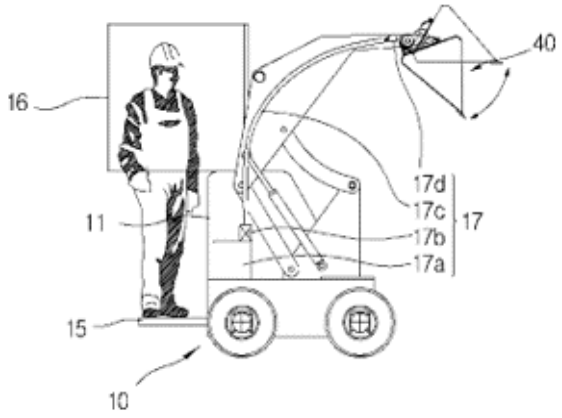
C. Ground 1

1. KR996 (EX1005)

51. KR996 is entitled “Environmentally Friendly Construction Equipment for Building Deconstruction Work.” KR996 (EX1005), (54).[3] 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

[3] Citations are to the English translation of KR996. EX1005.

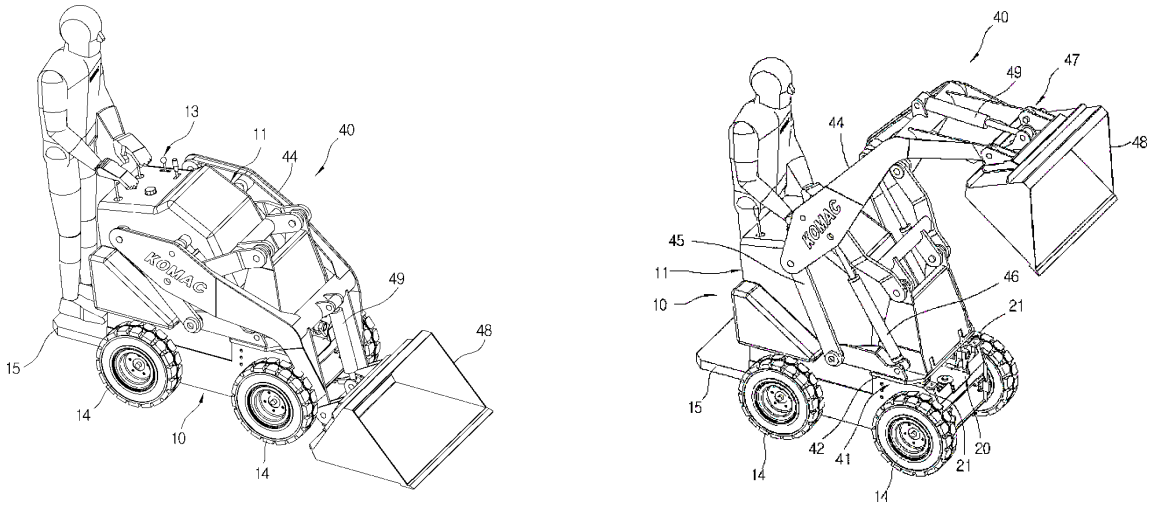
maintenance, snow removal, and towing." KR996 (EX1005), [0001]-[0002]. In particular, KR996 provides a vehicle 10 to which, interchangeably, a loader unit 40 or an arm unit 60 is attached. KR996 (EX1005), [0041], Figs. 1-13, 21 illustrating the loader unit 40 and Figs. 14-20, 22 illustrating the arm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



KR996 (EX1005), Fig. 21

52. 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

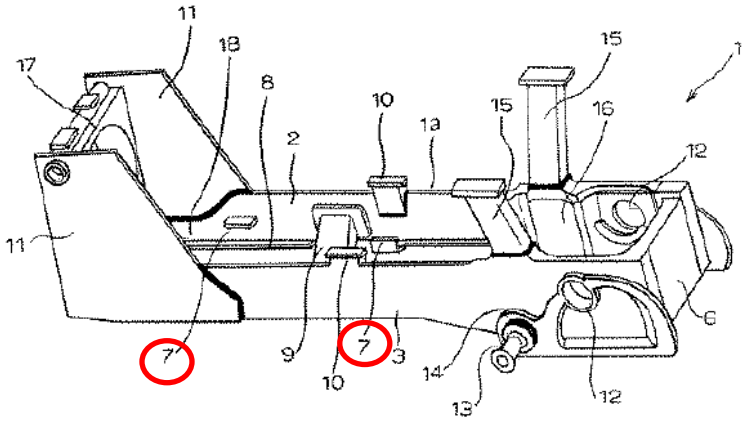
positions, respectively.



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

2. JP705 (EX1006)

53. JP705 discusses "a main frame for a work vehicle such as a bulldozer, hydraulic excavator, or other construction or civil engineering machine, and more particularly relates to a main frame for a work vehicle that enables easy and reliable installation of various on-board devices such as an engine, a transmission, and the like." JP705 (EX1006), [0001]. A main frame 1 has a pair of parallelly extending left and right side plates 2, 3. JP705 (EX1006), [0019]. "A pair of left and right mounting parts 7 [ ] for mounting an engine, a steering device, and the like (not depicted) are provided near the upper surfaces of the side plates 2 and 3 and protrude from the inner side surfaces in the width direction of the frame." *Id*. See also, mounting parts 8.



EX1006, FIG. 1
(annotated)

3. Reasons to combine KR996 and JP705

54. KR996 and JP705 are analogous art to the ’386 Patent because they are in the same field of endeavor, pertaining to working vehicles including construction or agricultural machines (*i.e.*, earth-moving equipment). KR996 (EX1005), Abstract, [0001], FIG. 21; JP705 (EX1006), Abstract, [0001], FIG. 1; ’386 Patent (EX1001), 1:17-48, 2:44-3:2, FIG. 1. JP705 specifically suggests applying its teachings to an excavator, which is similarly a function of the vehicle of KR996 and the ’386 Patent. JP705 (EX1006), [0017]; KR996 (EX1005), [0005]; ’386 Patent (EX1001), 1:28-31 (“auger”). Further, KR996 and JP705 are analogous art to the ’386 Patent because they are reasonably pertinent to a same problem faced by the inventor - securely mounting components onto a frame to

effectuate the operation of a vehicle. KR996 (EX1005), Fig. 12; JP705 (EX1006), [0006]-[0008], FIG. 1; '386 Patent (EX1001), 4:4-16, 5:52-55, FIG. 6.

55. A POSITA would have been motivated to combine the teachings of JP705 with KR996 to produce predictable and beneficial results as discussed below.

56. First, the vehicle of KR996 has an engine disposed within its frame to provide energy to propel the vehicle. A POSITA would understand that Figs. 10 and 12 illustrate a component that is a motor (engine). This is confirmed by EX1014, which is a Korean publication sharing the same inventor and affiliated company as KR996. KR528 (EX1014), FIG. 3. Moreover, 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…").

57. It is common practice to use a bracket to secure the engine to the mainframe of such a vehicle. There are only a few places on the mainframe to provide such as a bracket – e.g., front, back, two sides. A POSITA would have known to select a bracket extending from the sides of the mainframe as this positions the engine between the two parallel sides providing balance.

58. Second, JP705 teaches providing a mounting surface for such an engine in a substantially similar vehicle; these mounting surfaces are provided by mounting parts 7 (*engine bracket*) that extend from the frame – beneficially providing a mounting surface for receiving an engine to effectuate the vehicle's operation. Again, in my experience, mounting an engine, such as in a compact utility loader, is typically done using an engine bracket. The engine bracket serves to securely attach the engine. Moreover, the engine can serve as a structural member further increasing the stiffness of the connection between the two parallel frame elements. This would be especially important in instances in which the load

is not uniformly distributed to both loading arms.

59. JP705 describes a main frame and aspects thereof that work generally with many types of vehicles, it provides benefits that work particularly well with a compact vehicle. JP705 (EX1006), (57) (SOLUTION). As such, elements of the mainframe of JP705 that are described as being reduced in both size and weight, would work particularly well with KR996's compact vehicle. A POSITA would recognize aspects of the mainframe of JP705 would apply to KR996 including a desire for lightweight component.

60. Using JP705's mounting parts 7 (*engine bracket*) extending from a frame provides a benefit of avoiding use of additional parts to secure the engine in the vehicle. JP705 (EX1006), [0008]. JP705 itself suggests providing mounting parts extending from a frame reduces the number of fastening parts (such as a bolt, nut, collar, or the like) required. JP705 (EX1006), [0008] [0016]. And this reduction of parts allows for a reduction in component costs and weight. JP705 (EX1006), [0008]. Forming the mounting parts 7 integrally with the main frame through conventional welding processes prepares the receiving surface, advantageously a "smooth, continuous surface," early in the manufacturing process. *See* JP705 (EX1006), [0016], [0031]. In addition to reducing the number of parts, welding the engine bracket directly to the frame eliminates additional intermediate fasteners that could loosen over time thus reducing both the security

of the attachment and the corresponding structural rigidity of the system. Further, integrating the mounting parts and a frame allows for efficient loading of an engine onto the available, previously prepared, designated mounting surface it provides. JP705 (EX1006), [0013], [0018], [0022]. A POSITA would recognize these same benefits would be gained by implementing JP705's mounting parts 7 for mounting an engine in KR996's compact vehicle.

61. Thus, this combination is merely applying a known technique to a known device (e.g., JP705's technique of mounting an engine in a vehicle using an engine bracket, with KR996's vehicle having a frame and engine) ready for improvement (e.g., providing an easily accessible mounting surface suitable to receive the engine extending from the frame) to yield predictable results.

62. The results of combining JP705's technique would have been predictable and had a reasonable expectation of success given both JP705 and KR996 relate to similar vehicle types with an engine mounted between sides of a and toward the rear of a frame. Modifying KR996's vehicle to provide mounting parts extending from the sides of the frame would have been a straightforward and simple matter of utilizing the engine mounting feature for its known function. JP705 describes that welding operations to form the mounting parts extending from the frame can be performed "stably [], easily, and efficiently." JP705 (EX1006), [0016]. Further, in evaluating the suggested frame of KR996 (*see* Fig. 10), a

POSITA would recognize that there is available space on the KR996 frame to provide JP705's mounting parts 7 extending therefrom.

4. Claim 50

[50.0] ***A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:***

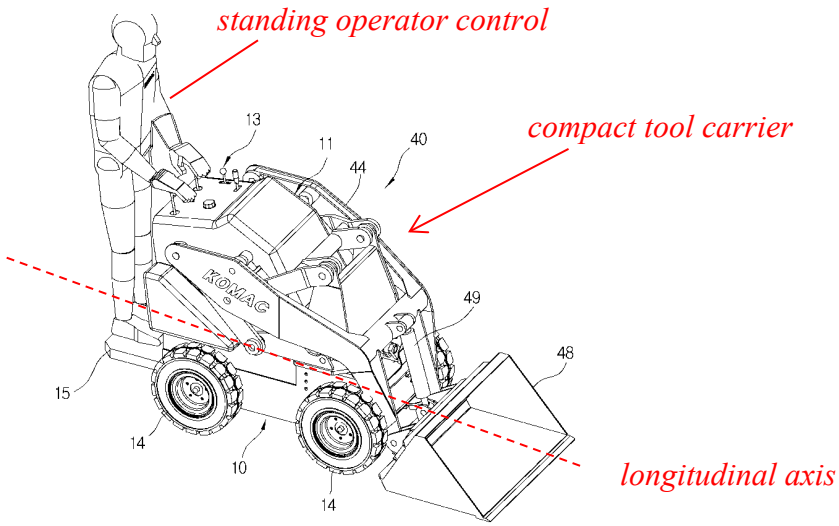
63. KR996 discloses this limitation.

64. KR996 describes a self-propelled vehicle (*a compact tool carrier*)[4] 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 in the '386 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

[4] In this declaration, claim terms are generally italicized for ease of reference.

(EX1016), pp. 7, 9.

65. 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].

66. This is the same configuration for operator control as provided in the '386 Patent. '386 Patent (EX1001), 3:38-42 ("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 ¶¶68-69 above.

67. 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.

68. Further, recognized standards covering the KR996 vehicle define a weight of *less than about 1500 kg*, as recognized by the '386 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*, '386 Patent ('386 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**."[5] Thus, a POSITA would

[5] All bold emphasis in quotations is added.

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.

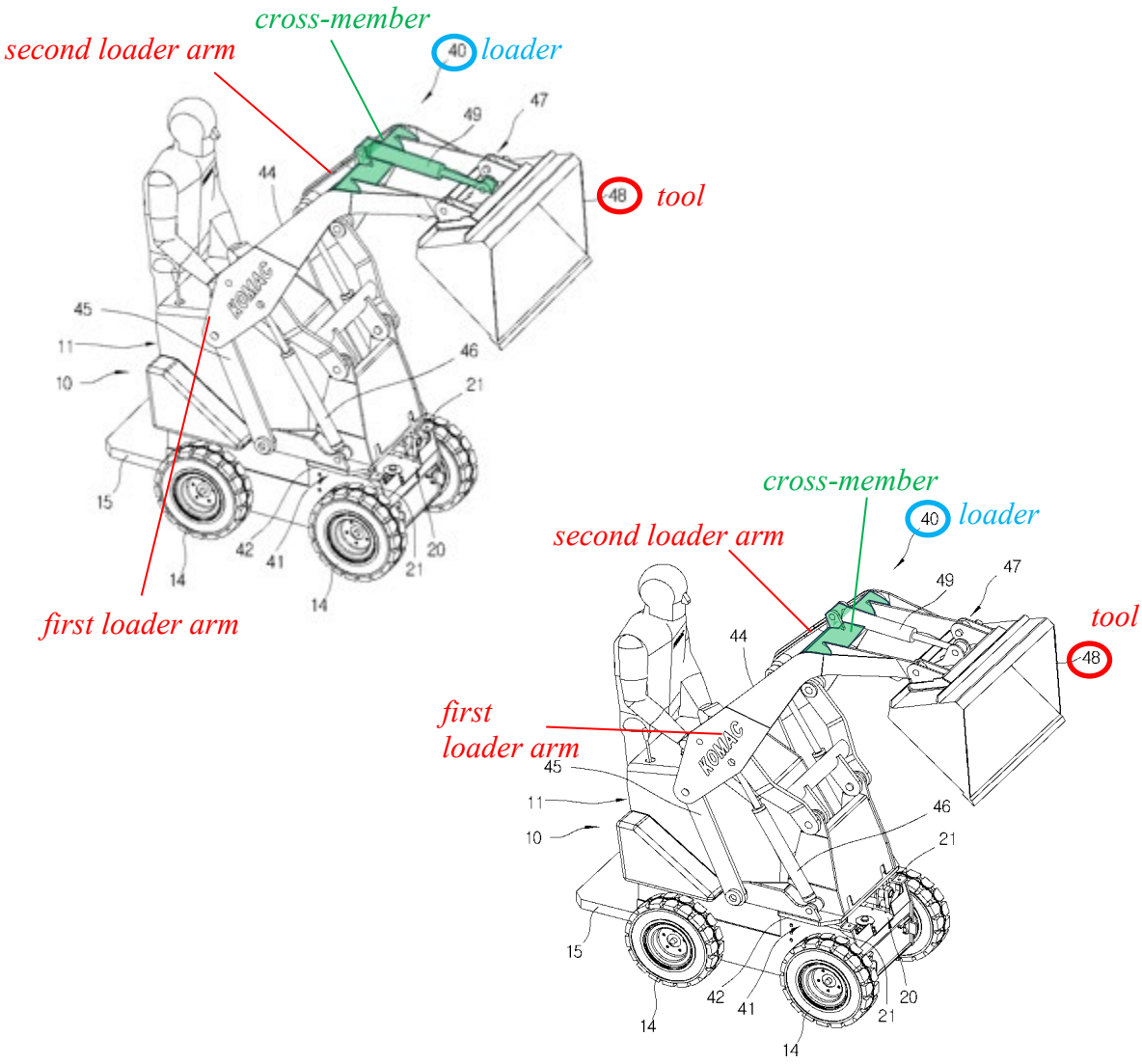
69. Thus, KR996 teaches a vehicle that provides the *compact tool carrier* of [50.0].

[50.1] ***a loader adapted to carry a tool, the loader comprising: a first loader arm; a second loader arm; and at least one cross-member that extends from the first loader arm to the second loader arm***;

70. KR996 teaches this element.

71. KR996 provides *a loader* including loader unit 40, moveable between a down position and a vertically raised position and having two booms 44 (*first loader arm* and *second loader arm*). KR996 (EX1005), (57), [0016], [0036], [0040], [0054], [0131], Figs. 7-11. The loader unit 40 is *adapted to carry a tool*, as illustrated by a bucket 48 (*tool*) attached to the loader unit 40 and booms 44. KR996 (EX1005), claim 1, [0054], [0074]-[0075], Figs. 8-9. The bucket is a "tool" just as described in the '386 Patent. '386 Patent (EX1001), 1:28-31 ("tools such as buckets, augers…and the like.")

72. Further, KR996 includes a cross-member (*at least one cross-member*) that *extends from* between booms 44 (*first loader arm to the second loader arm*). The cross-member provides structural support to the loader arms as well as provides a connection to the actuator tilting the tool (this actuator is also highlighted in Fig. 9). Figs. 8-9 are illustrative:



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

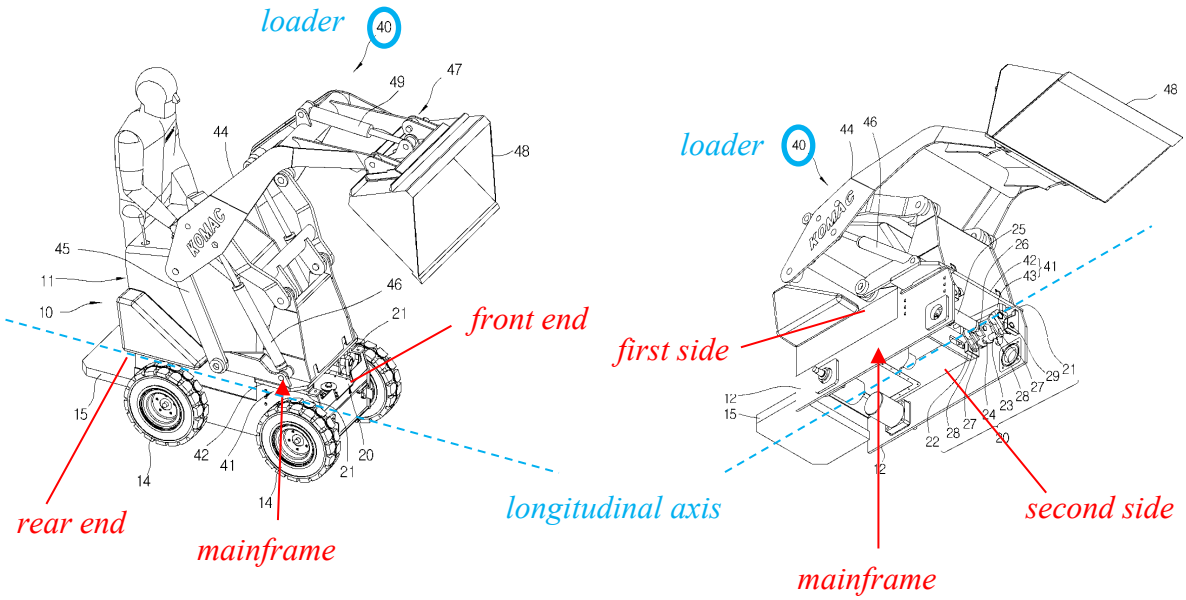
73. Thus, KR996 teaches [50.1].

