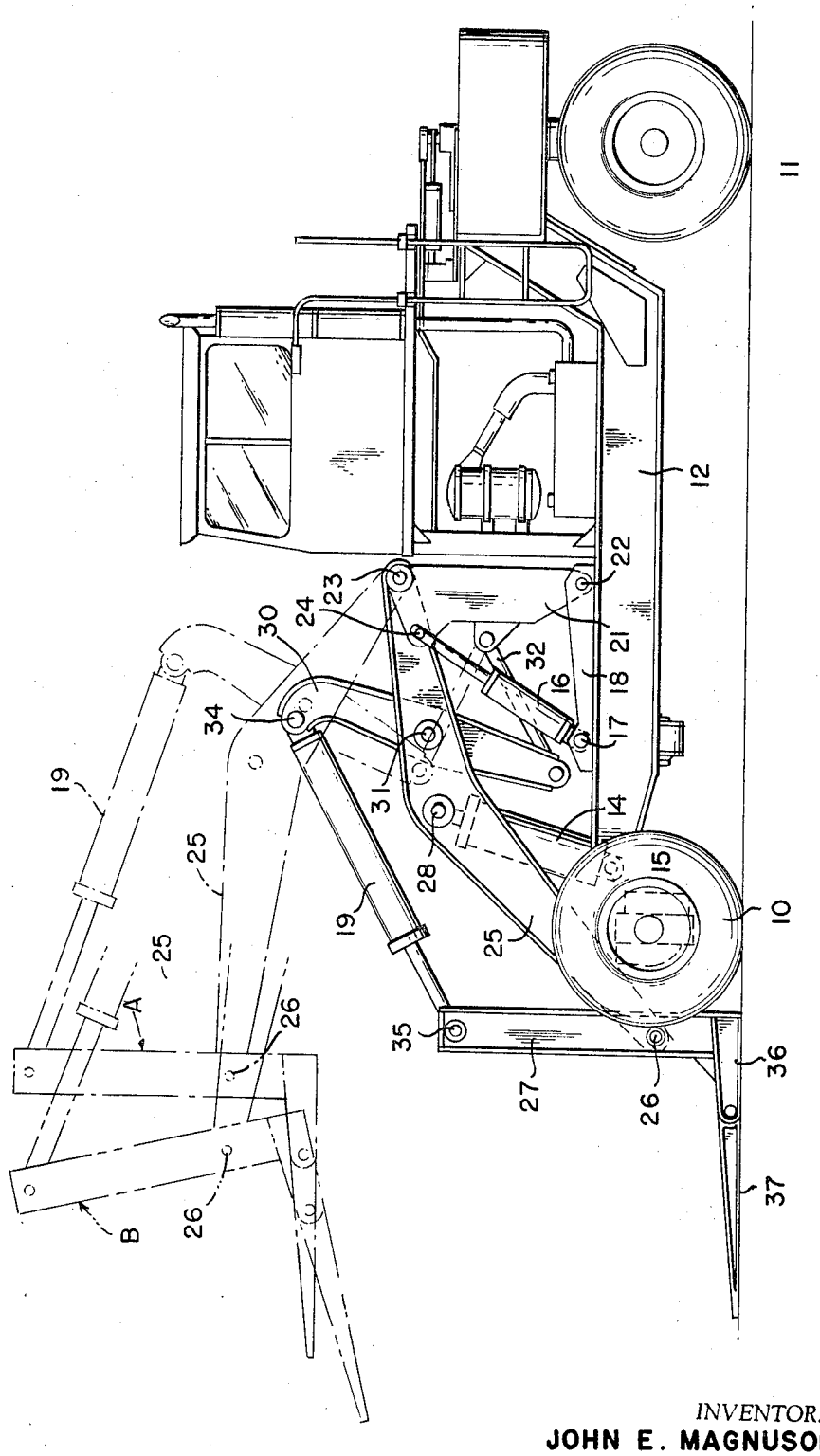
July 7, 1970 J. E. MAGNUSON 3,519,156

FRONT-END LOADER WITH AUTOMATIC TILT

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FIG. 1

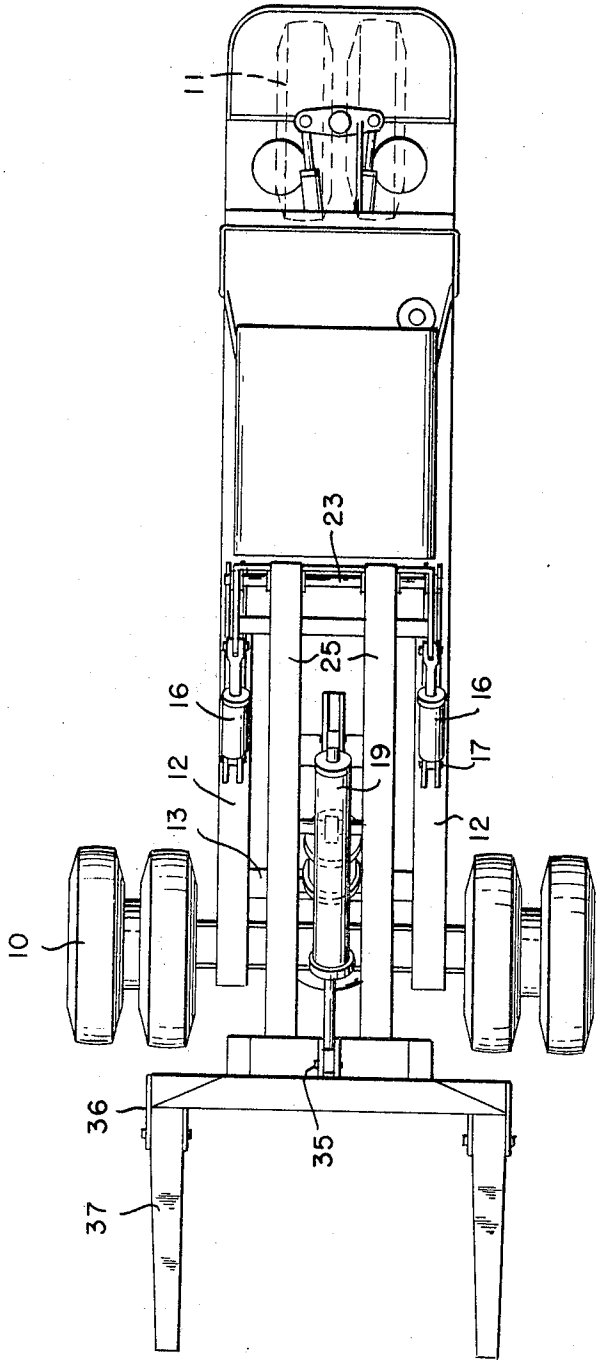


INVENTOR.
JOHN E. MAGNUSON
BY Seed, Berry & Dowrey
ATTORNEYS

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FIG—2

INVENTOR.
JOHN E. MAGNUSON
BY Seed Berry & Downey
ATTORNEYS

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FRONT-END LOADER WITH AUTOMATIC TILT

John E. Magnuson, Seattle, Wash., assignor to Pacific Car and Foundry Company, Renton, Wash., a corporation of Washington

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Int. Cl. B66f 9/12
U.S. Cl. 214—777 5 Claims

ABSTRACT OF THE DISCLOSURE

A reaching type of front-end loader characterized in that the load-handling head automatically tilts forwardly to dump a load by the act of giving reach movement to the boom which carries the head.

This invention relates to a material-handling vehicle, and particularly a vehicle of the general type illustrated and described in my U.S. Pat. No. 3,352,442, issued Nov. 14, 1967.

As with said issued patent, the material-handling mechanism of the present invention provides a boom to which a walking-beam is fulcrumed at approximately the boom's mid-length. The boom swings vertically about a root pivot located at the upper end of a mounting leg, and at its outer end connects pivotally with the lower end of a load-carrying head. Links, one of which is extensible, connect the upper end of the walking-beam to the upper end of the head, and the lower end of the walking-beam to the mounting leg. In the present invention the mounting leg is pivoted for fore-and-aft swing movement to the vehicle frame whereas in said patented structure, the leg is made rigid with the frame. The purpose is to give the boom a reach capability. This, however, is not novel in a generic sense. U.S. Pat. No. 3,024,933 has a swingable mounting leg in an assembly including the boom, walking-beam, head, and links.

An important characteristic in the mechanism of the present invention concerns the geometry of the mounting leg and that of the four-sided figure which includes as two of its sides a portion of such leg and the link connecting such leg with the walking-beam, the relationship being such that as the boom partakes of a reach action by forward swing of the mounting leg there is automatically imparted to the load-carrying head a forward tilting action.