[50.2a] ***a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis,***

74. KR996 teaches this element.

75. The vehicle of KR996 includes a *mainframe for supporting the* loader

unit 40 (*loader*) and having respective [*first/second*] *sides* and [*front/rear*] *end[s] relative to the longitudinal axis*. KR996 (EX1005), Figs. 8, 9, 10. Annotated Figs. 9 and 10 are illustrative:



EX1005, Figs. 9, 10
(annotated)

76. KR996's mainframe is *for supporting the loader* as the loader unit 40 including its boom 44 is attached to the mainframe by way of the linkages and actuator connecting to the loader arm, discussed below. I understand the Patent Owner has stated "'Mainframe' is used in the '386 Patent to describe the body of the compact tool carrier that supports the loader. This is how the specification uses the term 'mainframe.'" EX0130, p. 45 (emphasis omitted). '386 Patent also describes its "mainframe 10 includes bracket portions 40a, 40b [] through which various pivot linkages are attached." '386 Patent (EX1001), 4:8-10. KR996

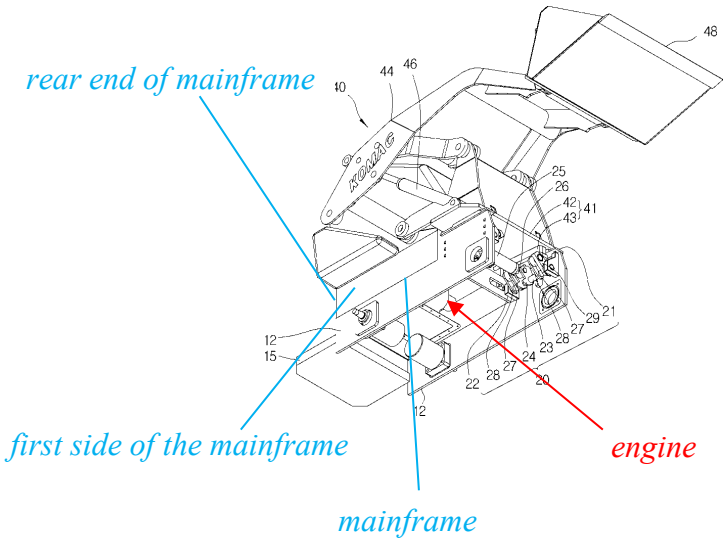
provides a *mainframe* that includes main body 11 of KR996 and its sides 12 as well as other portions of KR996's illustrated vehicle such as those portions that support the loader by providing attachment to the actuator and links that mount the loader to the vehicle. While KR996 describes embodiments 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, '386 Patent, FIG. 7.

77. Thus, KR996 teaches [50.2a].

[50.2b] ***the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe,***

78. KR996 in view of JP705 renders obvious this limitation.

79. KR996's vehicle includes *an engine* for propelling the vehicle. I have annotated Fig. 10 below as illustrative of the engine.



EX1005, Fig. 10
(annotated)

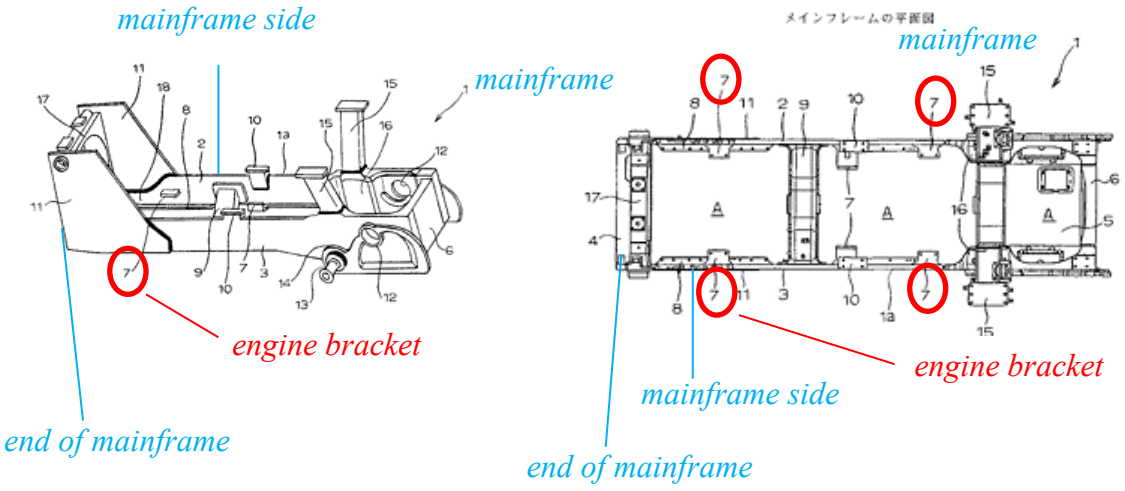
See also, Fig. 12, claims 1, 2, [0002]-[0005] showing the vehicle is self-propelling, which would be provided by an engine.

80. As I discussed above, the engine and its relative location in the vehicle, 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.

81. It was well-known in the art that a compact carrier such as KR996 typically uses an engine bracket to support and secure the engine in place. This is a standard practice. A POSITA would have been motivated to apply the teachings of

JP705 (EX1006) to provide a surface for mounting the engine of KR996's vehicle for the reasons discussed above.

82. JP705 describes mounting parts 7 (see also mounting parts 8) extending from a side of a main body 1a of a mainframe 1 to mount an engine. JP705 (EX1006), [0019], [0001], FIGS. 1, 3. "[T]he term 'mounting part' refers to a site with a mounting seat surface formed in a portion of the frame's main body for attaching various attachment members[.]" JP705 (EX1006), [0018]. The mounting parts 7, 7 are particularly described as for "mounting an engine" and therefore provide an *engine bracket… for mounting an engine to the mainframe*. JP705 (EX1006), [0019].

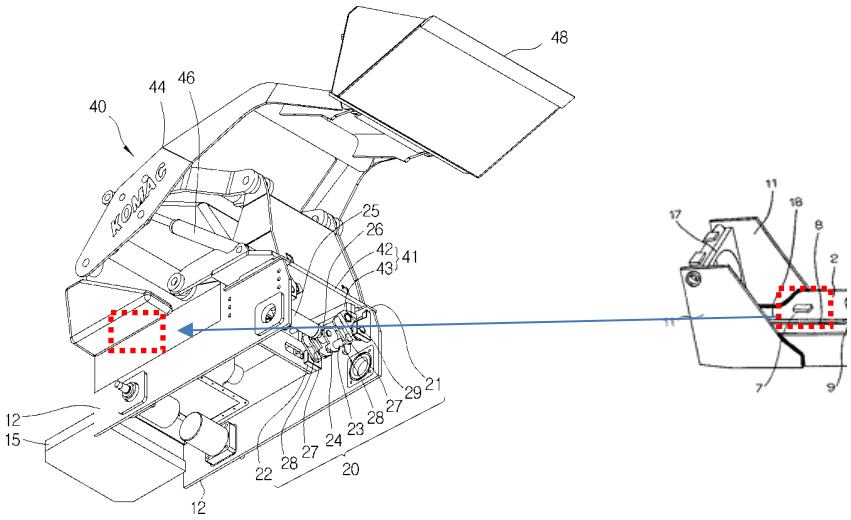


EX1006, FIGS. 1 and 3

83. The mounting parts 7 (*engine bracket*) *extend*[] *from* a respective side

2[3] of the frame *toward* an opposing side 2[3] and are *spaced from the rear end of the mainframe*. JP705 (EX1006), FIGS. 1, 3. It would have been obvious to implement the mounting parts 7 (*engine bracket*) of JP705 similarly *extend[ing] from the first side* of the mainframe of KR996 *toward the second side* for mounting the engine of KR996's vehicle. The mounting of the engine from the side would allow for engine maintenance such as oil change and such side mounting would not interfere with other engine components. Furthermore, as discussed above (paragraph 58), the engine will serve as a member increasing the stiffness of the structure.

84. As in KR996, an engine is spaced *from the rear end of mainframe*, and the JP705 engine bracket is similarly spaced *from the rear end of a mainframe*, a POSITA would have recognized to position the mounting parts 7 (*engine bracket*) similarly *from the rear end of the mainframe* of KR996. Further, a POSITA would recognize that drive sprockets on the tracked vehicle and drive wheels on the wheeled vehicle such as KR996 are driven hydraulically. As such, the drive sprockets/wheels have hydraulic motors attached. Hydraulic hoses are typically used to extend from the engine driven hydraulic pump. Accordingly, the engine can be easily located where there is adequate space, such as spaced from the rear end of the mainframe, and connection to the drive sprockets is simply provided by suitable length hydraulic hoses.



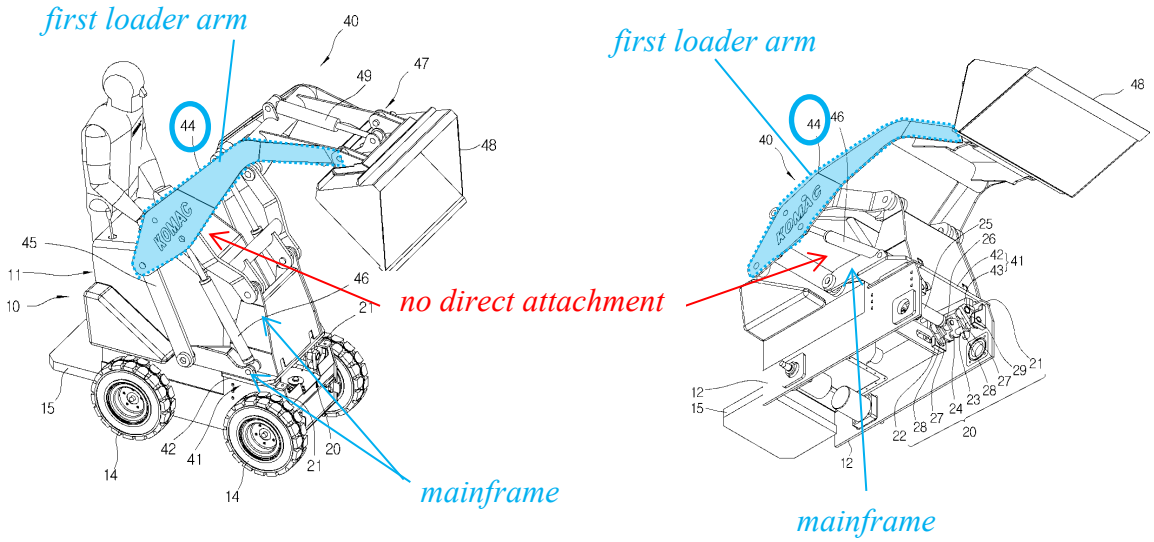
EX1005, Fig. 10, EX1006, FIG. 1 (portion) (annotated)

85. Thus, KR996 in view of JP705 renders obvious element [50.2].

[50.2c] ***the first loader arm not being directly attached to the mainframe;***

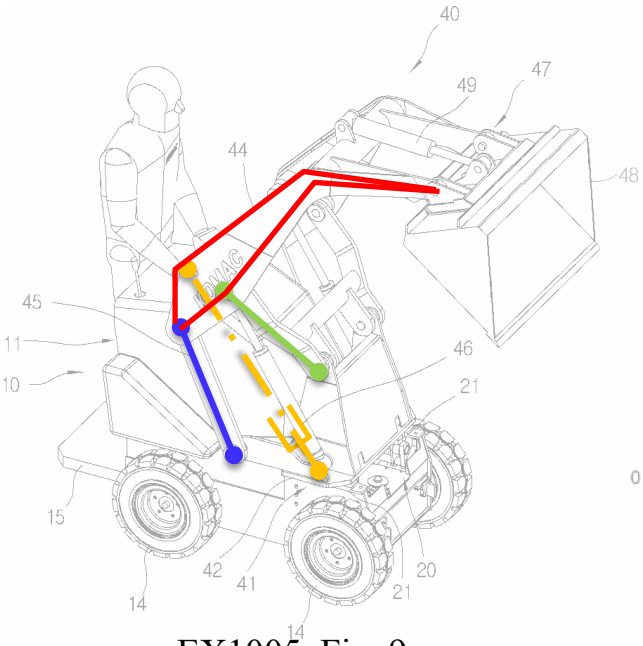
86. KR996 teaches this element.

87. KR996 illustrates loader unit 40 having a boom 44 (*first loader arm*) *not being directly attached to the mainframe*, rather boom 44 is attached only by intermediary parts (boom cylinder 46 and links 45), which are discussed in more detail in [50.3]-[50.5] below.

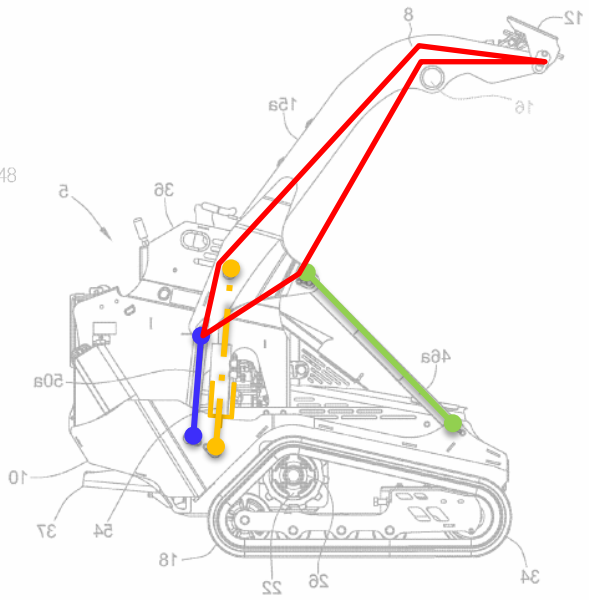


EX1005, Figs. 9, 10
(annotated)

88. I have provided the below schematic view of the KR996 vehicle in comparison with a schematic view of the ’386 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)



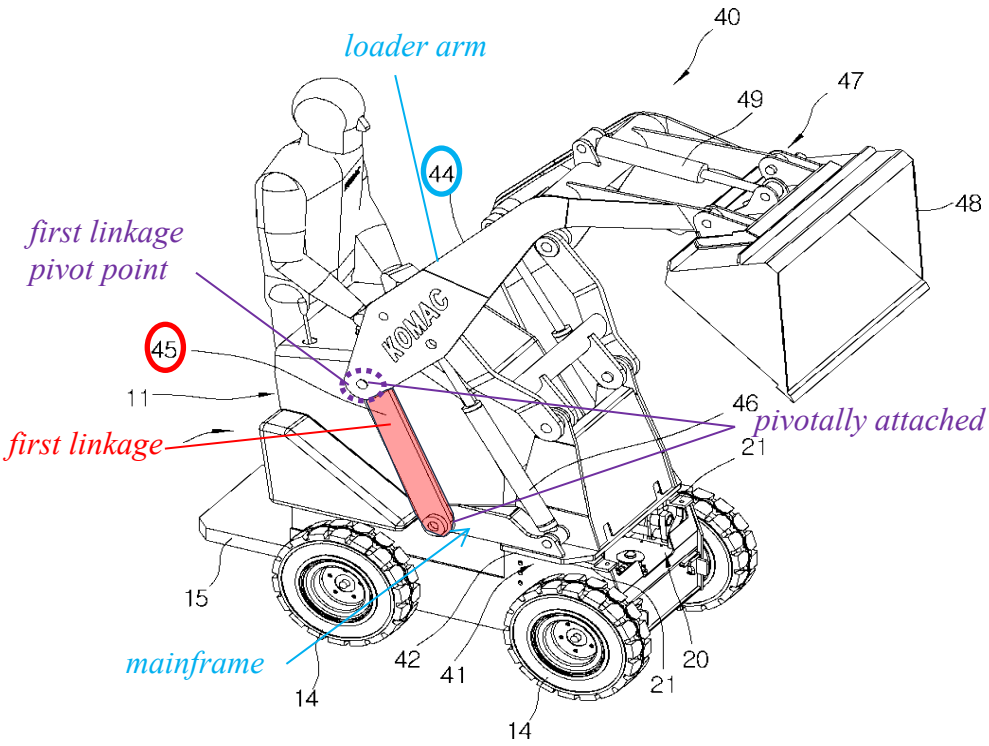
EX1001, Fig. 3
(annotated)

89. Thus, [50.2c] is taught by KR996.

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

90. KR996 teaches this element.

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



EX1005, Fig. 9
(annotated)

92. There are pivot point connections, each a point of relative rotation between the linkage 45 and each of the boom 44 and the mainframe. 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 in paragraph 32, 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.

93. 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

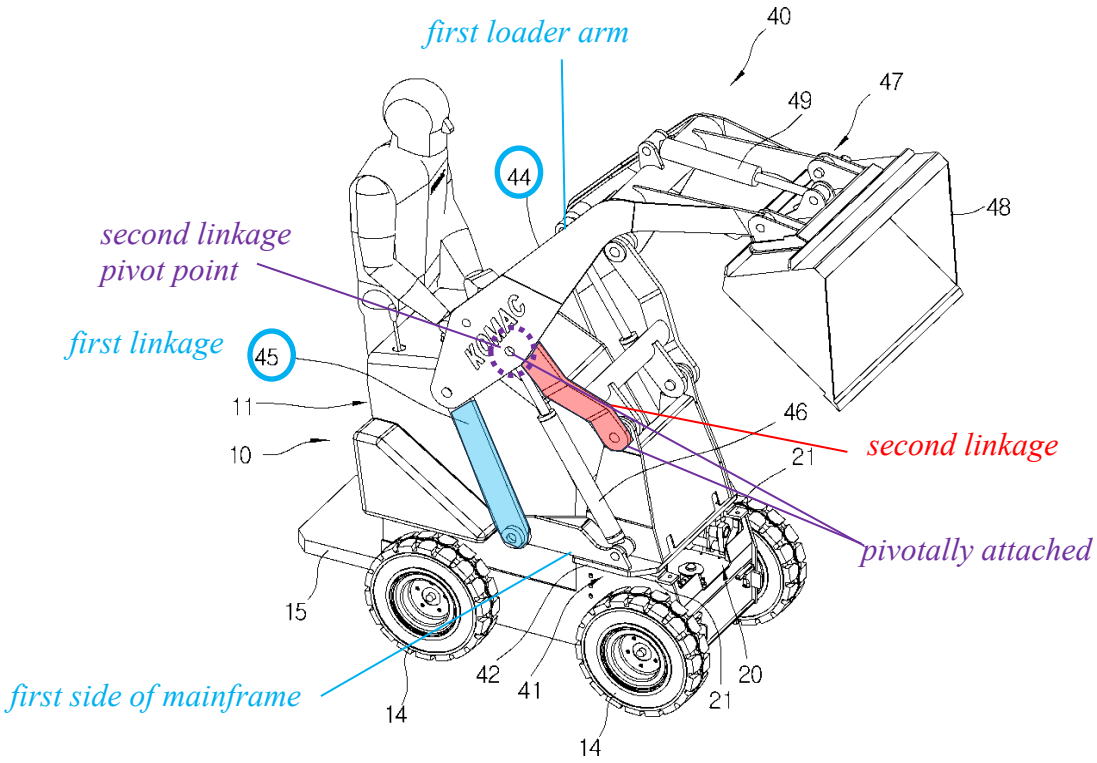
94. This is consistent with '386 Patent's disclosure of a loader linkage (e.g., a loader linkage 46a or 50a) pivotally attached to the first side of the mainframe and pivotally attached to the loader arm. *See*, *e.g.*, '386 Patent (EX1001), FIG. 3, 4:25-35.

95. Thus, [50.3] is taught by KR996.

[50.4a] ***a second linkage pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at a second linkage pivot point,***

96. KR996 teaches this element.

97. KR996 also illustrates an additional link providing *a second linkage* similarly *pivotally attached* to a *first side of the mainframe* at a pivot point and *pivotally attached* to the boom 44 (*first loader arm*) at *a second linkage pivot point*. KR996 (EX1005), Figs. 1-10, claim 1, [0054], [0134].



EX1005, Fig. 9
(annotated)

98. There are pivot point connections, each a point of relative rotation between the linkage and each of the boom 44 and the mainframe. 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 32, 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.

99. 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

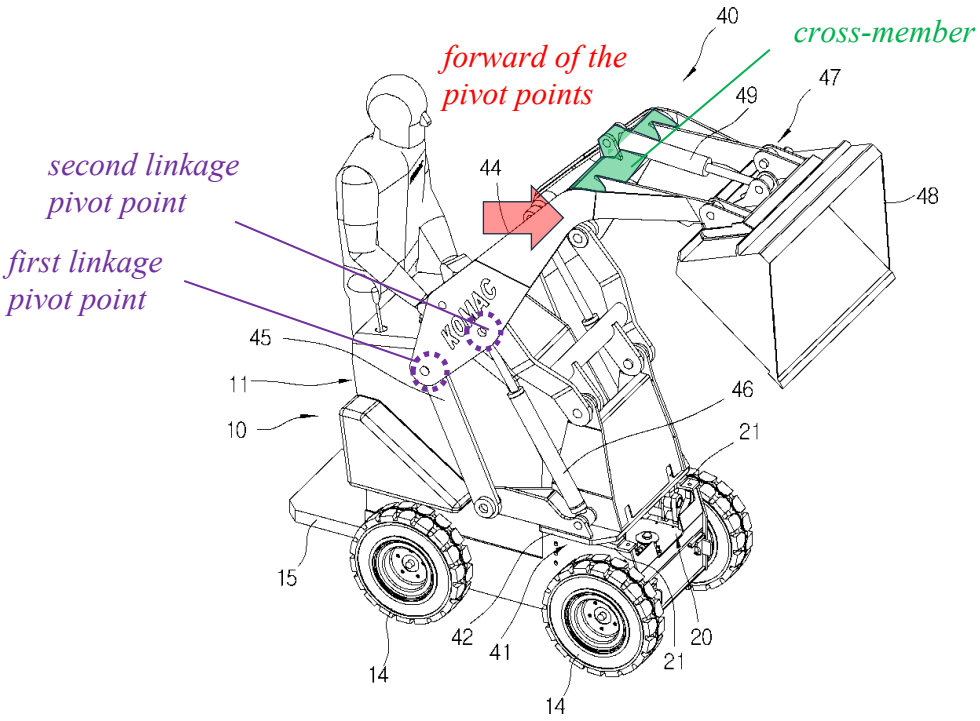
100. This is consistent with '386 Patent's disclosure of a loader linkage (e.g., a loader linkage 46a or 50a) pivotally attached to the first side of the mainframe and pivotally attached to the loader arm. *See*, *e.g.*, '386 Patent (EX1001), FIG. 3, 4:25-35.

101. Thus, [50.4a] is taught by KR996.

[50.4b] ***each cross-member being disposed forward of the first linkage pivot point and the second linkage pivot point;***

102. KR996 teaches this element.

103. KR996 illustrates its cross-member (*each cross-member*) is *disposed forward of the first linkage pivot point* and forward of *the second linkage pivot point*. KR996 (EX1005), Figs. 1-10, 21, claim 1, [0054], [0134]. Fig. 9 is illustrative:



EX1005, Fig. 9 (annotated)

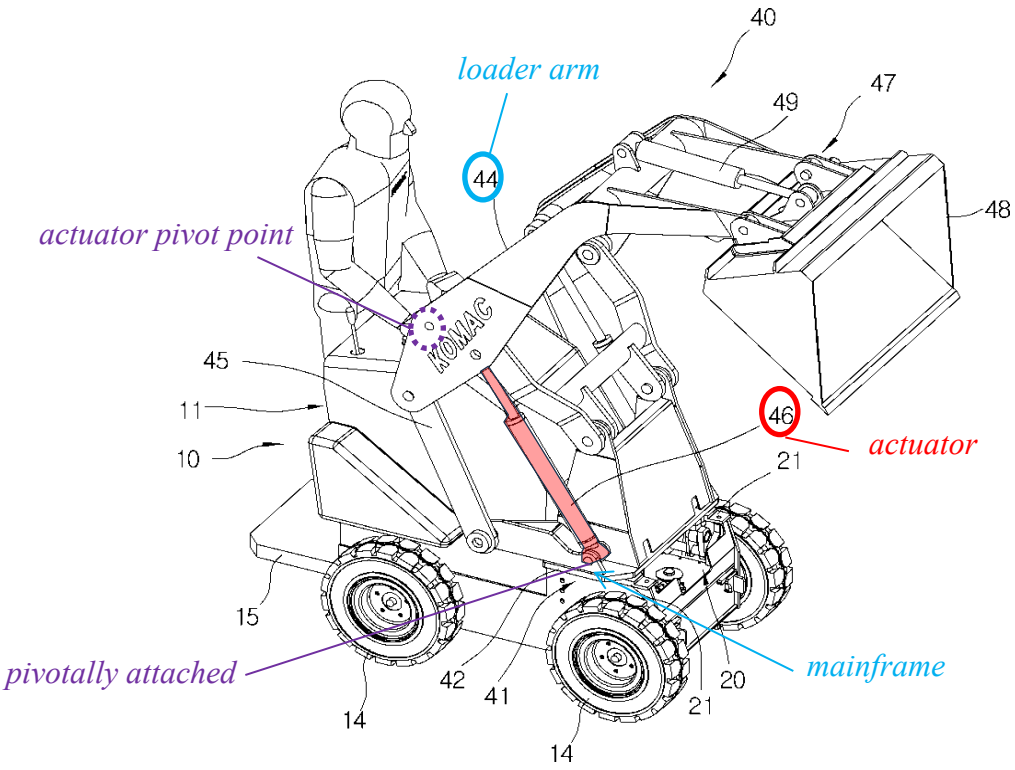
104. Thus, [50.4b] is taught by KR996.

[50.5] ***an actuator pivotally attached to the first side of the mainframe and pivotally attached to the first loader arm at an actuator pivot point;***

105. KR996 teaches this element

106. KR996 describes a boom cylinder 46 (*actuator*) that drives the boom 44 (*first loader arm*). KR996 (EX1005), [0054], claim 1, [0134], Figs. 1-13, 21. The boom cylinder 46 (*actuator*) is *pivotally attached to the first side of the mainframe* at a pivot point and *pivotally attached* the boom 44 (*first loader arm*) at *an actuator pivot point*. A POSITA would recognize a boom cylinder is an actuator cylinder, or simply actuator. See, e.g., Bares (EX1010) 2:66-3:1 ("The lift arm

assembly 24 is raised and lowered with extendible and retractable double acting hydraulic cylinders or actuators".) An actuator cylinder may be pneumatic, hydraulic, or electric. For example, the '386 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)

107. 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.

108. 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.

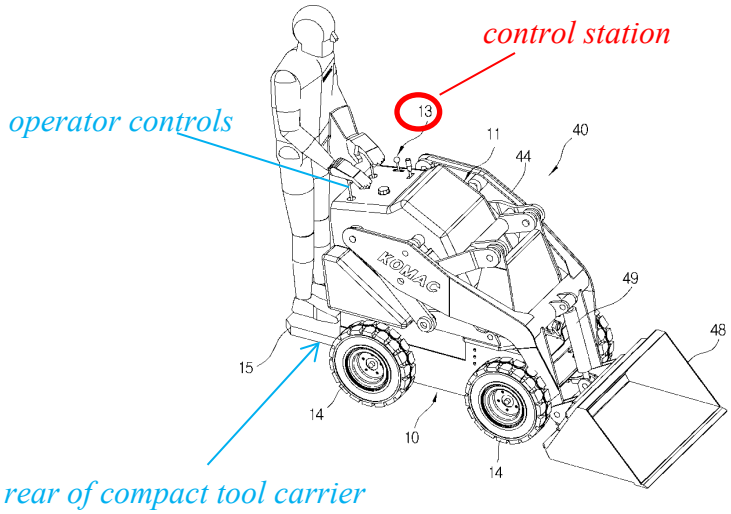
109. Thus, [50.5] is taught by KR996.

[50.6] ***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 and adapted to allow for standing or walk-behind operation; and***

110. KR996 teaches this element.

111. KR996 describes a control unit 13 (*control station*) having *operator controls* to "operate the equipment while the worker is on board at the rear" that is *mounted towards the rear* of the vehicle (*compact tool carrier*). KR996 (EX1005), [0042], Figs. 1, 8-9. The control unit 13 controls moving the vehicle including *propelling the compact tool carrier forward*. KR996 (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 (*the 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)." KR996 (EX1005), [0072].



EX1005, Fig. 8 (portion)
(annotated)

112. As illustrated by the KR996 figures and as discussed in [50.0], the vehicle including its controls 13 (*control station*) is *adapted to allow for standing or walk-behind operation*. KR996 (EX1005), Figs. 8-9, [0033]. This claim term uses the disjunctive "or" meaning one or the other, or both. To the extent the Patent Owner argues both standing operation and walk-behind operation are required, KR996 supports this. KR996 discloses an operator platform that is described as a folding step and thus, suitable for being displaced when operating the vehicle.

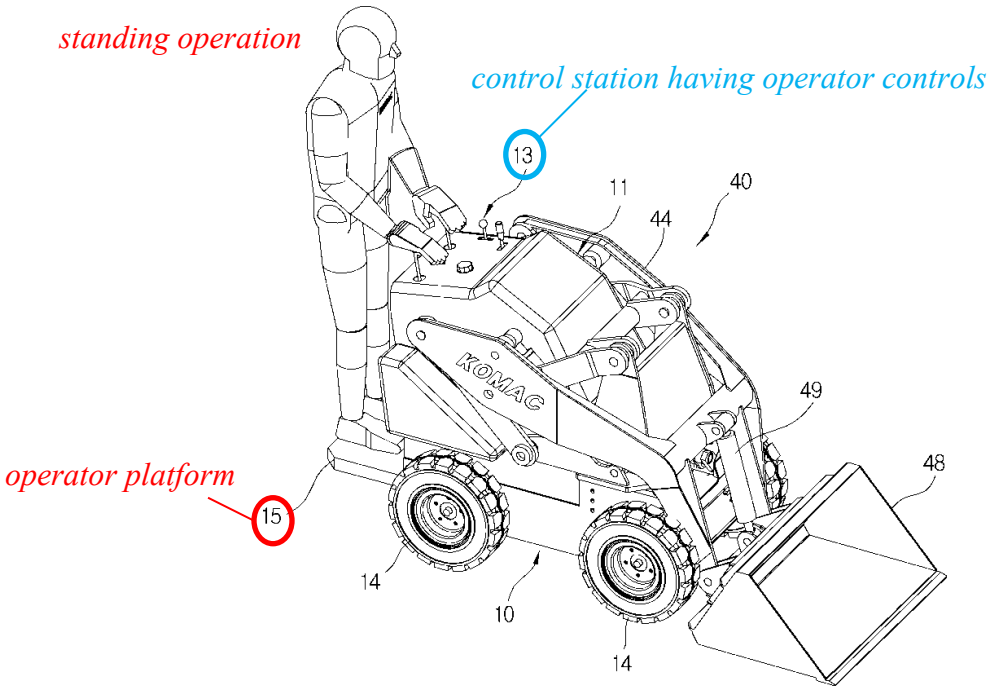
KR996 (EX1005), claim 18 ("folding safety step"), [0033] "foldable step," [0044]. EX1013 (Azure) confirms that a folding step for an operator platform provides both walk-behind and standing/riding platform operation of the vehicle. EX1013, [0004]–[0006], [0008], FIG. 4.

113. Thus, [50.6] is taught by KR996.

[50.7] ***an operator platform for standing operation of the operator controls of the control station.***

114. KR996 teaches this element.

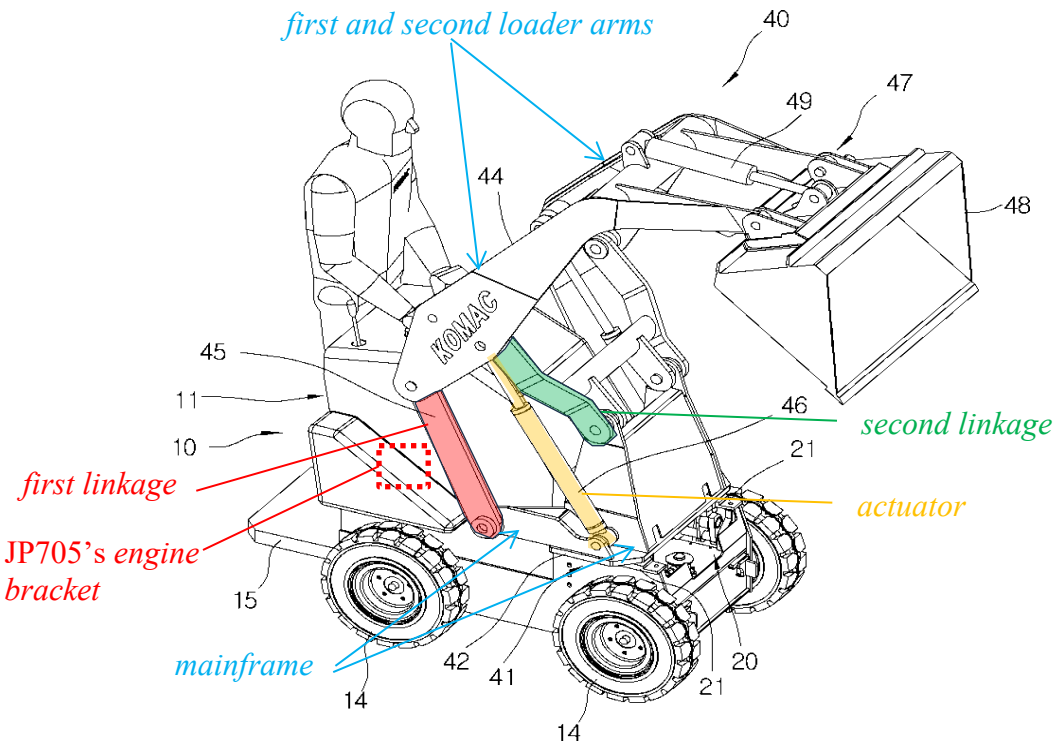
115. KR996 also describes a safety step 15 (*operator platform*) for *standing operation* of the *operator controls* of the control unit 13 (*control station*). KR996 (EX1005), Figs. 1, 7-10, 11, 21, [0033] ("a **foldable safety step** is installed on the lower rear part of the vehicle, allowing the **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. 8 (portion)
(annotated)

116. Thus, [50.7] is taught by KR996.

117. As shown in FIG. 9 below, in KR996-JP705, KR996's vehicle provides stand-behind operation from a step 15 (*operator platform*) with booms 44 (*first* and *second loader arm[s]*) attached to its mainframe only by links (*first and second linkage[s]*) and boom cylinder (*actuator*) and is enhanced with JP705's *engine bracket* to render obvious clam 50.



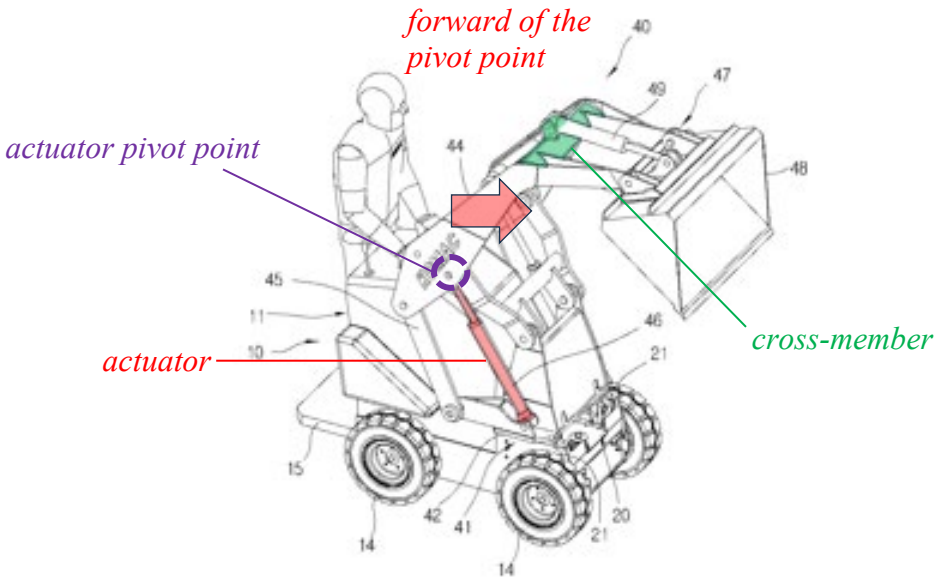
EX1005, Fig. 9
(annotated)

5. Claim 51

[51] ***The compact tool carrier as set forth in claim 50 wherein each cross-member is disposed forward of the actuator pivot point.***

118. KR996 and JP705 teach claim 1 as I discuss above. And this element is also suggested by KR996.

119. KR996 further illustrates the cross-member of [50.1], which is *each cross-member*, is disposed *forward of the actuator pivot point* between the boom cylinder 46 and the boom 44. KR996 (EX1005), Figs. 1-10. claim 1, [0054], [0134]. Fig. 9 is illustrative:



EX1005, Fig. 9
(annotated)

120. Thus, claim 51 is rendered obvious by KR996 and JP705.

6. Claim 52

[52] ***The compact tool carrier as set forth in claim 50 wherein the mainframe incorporates a single weldment.***

121. KR996 and JP705 teach claim 50 and further suggest this element.

122. First, as discussed above in [50.2b] and the reasons to combine JP705, it would have been obvious to provide the engine bracket of JP705, which is attached by a *weldment* to the mainframe of KR996, thus providing a mainframe

that *incorporates a single weldment*.[6]

123. Further, a POSITA would have found it obvious to form other portions of the mainframe of KR996 as part of a *single weldment* as use of welding to join components of a support frame for a loader apparatus was a well-known method of attachment. There are numerous examples of implementing a welding technique in substantially similar compact tool carriers. EX1010 (Bares) 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."

124. 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

[6] The '386 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, 2:53-56.

surrounding components (*e.g.*, placement of the engine in the loader apparatus), replaceability of parts, structural rigidity, and/or costs including as discussed above with reference to JP705.

125. To the extent Patent Owner argues that certain components of the mainframe are required to be coupled by a weldment, JP705 illustrates a main frame (*mainframe*) that consists of one *single weldment*. JP705 (EX1006), [0019] ("The main frame 1 is constructed from cast steel for welding construction …"). As discussed above, JP705 easily applies to the compact utility loader of KR996, and further it was well known in the art to have a mainframe consisting of a single weldment to provide a compact tool carrier. See, e.g., Bares (EX1010), 4:8-9. Providing the mainframe of KR996 as a welded structure as taught in JP705 would have been a predictable application of JP705's general teachings of benefits of welding, as discussed above with reference to an engine bracket.

126. Thus, claim 52 is rendered obvious by KR996 and JP705.

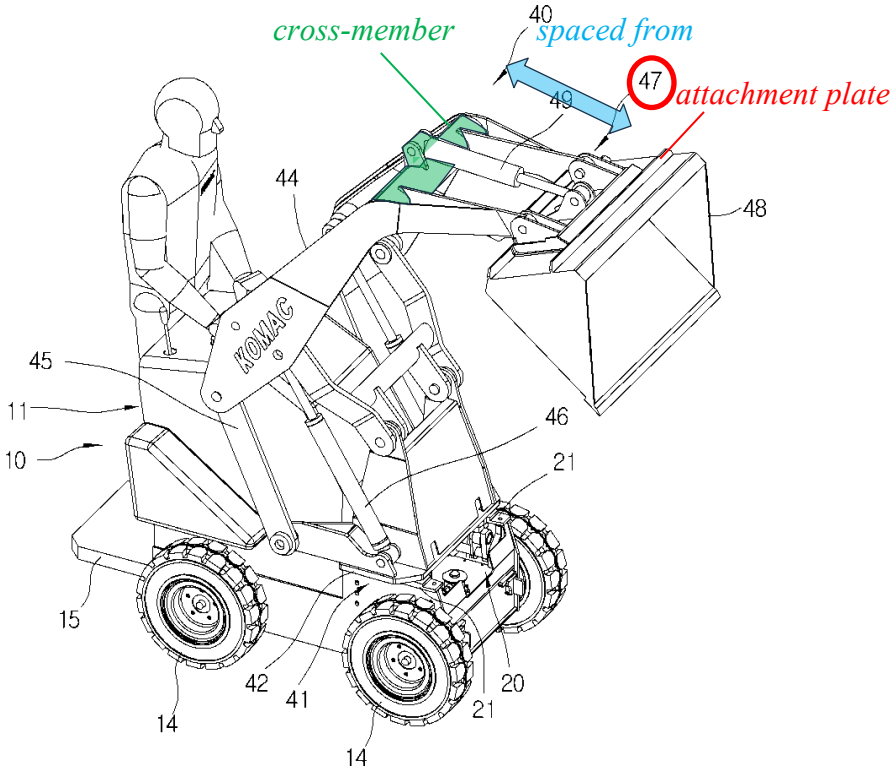
7. Claim 53

[53] ***The compact tool carrier as set forth in claim 50 further comprising an attachment plate for removably attaching a tool to the compact tool carrier, the cross-member being spaced from the attachment plate.***

127. KR996 and JP705 teach claim 50 and KR996 also teaches this element.

128. KR996 describes a bucket attachment 47 (*attachment plate*) *for*

removably attaching a bucket 48 (*tool*) *to* the KR996 vehicle (*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)**[.]" KR996 (EX1005), [0054]. KR996's *cross-member* is *spaced from* the bucket attachment 47 (*attachment plate*) as shown in Fig. 9:



EX1005, Fig. 9
(annotated)

129. 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.

130. Thus, claim 53 is rendered obvious by KR996.

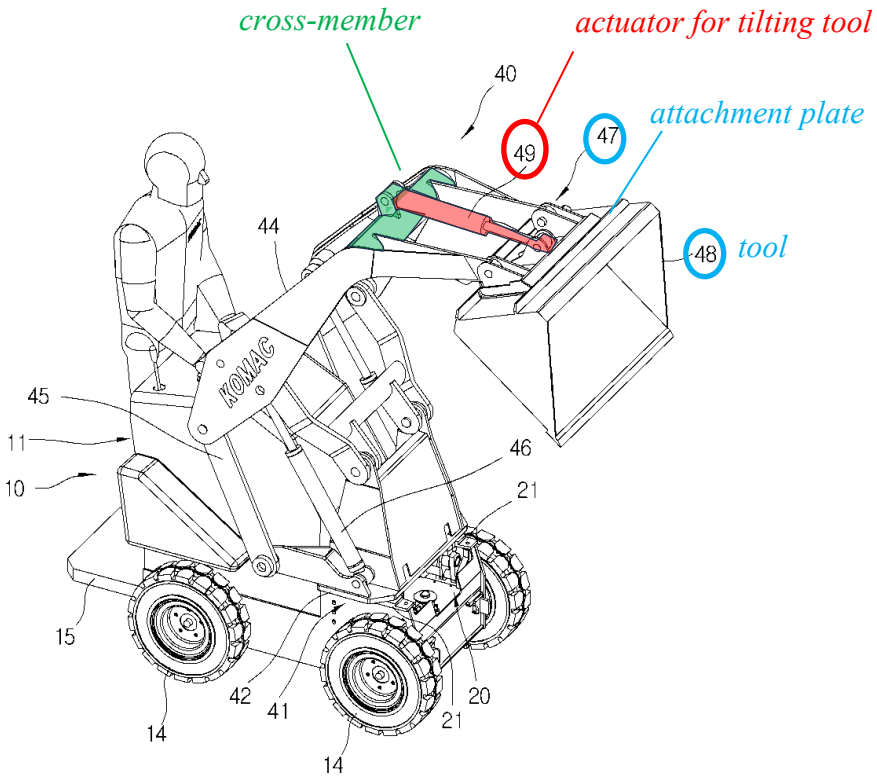
8. Claim 54

[54] ***The compact tool carrier as set forth in claim 53 further comprising an actuator for tilting of tools connected to the attachment plate, the actuator being connected to the cross-member and the attachment plate.***

131. KR996 and JP705 teach claim 53 as discussed above. And KR996 also teaches this element.

132. KR996 illustrates "boom (44) and a bucket attachment (47) are

equipped with **a bucket cylinder (49)** that **rotates the bucket (48)**." KR996 (EX1005), [0054]; *see also*, KR996 (EX1005), claim 1. KR996's bucket cylinder 49 is an *actuator* just as the boom cylinder 46 is an actuator as I discuss above. See '386 patent which describes the actuator as a hydraulic cylinder. '386 Patent, 4:34. And bucket cylinder 49 (*actuator for tilting of tools*) is *connected to the cross-member* and bucket attachment 47 (*attachment plate)*. Fig. 9 is illustrative:



EX1005, Fig. 9
(annotated)

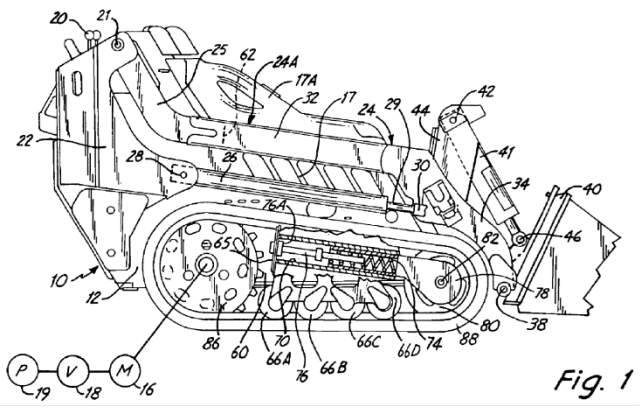
133. Thus, claim 54 is rendered obvious by KR996 and JP705.

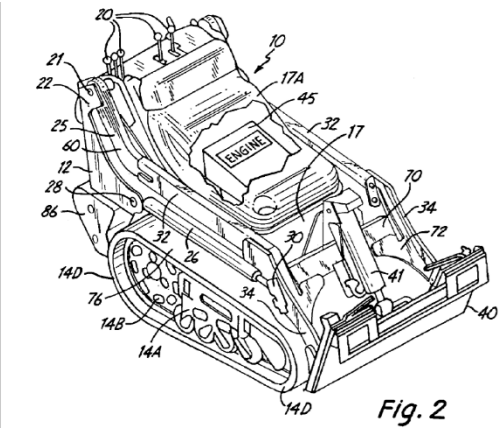
D. Ground 2 : KR996, JP705, Bares, and Beltrami

134. Independent claims 55, 80, and 83 include similar elements as claim 50, which are taught by KR996 in combination with the engine bracket of JP705. These claims further add another conventional feature, a track assembly, which is illustrated by Bares. And the claims recite certain relative, dimensions that, in addition to being suggested by the plain inspection of the figures of KR996 and recognized a POSITA to be not only a result affective variable but also driven by physical principles to be low, would have been obvious to implement as taught by Beltrami.

1. Bares (EX1010)

135. 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

136. 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.

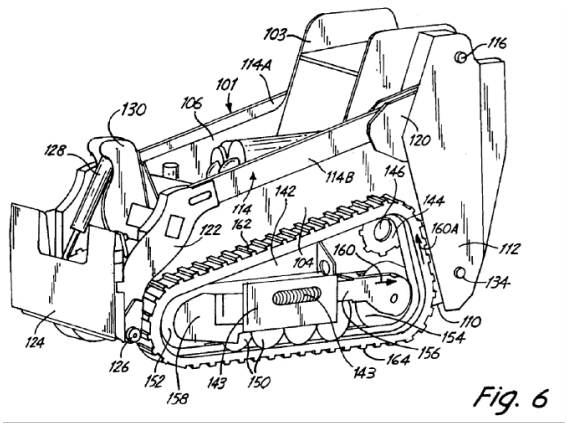


Fig. 6

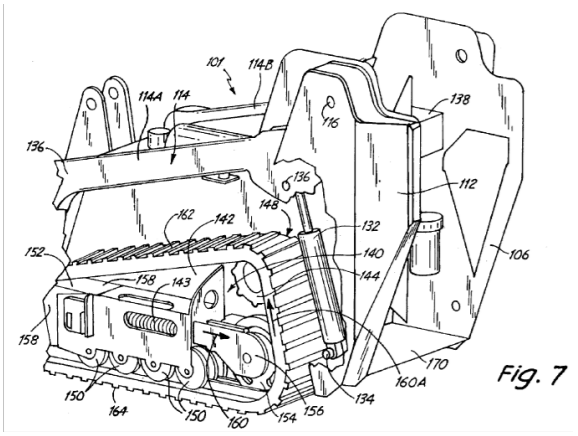


Fig. 7

EX1010, FIGS. 6, 7

137. 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. Beltrami (EX1008)

138. 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.

139. 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 32). 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.

3. Reasons to combine KR996 and JP705

140. I describe the reasons to combine KR996 and JP705 are provided above with reference to Ground 1 beginning at paragraph 54.

4. Reasons to combine KR996-JP705 and Bares (KR996-JP705-Bares)

141. Bares, like KR996-JP705, is in the same field of endeavor as the '386

Patent, pertaining to working vehicles (*e.g.*, earth-moving equipment) and in particular, is directed to self-propelled vehicles with a stand or walk behind operation and a loader. KR996 (EX1005), Abstract, [0001], FIG. 21; Bares (EX1010), 5:55-57, FIGS. 1-8; '386 Patent (EX1001), 1:16-31, 2:59-3:3, FIG. 1. KR996-JP705, Bares, and '386 Patent are also each reasonably pertinent to a same problem faced by the inventor regarding the need to provide compact tool carriers with a relatively low-profile, compact design. KR996 (EX1005), [0008]-[0009], [0012]; '386 Patent (EX1001), 1:28-30, 37-38; Bares (EX1010), 1:46-58.

142. POSITA would have been motivated to combine the teachings of Bares with KR996-JP705 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-JP705 vehicle would have been predictable with a reasonable expectation of success because both KR996-JP705 and Bares relate to similar vehicle types with a similar mainframe having a drive mechanism attached thereto.

143. 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.

144. It was a known practice to market compact tool carriers such as KR996-JP705 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.

145. 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.

146. A POSITA would have recognized a reasonable expectation of success in providing a tracked assembly on the KR996-JP705 vehicle as track assemblies were well known in the art and perform the same function as the wheel mounted drive mechanism illustrated in KR996-JP705. This is simple substitution of one known, equivalent element for another to obtain predictable results and performing the same function. Also Bares provides an easy to implement assembly. Bares (EX1010), 1:33-45.

5. Reasons to combine KR996-JP705-Bares and Beltrami

147. KR996, including as modified as KR996-JP705-Bares, and Beltrami

are analogous art to the ’386 Patent because they are in the same field of endeavor of earth-moving machinery. ’386 Patent (EX1001), 1:17-36; KR996 (EX1005), Abstract; Beltrami (EX1008), 1:5-15. Further, KR996/JP705 and Beltrami, like the ’386 Patent, are directed to earth-moving machinery with a vertical lift style loader. ’386 Patent (EX1001), FIG. 1; KR996 (EX1005), Fig. 9; Beltrami (EX1008), Figs. 2-6. KR996/JP705 and Beltrami are also analogous art to the ’386 Patent because they are reasonably pertinent to a same problem faced by the inventor - producing a vertical lift path for the tool attachment in operation. ’386 Patent (EX1001), 1:19-39; KR996 (EX1005), Figs. 8, 9; Beltrami (EX1008), 1:24-40.

148. 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/JP705 to produce a predictable and beneficial vehicle configuration. As discussed above, KR996 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 32. 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.

149. 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 or 2 times the distance between the axis and the ground/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 low on its frame, in particular, a relatively small vertical distance from the rotational axis of the drive mechanism.

150. 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.

151. 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.

152. The results of combining Beltrami's technique with KR996-JP705-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-JP705-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.

6. Claim 55

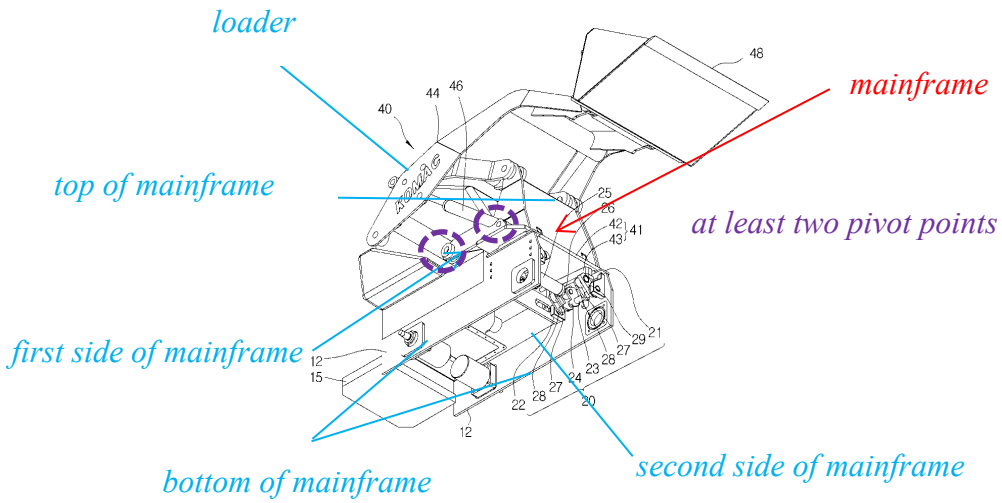
153. Claim 55 shares many limitations with claim 50 discussed in Ground 1, with additional limitations to a drive mechanism and pivot point locations, which are discussed below the following cross-referencing table.

		See the analysis for:
[55.0]	*A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:*	[50.0]
[55.1]	*a loader having an arm, the loader being adapted to carry a tool;*	[50.1] including loader unit 40 (*loader*) and boom 44 (*arm*) to carry bucket 48 (*tool*)

		See the analysis for:
[55.2a]	*a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis,*	[50.2a]
[55.2b]	*the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe,*	[50.2b] including JP705's mounting part 7 (*engine bracket*) obvious to combine with KR996's mainframe for the reasons above
[55.2c]	*each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader,*	See below
[55.2d]	*the loader arm not being directly attached to the mainframe;*	[50.2c]
[55.3]	*a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.3] including link 45 (*linkage*) *pivotally attached* to the *first side* of KR996's mainframe and *pivotally attached* to boom 44 (*loader arm*)

		See the analysis for:
[55.4]	*an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.5] including boom cylinder 46 (*actuator*) *pivotally attached* to the *first side* of KR996's mainframe and *pivotally attached* to boom 44 (*loader arm*)
[55.5a,b]	*a drive mechanism comprising tracks…1.5 D5; and*	See below
[55.6]	*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 and adapted to allow for standing or walk-behind operation.*	[50.6] including control unit 13 (*control station*)

154. As to [55.2c], *each side* of KR996's mainframe has a *top* and a *bottom*, the *first side of the mainframe* has *at least two pivot points relative to the* loader unit 40 (*loader*) as illustrated by the pivot points between the link 45 and the mainframe and boom cylinder 46 and the mainframe. Fig. 10 is illustrative:

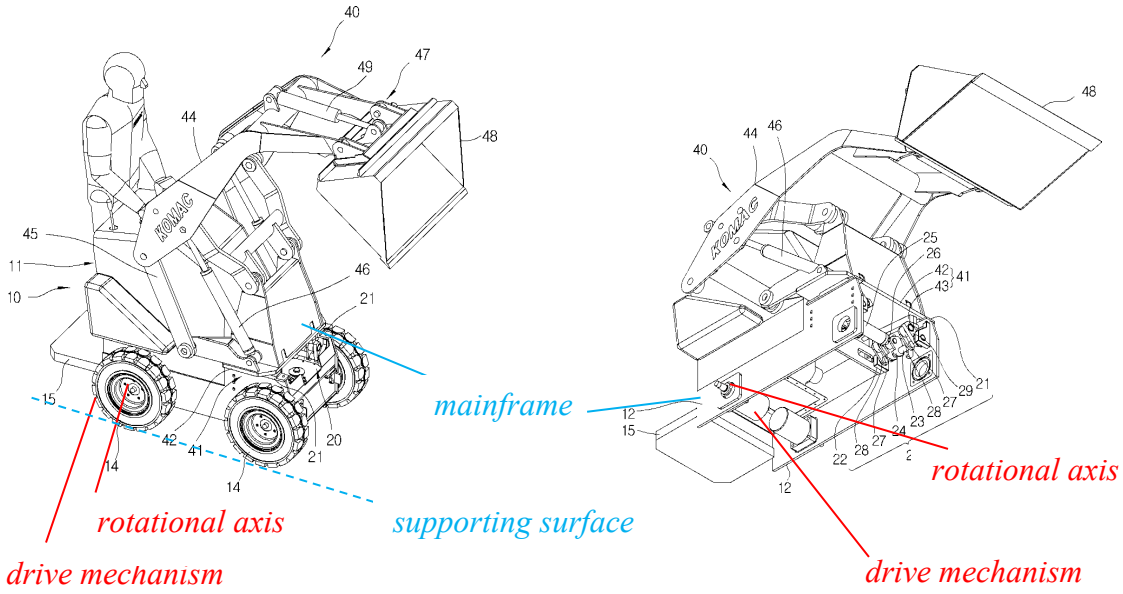


EX1005, Fig. 10
(annotated)

155. Thus, KR996 teaches [55.2c].

[55.5a] ***a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5***,

156. As to claim element [55.5a], KR996 describes *a drive mechanism* including "wheels (14)" (*wheels*) for *propelling* the vehicle (*compact tool carrier*) over a supporting surface (*e.g.*, ground). KR996 (EX1005), [0042], Figs. 1, 8-10. The *drive mechanism* is attached to the mainframe *about a rotational axis*. This is the same configuration as provided in the '386 Patent. *See* '386 Patent (EX1001), 1:67-2:3.

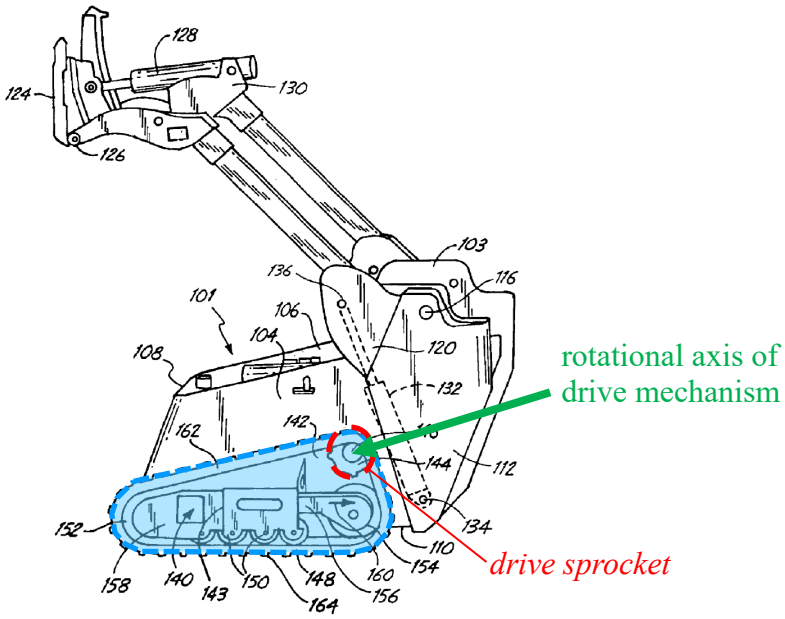


EX1005, Figs. 9, 10
(annotated)

157. 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.

158. 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 explains its drive mechanism is *for propelling the loader*

apparatus over a supporting surface. *See* EX1010, 2:37-39 ("**[ground drive] assembly** [] on each side of the loader for **propelling the loader in forward** and reverse directions."), 5:18-43 ("to power the unit and propel it over the ground.") And Bares' drive sprocket 144 driven by motor 146 rotates around *a rotational axis*, just like in the '386 Patent. Bares' drive mechanism as illustrated and on KR996's provides these same features. The following figures are illustrative:



EX1010, FIG. 8
(annotated)

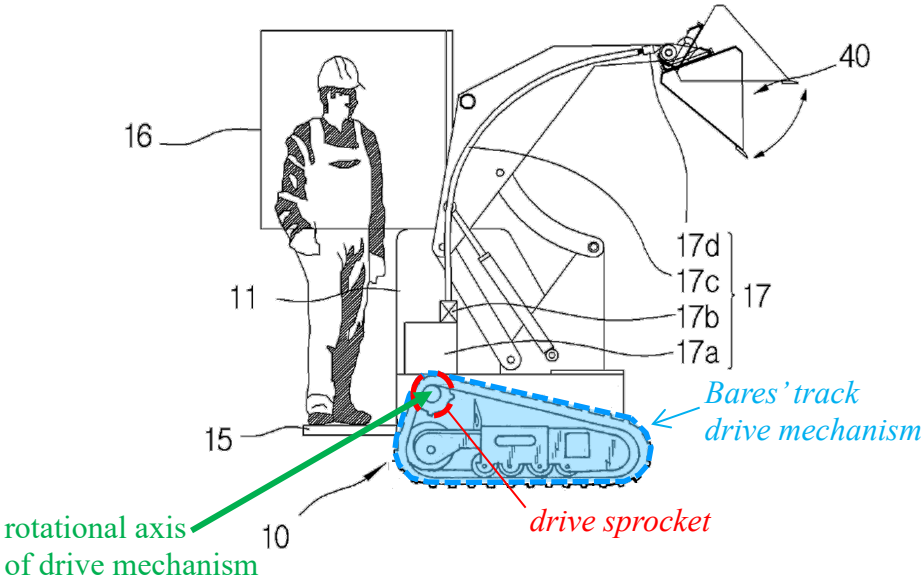


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

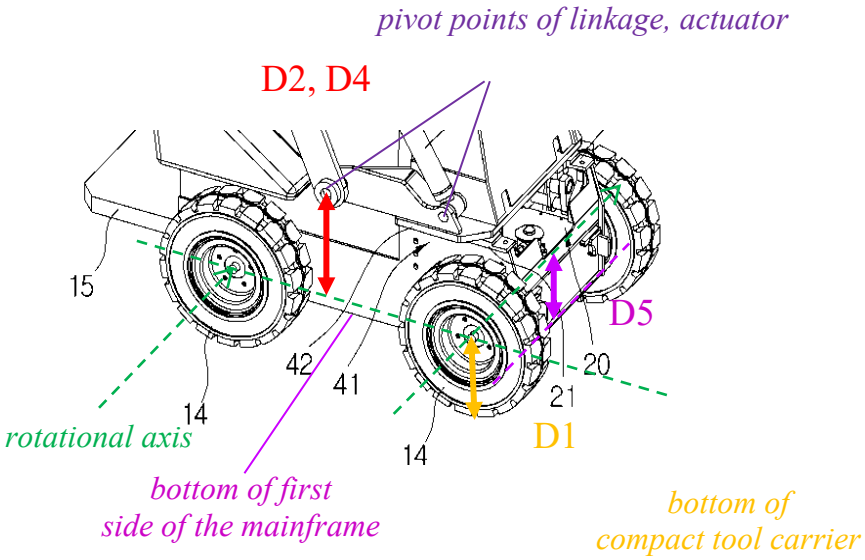
159. Figure A is based on Figure 21 of KR996, with how a POSITA would understand Bares' track assembly, taken from Bares' FIG. 8, would be applied to the vehicle. (The illustration of the tracked assembly of Bares' FIG. 8 is flipped and lead lines/labels removed substituted for KR996's Fig. 21's wheel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

160. 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*.

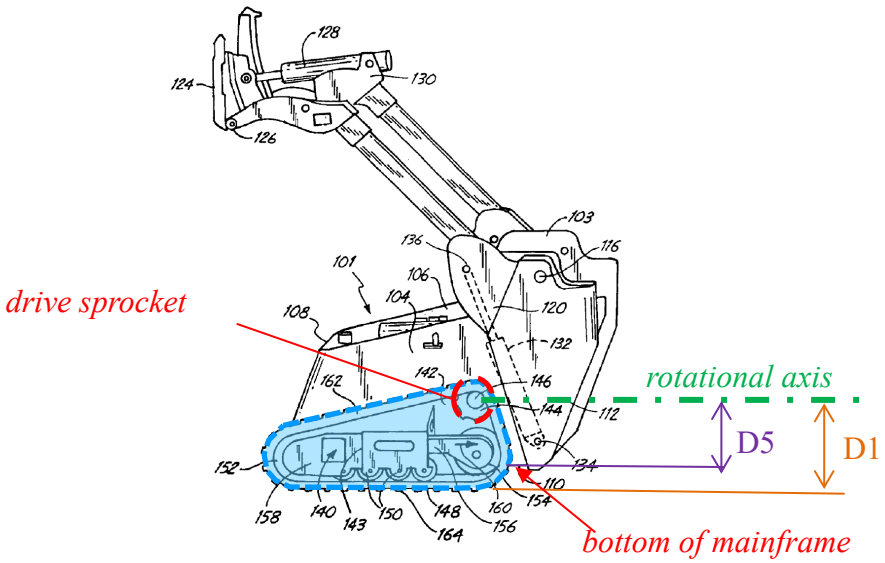
161. A POSITA would recognize that this distance D1 (between the rotational axis and the bottom of the carrier (i.e., contacting ground) is a result affective variable that is selected in the design process. D1 is determined by a size (i.e., diameter) of the wheels. And the size of the wheels is selected 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 alterative to wheels. *See* Bares '568 (EX1009), FIG. 1.

162. 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.

163. Each of KR996 (see [55.5b]) 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)

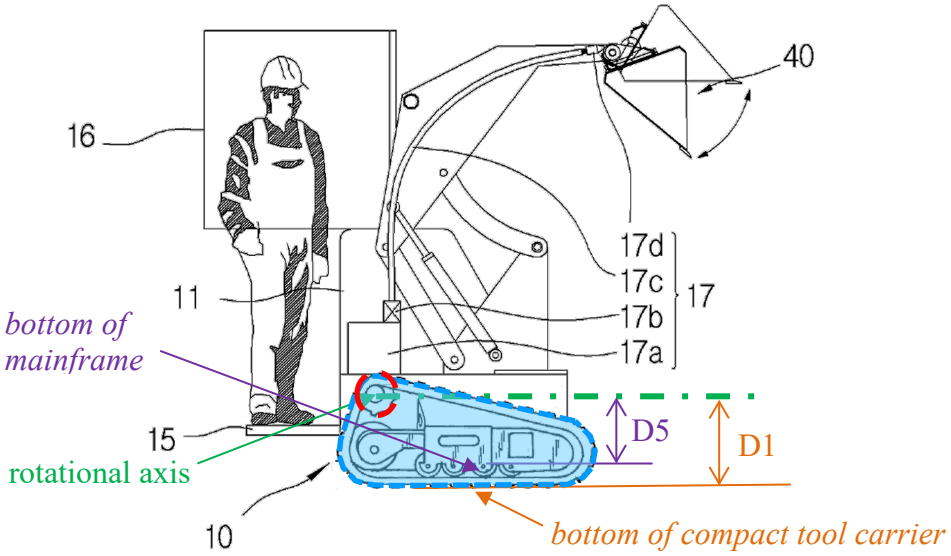


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

164. 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.

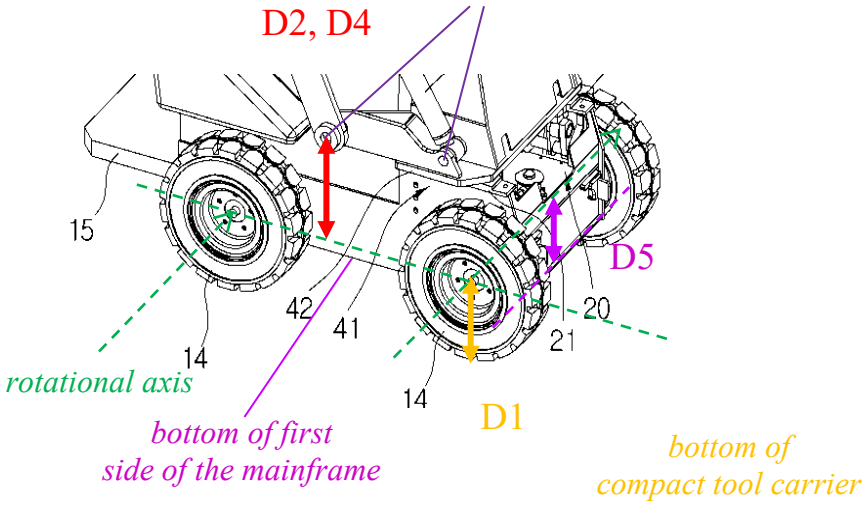
165. Thus, element [55.5a] is taught by KR996.

[55.5b]…*the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than D1 and being less than 1.5 D5; and*

166. As to element [55.5b], KR996 including as modified by Bares in implementing the teachings of Beltrami teach this element.

167. KR996 suggests through plain inspection of its figures, that there is a *vertical distance D2* between the pivot point at which the link 45 (*linkage*) is attached to the *mainframe* and the *rotational axis*. And there is a *vertical distance*

D4 between the pivot point at which the boom cylinder 46 (*actuator*) is attached to the *mainframe* and the *rotational axis*. *See* annotated Fig. 9.



EX1005, Fig. 9 (portion)
(annotated)

168. Driven by a simple inspection of the relative dimensions illustrated in KR996's Figures, a POSITA would have reason to configure D2 and D4 are each *less than 1 times D1* and each *less than 1.5 D5* as it is generally suggested by the drawings. It is noted that in combining the KR996 vehicle with Bares' track assembly, D1 and D5 are increased and the rotational axis is moved higher to decrease D2 and D4.

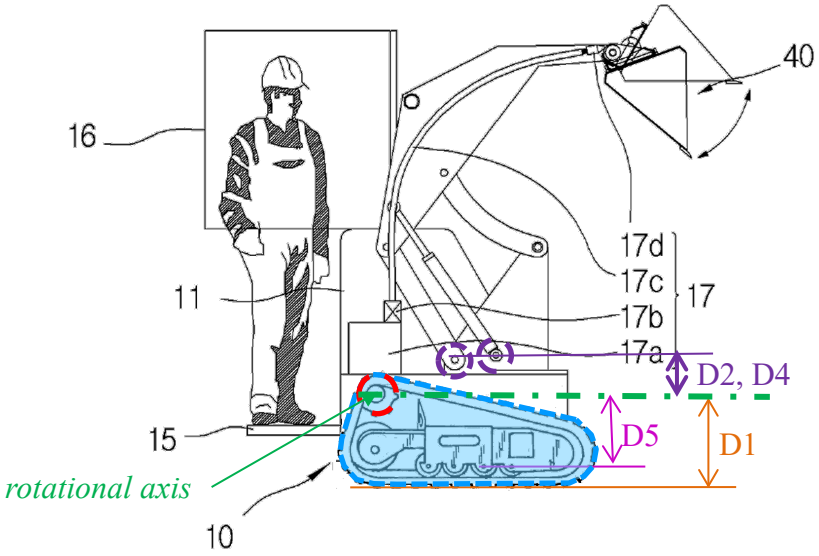


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

169. Thus, a POSITA would have found it predictable and easy to implement D2 and D4 each being *less than 1 times D1* and each being *less than 1.5 times D5* in the KR996 vehicle with Bares' track assembly as this is the natural configuration resulting from the combination with a raised drive sprocket.

170. Further, a POSITA would have had reason and found it beneficial to provide D2 and D4 each being *less than 1 times D1* and each being *less than 1.5 times D5* in KR996's vehicle as discussed above with reference to the reasons to combine Beltrami and further discussed below. As I discussed above and continue to discuss below, a POSITA would recognize a benefit to minimizing the distances

between the pivot points and the rotational axis – thus, minimizing D2 and D4. One predictable arrangement is D2 and D4 each being less than 1 times D1 and each being less than 1.5 D5.

Standard Practice to Optimize Pivot Point Locations :

171. Like the ’386 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 ’386 Patent illustrate a loader based on a four bar mechanism. And optimization within prior art conditions or through routine experimentation supports a finding of obviousness. 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.

172. 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:

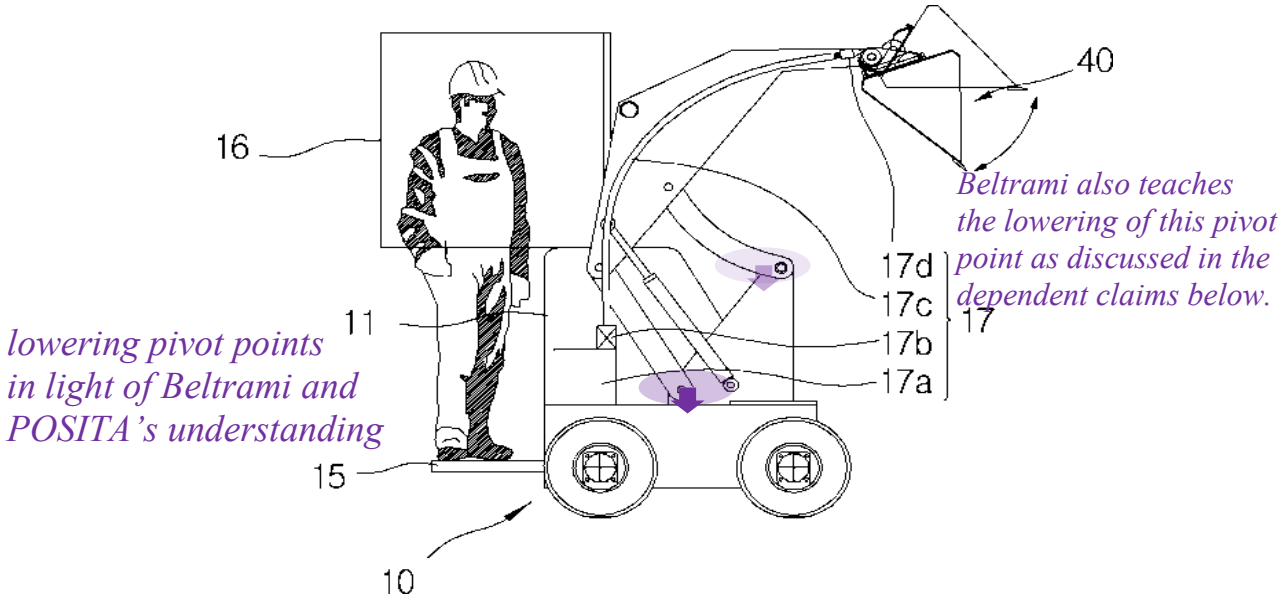
173. Beltrami also confirms that decades prior to the ’386 Patent, modifying positions of the relevant pivot points affected the design goals and was a known technique in designing such a vehicle. Beltrami (EX1008), 4:25-50 (“…a substantially vertical path such as that indicated by the reference number 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…").

174. 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.

175. Thus, a POSITA would have had the skillset, desire, and motivation to provide the pivot points low (*i.e.*, minimizing D2 and D4). 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 and reducing

D2 and D4.



EX1005, Fig. 21
(annotated)

The Benefits of Providing Low Pivot Points were well understood:

176. Further, it would have been obvious to position the pivot points such that D2 and D4 are *less than 1 times D1* and *less than 1.5 D5* as claimed (as well as distance D3 discussed with reference to the dependent claims below). I have reviewed the '386 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 '386 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.

'386 Patent (EX1001), 5:62-67 (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 '386 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 '386 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 visibly of the operator is increased, i.e., the operator's line of sight to the ground in front of the carrier is increased.

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

- Heochst (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].

178. 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.

The Claimed Relative Distances of Claim 55 Are Obvious:

179. 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 D2 and D4 in the context of KR996) to provide for the benefits discussed above and provide D2 and D4 each being less than 1 times D1 and each being less than 1.5 time D5. As discussed above, there would have been a reasonable expectation of success as designing a four-bar mechanism for equipment such as in KR996 is a straightforward process recognized decades prior to the '386 Patent.

180. Thus, claim 55 (like the orientations of the pivot points recited in the claims below) is rendered obvious by KR996, JP705 and Bares in combination with the teachings of Beltrami.

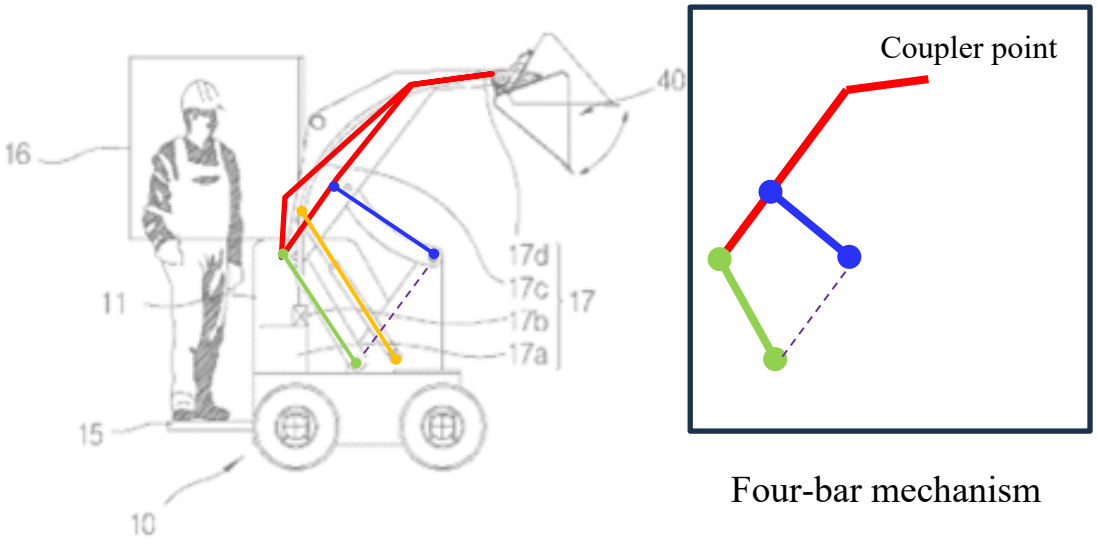
Implementation Details as to Lower Pivot Points – Claims 55-60, 80, 83

181. 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 55 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. While Claim 55 of the '386 Patent recites the distances related to only one linkage and actuator pivot points, to further illustrate the obviousness of all claims of the '386 Patent, and the teachings of the '386 Patent generally, I discuss each pivot point in the discussion below.

182. 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.

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

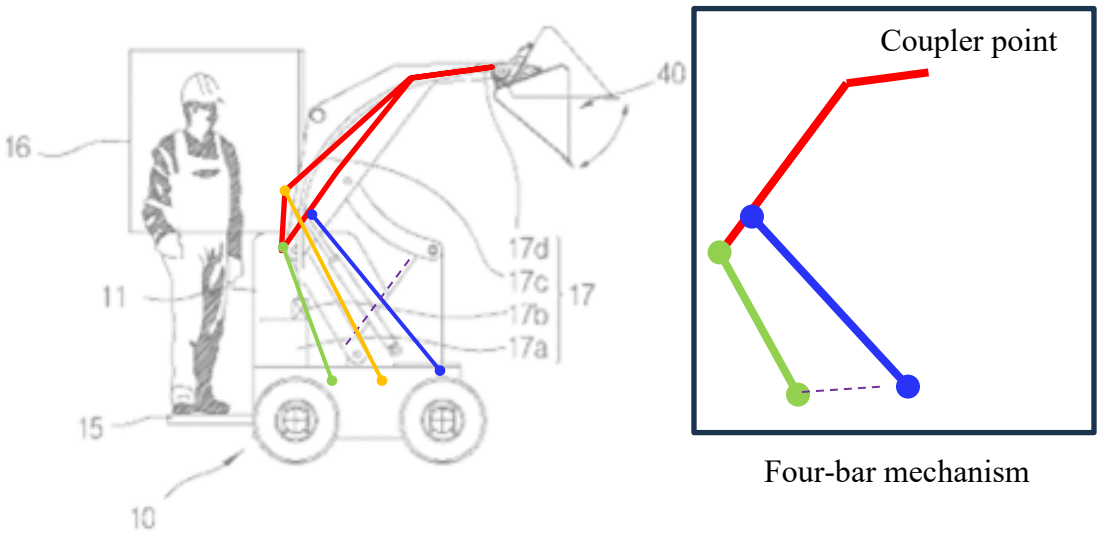


EX1005, FIG. 21
(annotated)

184. 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.

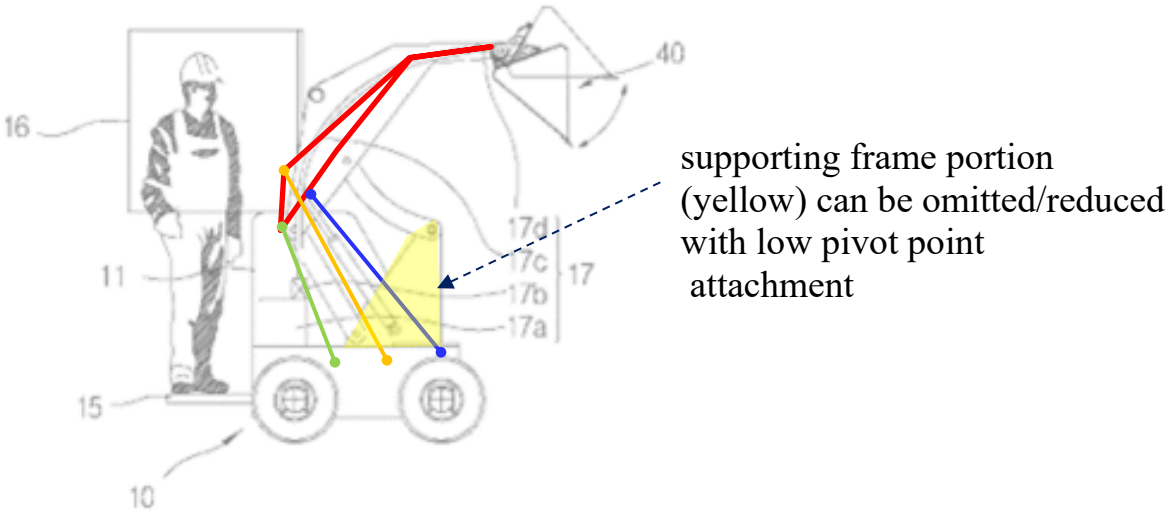
185. I provide a schematic drawing of this modification below:



EX1005, FIG. 21
(annotated)

186. 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)

187. 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:

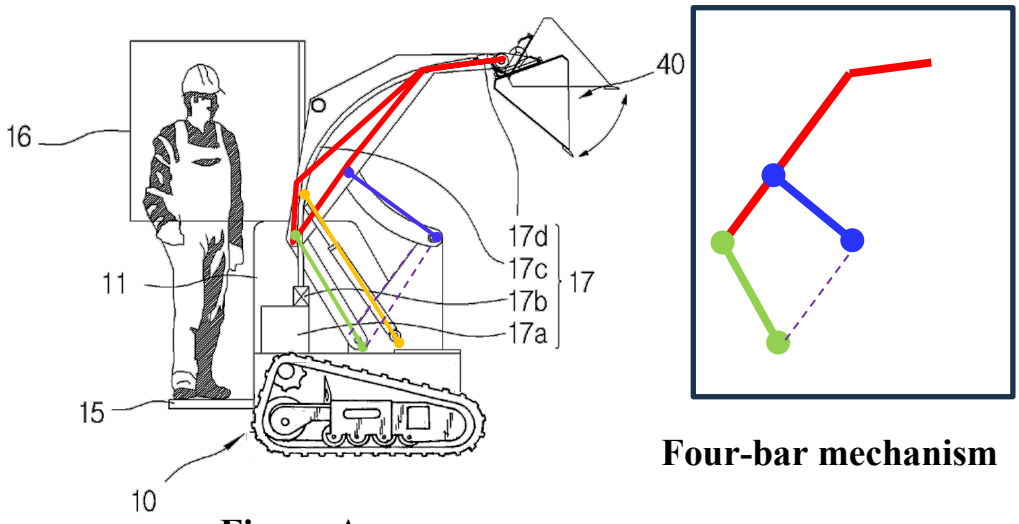


Figure A
(annotated)

Four-bar mechanism

188. 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

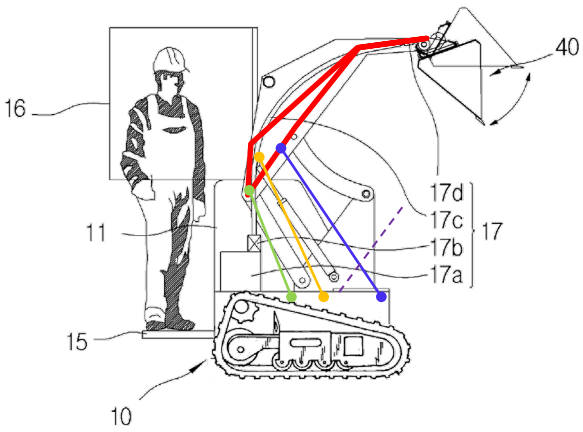
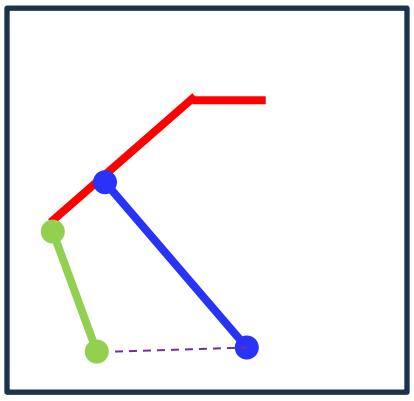


Figure A
(annotated)
with lowered pivot points



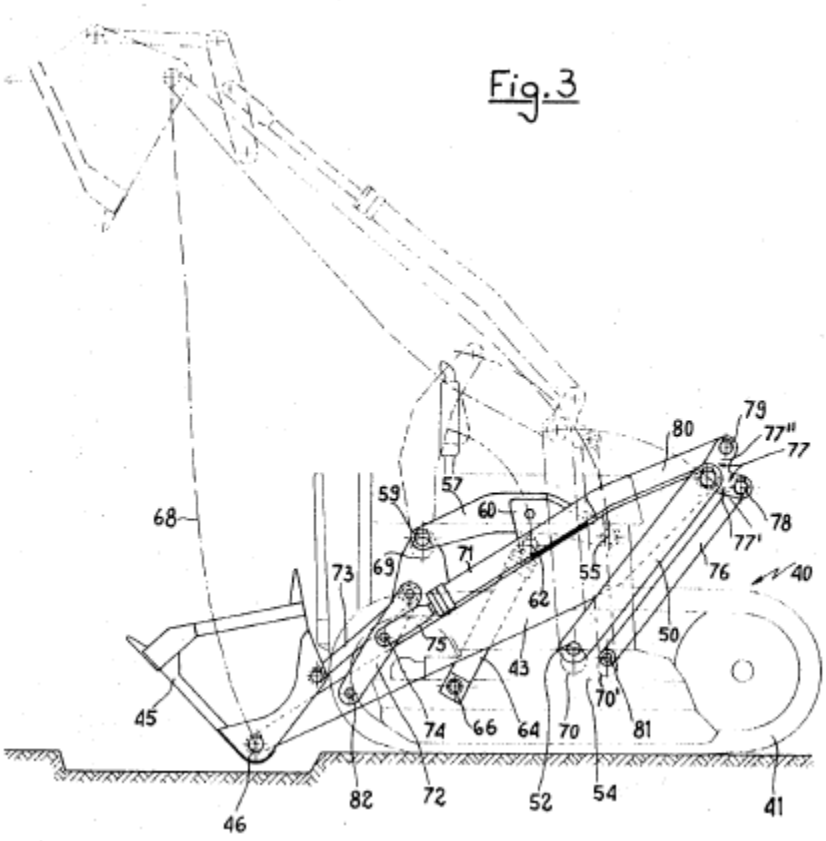
Four-bar mechanism

189. 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.

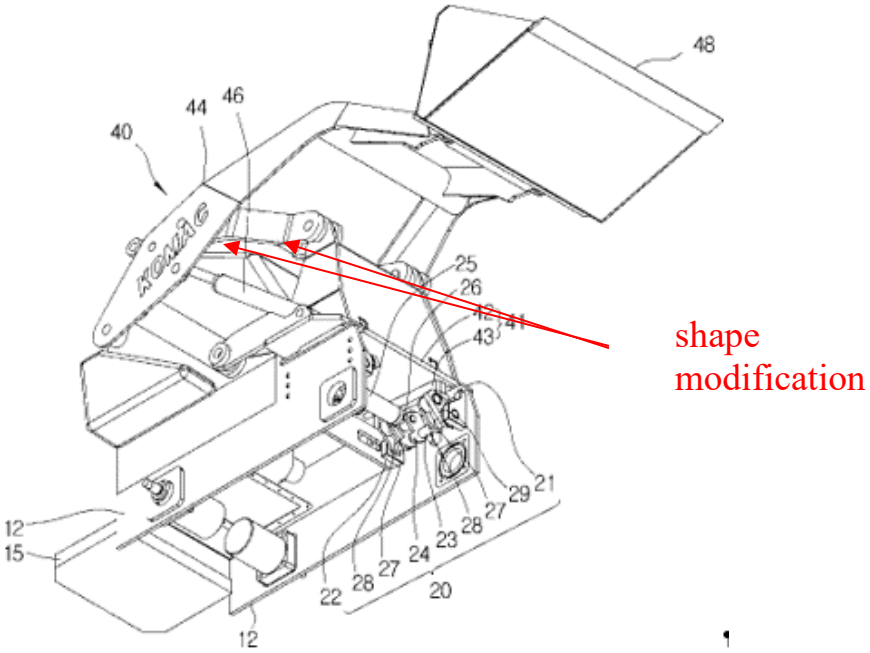
190. EX1021 also illustrates a four bar mechanism on a skid steer and shows this is a predictable, beneficial arrangement: "the front links 22, the rear links 21 and the lift cylinders 23 mounted to the frame 2 at the substantially same level. Since the links 21, 22 and the lift cylinders 23 are thus 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 (EX1004). 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].

191. Further, configuring D2 and D4 to be less than 1.75 and less than 1.5 D5 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.

192. 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.

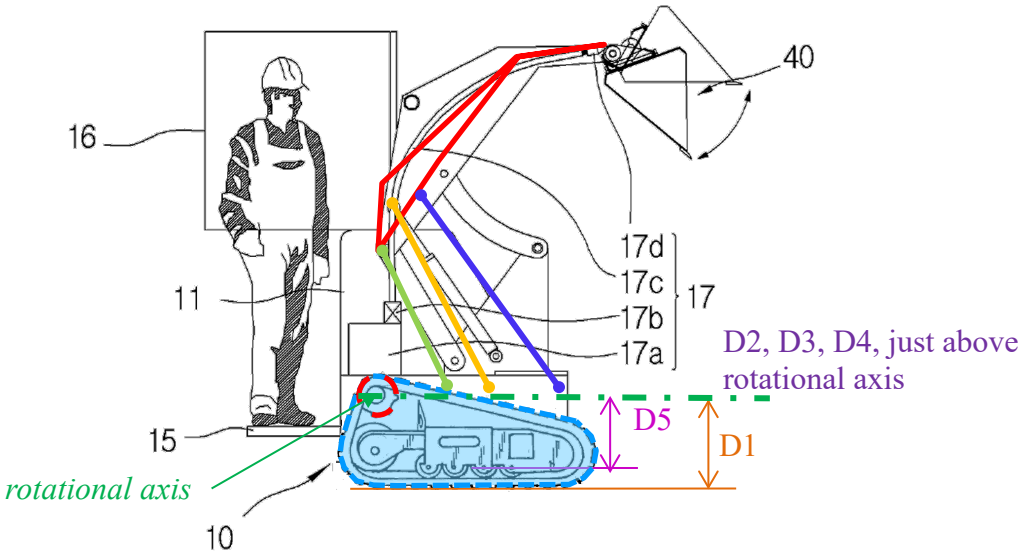


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly
and lowered pivot points

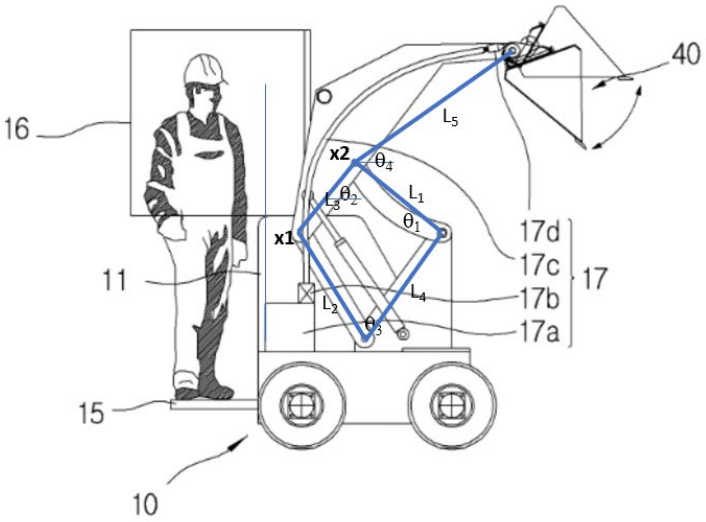
193. To further illustrate this straight-forward concept of lowering the pivot point connection of the KR996 mechanism, Appendix A (EX1004) of this declaration illustrates [1] a kinematic simulation of KR996 as drawn in the reference itself, and [2] a kinematic simulation of KR996 modified with the forward-most

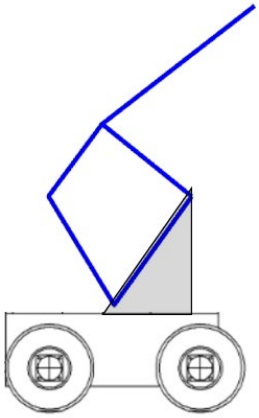
pivot point lowered. The simulations show the predictable result of loader movement.

194. 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 Θ1, Θ2, Θ3, Θ4). 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.

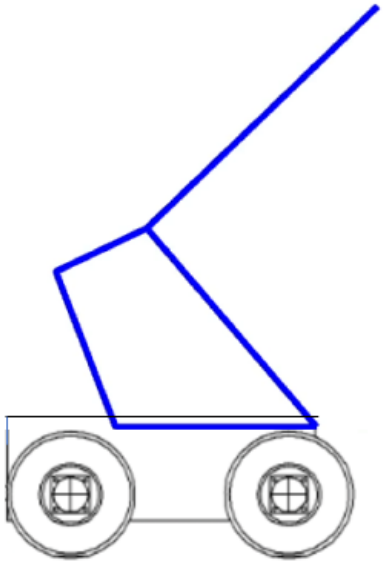
195. In a first kinematic simulation, the operation of the KR996 vehicle with pivot points as drawn in the reference is shown. I provide a snapshot of this simulation below. The simulation shows, by kinematic diagram, the linkage and loader arm movement from a low position to a raised position.





196. 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.



197. 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.

198. 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 performance. 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.

199. 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).

7. Claim 56

[56] ***The compact tool carrier as set forth in claim 55 wherein D2 and D4 are each less than 0.75 D1.***

200. Claim 55 is taught by KR996, JP705, Bares and Beltrami, and these recited dimensions would have also been obvious to implement.

201. See claim 55 including my discussion recognizing a POSITA would have knowledge and reason to minimize the distances between the pivot point attachments and the axis - D2 and D4 - including to provide a low center of gravity and minimize materials and expenses for forming a frame. The '386 Patent provides no surprising or unexpected result for any specific relationship, e.g., less than 1 times

D1 as in claim 55, less than 0.75 D1 here. *See* element [55.5b], '386 Patent (EX1001), 5:20-31. Further, as I noted above, a POSITA would have had reason to increase D5 to provide for additional frame structure to distribute the stress of supporting the loader arm, drive mechanism, and other attachments.

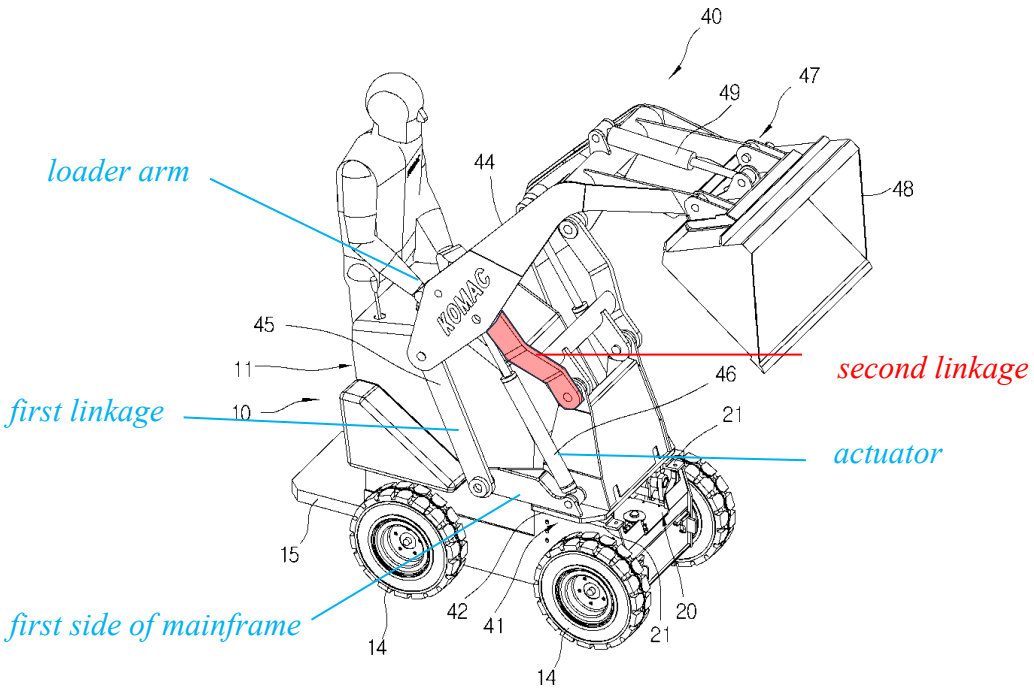
202. Thus, for the same reasons as discussed above with reference to element [55.5b], it would have been obvious to position D2 and D4 each less than 0.75 D1 and claim 56 is obvious over KR996, JP705, Bares, and Beltrami.

8. Claim 57

[57] ***The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, the rotational axis and the pivot point at which the second linkage is attached to the mainframe being separated by a vertical distance D3, D3 being less than 1.5 times D1.***

203. Claim 55 is taught by KR996, JP705, Bares, and Beltrami, and these recited dimensions would have also been obvious to implement.

204. In claim [55], KR996 illustrates the link 45 discussed in [55.3] is *a first linkage*, and the vehicle further includes a second link (unlabeled) pivotally attached to the first side of the mainframe at a pivot point and the loader providing *a second linkage*. This second link (*second linkage*) is spaced a vertical distance (D3) from the rotational axis. FIG. 9 is illustrative of the second linkage.



EX1005, Fig. 9
(annotated)

205. For substantially the same reasons as discussed above in element [55.5b], a POSITA would have had reason to provide the pivot point attachment of the second linkage to the mainframe a vertical distance from the axis *D3 less than 1.5 times D1* to provide the attachment low on the vehicle. As I discuss, this provides benefits including a low center of gravity, decreased need for frame materials and cost, and/or operator sight-line improvement. I also note that Beltrami suggests not needing to provide a supporting frame, which a POSITA would understand to be the portion of mainframe of KR996 that extends vertically (3:35-42). A POSITA would readily arrange components such as discussed above beginning at paragraph 189.

206. Again, as shown above and in Appendix A, the same functionality of

the four-bar mechanism of KR996 can be provided implementing Beltrami's teachings of a low pivot point attachment of the second linkage. The second linkage is illustrated by the blue link in the schematic diagram of KR996's Fig. 21 and Bares' track assembly as shown below:

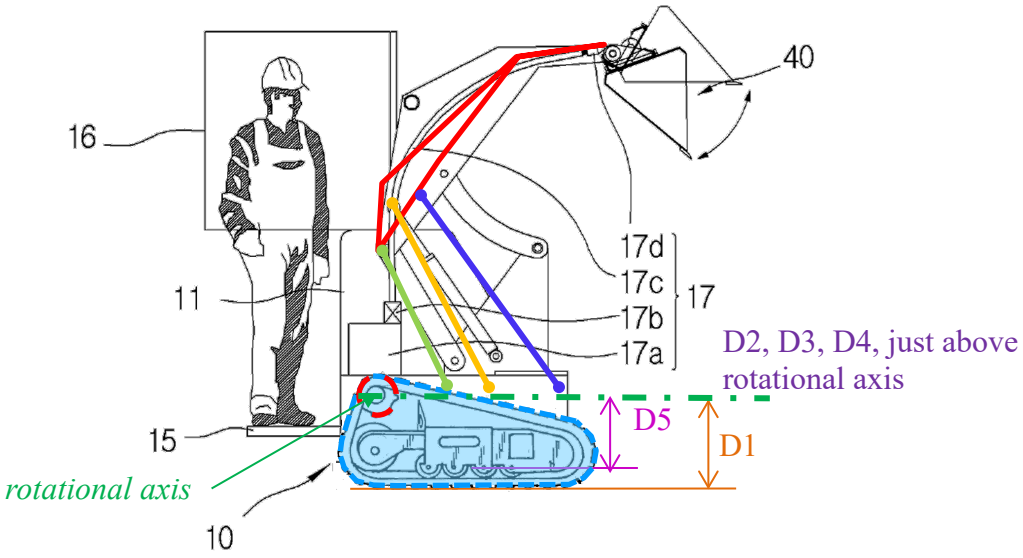


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly
and lowered pivot points

207. Thus, for the same reasons as discussed above with reference to element [55.5b], it would have been obvious to position D3 less than 0.75 D1 and claim 57 is obvious over KR996, JP705, Bares, and Beltrami.

9. Claims 58-59

[58, [59]] ***The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than [0.75] D1.***

208. Claim 55 is taught by KR996, JP705 and Beltrami, and this additionally recited linkage is taught by KR996 and the dimensions would have been obvious to implement.

209. As illustrated in claims [55], [57], KR996 illustrates the link 45 discussed in element [55.3] is *a first linkage*, and the vehicle further includes a second link (unlabeled) (*a second linkage*) pivotally attached to the first side of the mainframe and the loader. KR996, Figs. 8-9.

The mainframe in KR996 comprises a *forward-most pivot point* of the recited points in the attachment of the link (unlabeled) (*second linkage*) and the mainframe. KR996 (EX1005), Figs. 8, 9. For substantially the same reasons as discussed above in element [55.5b], a POSITA would have had the knowledge and reason to provide the pivot point attachment of the link (*second linkage*) *less than 1 times D1* in the context of claim 58 (or *less than 0.75 D1* in the context of claim 59) to position the attachment low on the vehicle. As I discuss, this provides benefits including a low

center of gravity, decreased need for frame materials and cost, and/or operator sight-line improvement. I also note that Beltrami suggests not needing to provide a supporting frame, which a POSITA would understand to be the portion of the mainframe of KR996 that extends vertically (3:35-42).

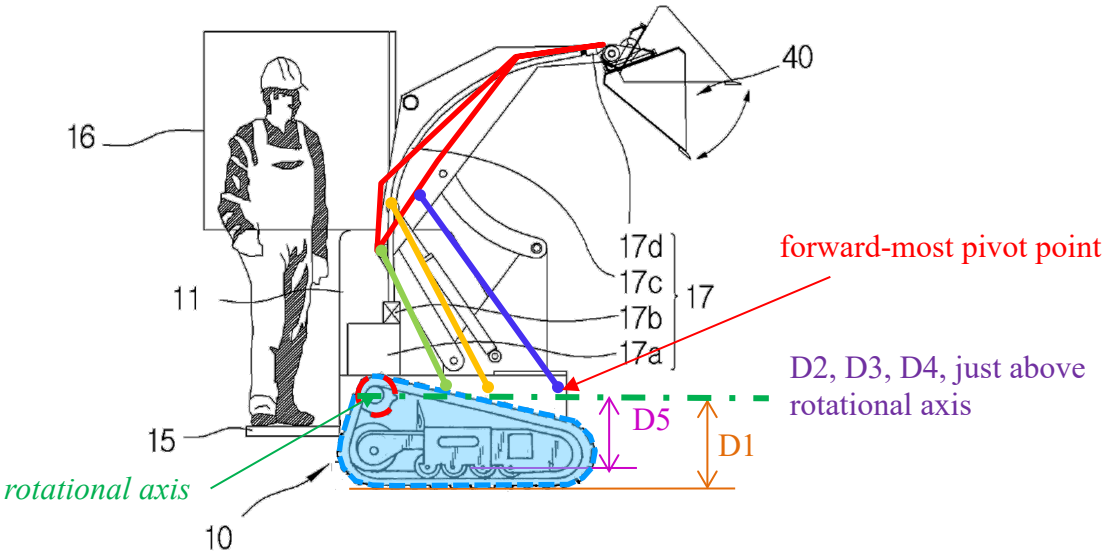


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly
and lowered pivot points

210. Thus, claims 58-59 are rendered obvious by KR996, JP705, Bares, and Beltrami.

10. Claim 60

[60] ***The compact tool carrier as set forth in claim 55 wherein the linkage is a first linkage, the compact tool carrier further comprising a second linkage pivotally attached to the first side of the mainframe at a pivot point and pivotally***

attached to the loader, wherein the mainframe comprises a forward-most pivot point with (1) the pivot point at which the first linkage is attached to the mainframe, (2) the pivot point at which the actuator is attached to the mainframe, or (3) the pivot point at which the second linkage is attached to the mainframe being the forward-most pivot point, a vertical distance between the rotational axis and the forward-most pivot point being less than 0.75 D5.

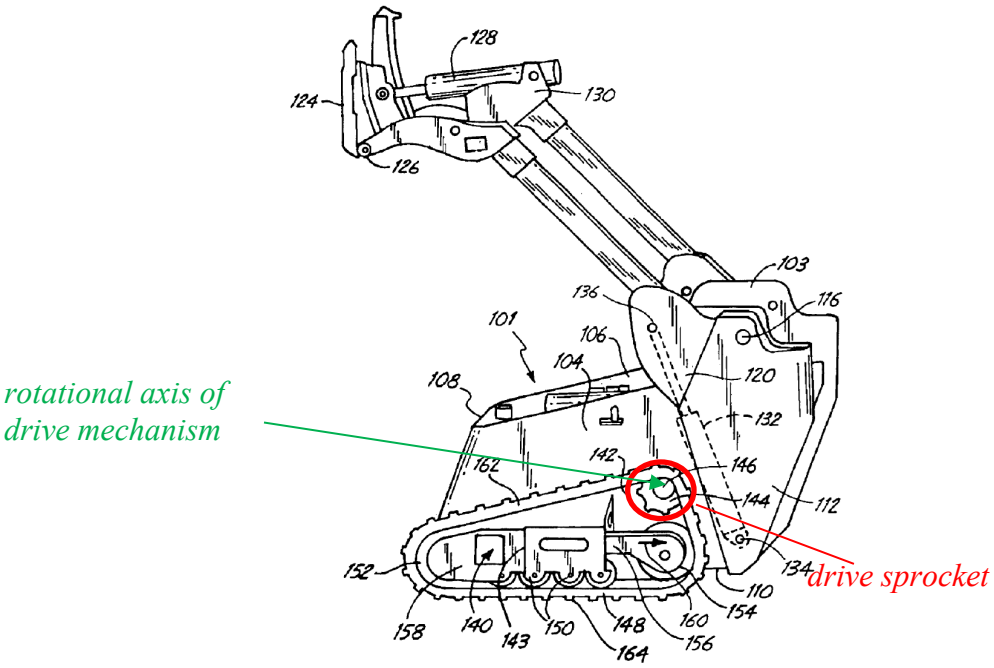
211. Claim 55 is rendered obvious by KR996-JP705-Bares and Beltrami and KR996 illustrates link 45 of [55.3] is *a first linkage* and further includes another link (*second linkage*) *pivotally attached to the first side of the mainframe* and boom 44 (arm of *loader*) as shown in [57]. This second linkage provides a *forward-most pivot point*. EX1005, Figs. 8-9. For substantially the same reasons as discussed above in [55.5b] and [57], POSITA would have had the knowledge and found benefit in configuring the attachment of the *second linkage less than 0.75 D5* to position the attachment low on the vehicle to provide a low center of gravity and minimize materials and expenses for forming a frame. I discuss above, a benefit of increasing D5 (e.g., paragraph 162), removal of the frame (e.g., paragraph 186) and the ability of a POSITA to suitably arrange components (e.g., paragraph 189-191).

11. Claim 61

[61] ***The compact tool carrier as set forth in claim 55 wherein the drive mechanism comprises a drive sprocket, the drive sprocket rotating about the rotational axis.***

212. Claim 55 is rendered obvious by Bares' track assembly combined with the vehicle of KR996-JP705 as discussed above; Bares' track assembly includes drive sprocket 144 (*drive sprocket*) driven by a motor 146 shaft. EX1010, 5:25-30,

FIGS. 6-8.



EX1010, FIG. 8
(annotated)

213. The drive sprocket 144 (*drive sprocket*) *rotat[es] about the rotational axis* just as in the '386 Patent. EX1001, 3:26-28.

214. Thus, claim 61 is rendered obvious by KR996, JP705, Bares and Beltrami.

12. Claim 62

[62] ***The compact tool carrier as set forth in claim 55 further comprising an operator platform for standing operation of the operator controls of the control station.***

215. Claim 55 is rendered obvious as discussed above and KR996 also discloses safety step 15 (*operator platform*) as discussed in [50.7] for *standing*

operation of the *operator controls* of the control unit 13 (*control station*). EX1005, [0033], Figs. 8-9, [0049]. Thus, claim 62 is rendered obvious by KR996, JP705, Bares and Beltrami.

13. Claim 63

[63] ***The compact tool carrier as set forth in claim 55 wherein the mainframe incorporates a single weldment.***

216. Claim 55 is rendered obvious and it would have been obvious for the mainframe of KR996-JP705 to *incorporate[] a single* weldment as discussed in [52]. Thus, claim 63 is rendered obvious by KR996-JP705-Bares and Beltrami.

14. Claim 68

[68] ***The compact tool carrier as set forth in claim 55 wherein the drive mechanism further comprises a drive sprocket, the drive sprocket rotating about the rotational axis, and the pivot point at which the actuator is attached to the first side of the mainframe being above the rotational axis.***

217. Claim 55 is obvious as discussed above including Bares' drive mechanism in combination with the KR996 vehicle; Bares' track assembly includes drive sprocket 144 (*drive sprocket*) *rotating about the rotational axis* as discussed in [61]. EX1010, 5:25-30. The *pivot point at which the* boom cylinder 46 (*actuator*) *is attached to the first side of the mainframe* is *above the rotational axis*. KR996 illustrates the boom cylinder 46 is attached above the rotational axis of the wheeled assembly. And this configuration would continue in providing Bares' track assembly as the drive mechanism.

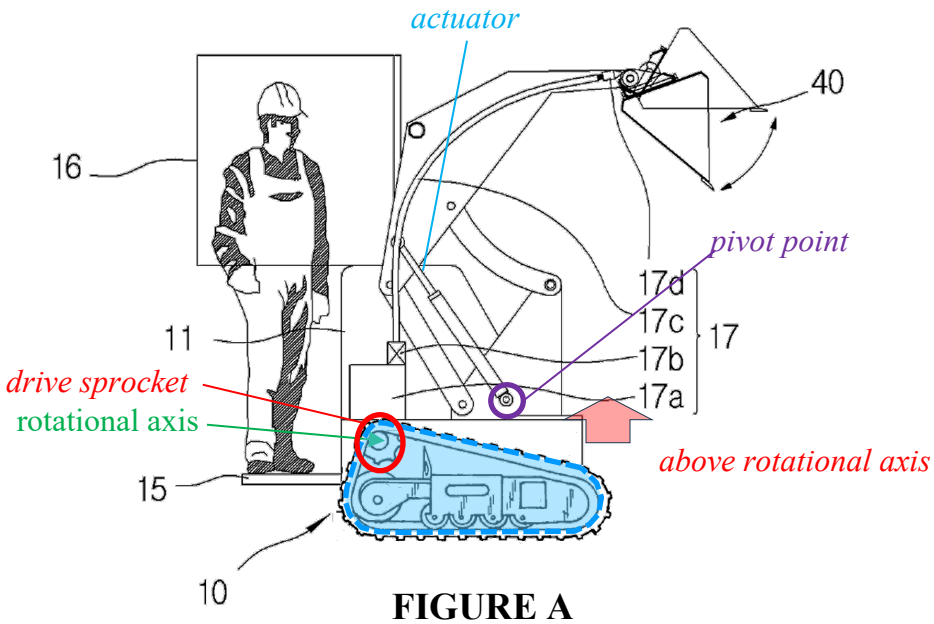


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

218. In the low pivot points, the pivot point between the actuator and the mainframe remains above the rotational axis. See [55.5b] 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].

219. Thus, claim 68 is rendered obvious by KR996, JP705, Bares and Beltrami.

15. Claim 69

[69] ***The compact tool carrier as set forth in claim 55 wherein the pivot point at which the linkage is attached to the first side of the mainframe is above the tracks or wheels.***

220. Claim 55 is rendered obvious as discussed above and also provides the pivot point at which link 45 (*linkage*) is attached to the *first side of the mainframe is above the rotational axis*. This is illustrated in KR996 and would continue in providing Bares' track assembly to KR996.

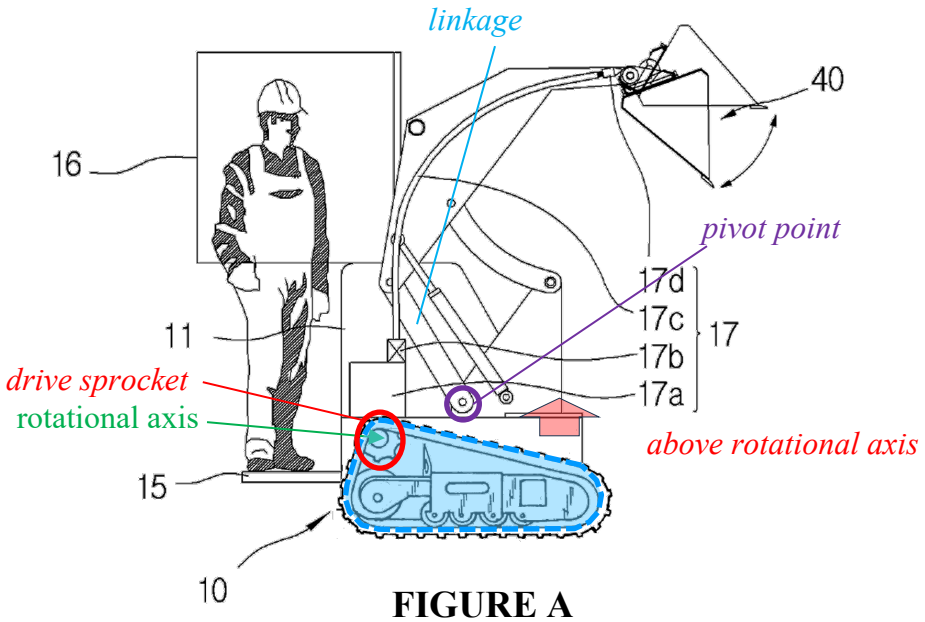


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

221. When lowering the pivot points as discussed above in claim [55], the pivot point remains above the rotational axis. A POSITA would understand that this

configuration is maintained in implementing the teachings of lowering the pivot point attachments as discussed 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].

222. Thus, claim 69 is rendered obvious by KR996, JP705, Bares, and Beltrami.

16. Claim 80

223. Claim 80 includes many of the same limitations as claim 50 in Ground 1 that are taught by KR996 in combination with JP705's engine bracket, and further includes limitations discussed in [55] including a drive mechanism including tracks, taught by Bares, and pivot point configurations, which would have been obvious to provide low including as taught by Beltrami; the following cross-reference table is illustrative.

		See the analysis for:
[80.0]	*A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:*	[50.0]

		See the analysis for:
[80.1]	*a loader having an arm, the loader being adapted to carry a tool;*	[50.1] including loader unit 40 (*loader*) and the boom 44 (*arm*) carrying bucket 48 (*tool*)
[80.2a]	*a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis,*	[50.2a]
[80.2b]	*the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe,*	[50.2b] including JP705's mounting part 7 (*engine bracket*) obvious to combine with KR996's mainframe for the reasons above
[80.2c]	*each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader,*	[55.2c] including pivot points of link 45 and boom cylinder 46 and the KR996 frame
[80.2d]	*the loader arm not being directly attached to the mainframe;*	[50.2c]
[80.3]	*a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.3] including KR996's link 45 (*linkage*) *pivotally attached to the first*

		See the analysis for:
		side of the KR996 *mainframe* and *pivotally attached* to the boom 44 (*loader arm*)
[80.4]	*an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.5] including KR996's boom cylinder 46 (*actuator*) *pivotally attached to the first side* of the KR996 *mainframe* and *pivotally attached* to the boom 44 (*loader arm*)
[80.5a]	*a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5,*	[55.5a] including Bares' track assembly (*drive mechanism*) having tracks 148 (*tracks*) and drive sprocket 144 providing a *rotational axis* that would have been obvious to combine with KR996 for the reasons above

		See the analysis for:
[80.5b]	*the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the linkage is attached to the mainframe being disposed above the tracks; and*	[55.5b] including to the extent KR996 does not plainly illustrate D2 and D4 being less than 2.0 D5 (e.g., Fig. 9), it would have been obvious to position these points low on the mainframe in light of Beltrami's teachings. Link 45 (*linkage*) is attached to the mainframe at a pivot point above the track (see [69])
[80.6]	*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 and adapted to allow for standing or walk-behind operation.*	[50.6] including control unit 13 (*control station*)

224. Thus, claim 80 is rendered obvious by KR996 in view of JP705 (engine bracket), Bares (track assembly), and Beltrami's teachings of lowering pivot points.

17. Claim 81

[81] ***The compact tool carrier as set forth in claim 80 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.***

225. Claim 80 is rendered obvious as discussed above and KR996 also provides safety step 15 (*operator platform*) on which an operator stands (*for standing operation*) that *extend[s] from the mainframe*. KR996 (EX1005), Figs. 7-9, 21, claim 18, [0033], [0042], [0049]. Bares similarly describes a step at the rear of a compact loader on which the operator stands during operation, "platform 170." EX1010, 5:55-57, FIG. 7. Bares illustrates a portion of a *mainframe*–side plates 104, 106–extends such that platform 170 is at least partially within a pocket defined by the extension of the frame and thus, is *forward of the rear of the mainframe*. FIG. 7 of Bares is illustrative:

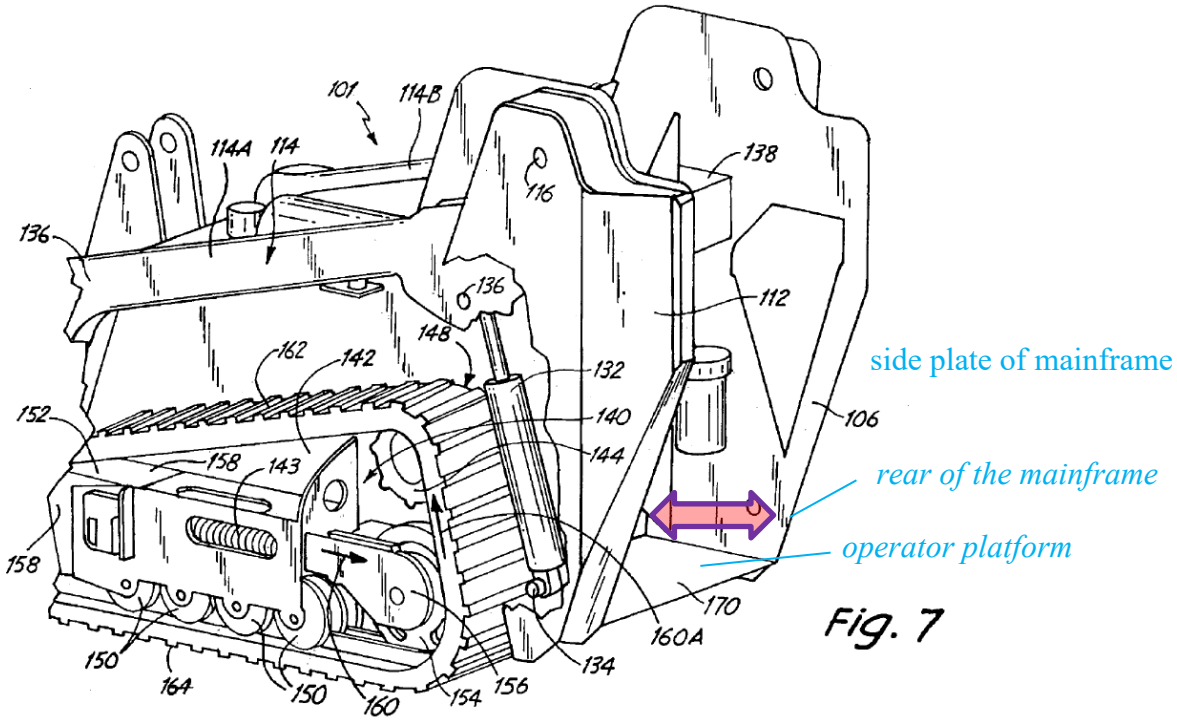


Fig. 7

EX1010, FIG. 7
(annotated)

226. Extending the mainframe as taught by Bares to KR996-JP705's frame provides *least a portion of the* step 15 (*operator platform*) *is forward of the rear end of the mainframe* as the mainframe extension forms a pocket providing a barrier of protection for the operator when on safety step 15.

227. Extending the mainframe as taught by Bares to KR996-JP705's frame provides *least a portion of the* step 15 (*operator platform*) *is forward of the rear end of the mainframe* as the mainframe extension forms a pocket providing a barrier of protection for the operator when on safety step 15. Extension of a frame of a carrier adjacent to an operator platform was a well-known configuration, easy to implement. See, e.g., McIlwraith (EX1007) FIGs. 2, 3; McIlwraith illustrates a

portion of its mainframe – side plates 11, 12 – extend such that the tread plate 14 is at least partially within a pocket defined by the extension of the frame and thus, is *forward of the rear of the mainframe*.

228. POSITA would have been motivated, and found it easy, to combine the extended frame of Bares with KR996-JP705 to produce a predictable and beneficial configuration of a barrier adjacent the operator's environment on the safety step. POSITA would have recognized a benefit in Bares' configuration as it provides operator protection suggested by industry standards. For example, ISO 3457 (EX1017) standard is directed to guards for earth-moving machinery such as KR996 and Bares. ISO 3457 would have suggested to a POSITA to provide Bares' extension of the mainframe to provide a barrier between the KR996's operator and drive mechanism or loader, as should a hazard exist, a "guard that restricts the movement of a person's body or a part of it, in order to avoid its contact with a machine component or exposure to other, similar hazards" is desired. ISO 3457 (EX1017), p. 1. By providing the extension of the frame of Bares to that of KR996, a barrier is provided between an operator and the equipment (e.g., drive mechanism and/or loader) avoiding contact with the drive mechanism/loader and/or debris generated. POSITA would have had a reasonable expectation of success in implementing the configuration as it merely extends a portion of the existing frame adjacent the safety step 15 of KR996 adjacent the operator.

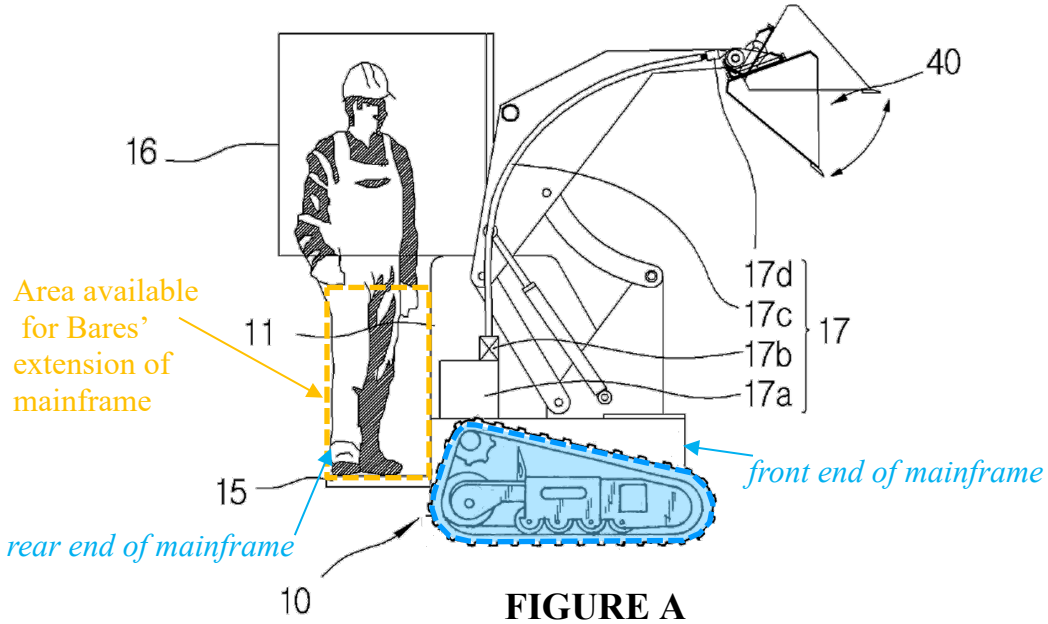


FIGURE A
KR996's Fig. 21 (annotated)
and modified with Bares' FIG. 8 track assembly

229. Thus, KR996, JP705, Bares, and Beltrami renders obvious claim 81.

18. Claim 82

[82] ***The compact tool carrier as set forth in claim 81 wherein the mainframe incorporates a single weldment.***

230. Claim 81 is rendered obvious and it would have been obvious to provide the mainframe of KR996-JP705 *incorporat[ing] a single weldment* for the reasons discussed in [52]. Thus, claim 82 is rendered obvious by KR996, JP705, Bares, in view of Beltrami.

19. Claim 83

231. Claim 83 includes many of the same limitations as claim 50 in Ground 1 that are taught by KR996 in combination with the engine bracket of JP705, and further includes limitations of a drive mechanism including tracks, taught by Bares as shown in [55], and pivot point configurations, which would have been obvious to provide low by Beltrami as also discussed in [55]; the following table of cross-references is illustrative.

		See the analysis for:
[83.0]	*A compact tool carrier configured for standing or walk-behind operator control and having a longitudinal axis and a mass of less than about 1500 kg, the compact tool carrier comprising:*	[50.0]
[83.1]	*a loader having an arm, the loader being adapted to carry a tool;*	[50.1] including loader unit 40 (*loader*) having boom 44 (*arm*) carrying bucket 48 (*tool*)
[83.2a]	*a mainframe for supporting the loader, the mainframe having a first side and a second side, and having a front end and a rear end relative to the longitudinal axis,*	[50.2a]

		See the analysis for:
[83.2b]	*the mainframe comprising an engine bracket that extends from the first side toward the second side for mounting an engine to the mainframe, the engine bracket being spaced from the rear end of the mainframe,*	[50.2b] including JP705's mounting part 7 (*engine bracket*) obvious to combine with KR996's mainframe for the reasons above
[83.2c]	*each side having a top and a bottom, the first side of the mainframe having at least two pivot points relative to the loader,*	[55.2c] including pivot points of boom cylinder 48 and link 45
[83.2d]	*the loader arm not being directly attached to the mainframe;*	[50.2c]
[83.3]	*a linkage pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.3] including KR996's link 45 (*linkage*)
[83.4]	*an actuator pivotally attached to the first side of the mainframe and pivotally attached to the loader arm;*	[50.5] including KR996's boom cylinder 46 (*actuator*)
[83.5a]	*a drive mechanism comprising tracks for propelling the compact tool carrier over a supporting surface, the drive mechanism having a rotational axis, the compact tool carrier having a bottom at which the drive mechanism contacts the supporting surface, the*	[55.5a] including Bares' track assembly (*drive mechanism*) including track 148 (*tracks*) obvious to combine with KR996's vehicle for the reasons above

		See the analysis for:
	rotational axis and bottom of the compact tool carrier being separated by a vertical distance D1, the rotational axis and the bottom of the first side of the mainframe being separated by a vertical distance D5,	
[83.5]	*the rotational axis and the pivot point at which the linkage is attached to the mainframe being separated by a vertical distance D2, the rotational axis and the pivot point at which the actuator is attached to the mainframe being separated by a vertical distance D4, both D2 and D4 being less than 2.0 D5, the pivot point at which the actuator is attached to the mainframe being above the rotational axis; and*	[55.5b] including to the extent KR996 does not plainly illustrate D2 and D4 being less than 2.0 D5 it would have been obvious to position these points low on the mainframe in light of Beltrami's teachings for the same reasons as discussed in [55.5b]. The boom cylinder 46 (*actuator*) is attached to the mainframe at a pivot point above the rotational axis (see [68])
[83.6]	*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*	[50.6] including control unit 13 (*control station*)

		See the analysis for:
	carrier and adapted to allow for standing or walk-behind operation.	

232. Thus, claim 83 is rendered obvious by KR996 in view of JP705 (*engine bracket*), Bares (track assembly comprising *tracks*), and Beltrami's suggestion of low pivot points.

20. Claim 84

[84] ***The compact tool carrier as set forth in claim 83 further comprising an operator platform for standing operation of the operator controls of the control station, the operator platform extending from the mainframe, at least a portion of the operator platform being forward of the rear end of the mainframe.***

233. Claim 83 is rendered obvious by KR996-JP705-Bares and Beltrami and KR996 also provides a safety step 15 (*operator platform*) *for standing operation of the operator controls* of the control unit 13 (*control station*), which *extend[s] from the mainframe*. KR996 (EX1005), Figs. 7-9, 21, claim 18, [0033], [0042], [0049]. Bares teaches extending the mainframe such *that at least a portion of the* step 15 (*operator platform*) is *forward of the rear end of the mainframe* as suggested by Bares and discussed in [81]. Thus, claim 84 is rendered obvious by KR996, JP705, Bares, and Beltrami.

21. Claim 85

[85] ***The compact tool carrier as set forth in claim 83 wherein the mainframe incorporates a single weldment.***

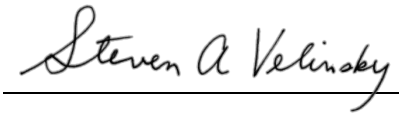
234. Claim 83 is rendered obvious as discussed above and it would have been obvious for the mainframe of KR996-JP705 to *incorporate[] a single weldment* as illustrated in [52]. Thus, claim 63 is rendered obvious by KR996, JP705, Bares, and Beltrami.

235. Thus, claim 85 is rendered obvious by KR996, JP705, and Beltrami.

XI. CONCLUSION

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

Date: 11/13/24



Steven Alan Velinsky