The structure of the present invention is further characterized in that a hydraulic jack functional to raise and lower the boom is more strategically placed than has heretofore been the case.

In the accompanying drawings:

FIG. 1 is a side elevational view illustrating a material-handling vehicle constructed to embody preferred teachings of the present invention.

FIG. 2 is a top plan view thereof.

As with my above-identified patent, the material-handling structure of the present invention is shown as employing, for its mobile mounting a vehicle having widely spaced traction wheels **10** at one end of a main frame and a swivel-mounted pair of closely adjacent steering wheels **11** at the other end. For purposes of description the traction end of the vehicle will be hereinafter termed the front end. The main frame has a longitudinal principal **12** at each of the two sides, and includes the usual cross members.

Only one of the cross-members is shown in the drawing. Denoted by **13**, such cross-member lies immediately to the rear of the live front axle. An upright hydraulic jack **14** foots upon the cross-member, pivoting at **15** for swing movement on the longitudinal median line of the vehicle.

The material-handling structure relies for its operation upon four double-acting hydraulic jacks, each of which pivots about a transverse horizontal axis, and namely the jack **14**, a pair of jacks **16** which act in concert, and a jack **19**. The jacks **16** overlie the frame principals and pivot at **17** from the front end of a respective one of two brackets **18** bolted or otherwise fixedly secured to the frame. Jack **19**, like the jack **14**, occupies the longitudinal median line of the vehicle.

The pivots **17** occupy a transverse vertical plane spaced well to the rear of the pivot **15**. The jacks **16** control the fore-and-aft swing movement of an upright mounting leg **21** which spans the width of the vehicle frame and is pivoted at **22** to the rear ends of the brackets **18**. A boom pivots at **23** to the upper end of the mounting leg and is given reach action by the swing movements of the leg. In the rearmost position of the leg the pivot point **23** occupies a perpendicular raised from the pivot point **22**. The pivot connections **24** between the outer ends of the jacks **16** and the mounting leg **21** lie somewhat to the front of the boom pivot **23** and are spaced from the pivot axis **22** a distance very nearly the same as the swing radius of the boom's root end. This distance also closely approximates the spacing between the pivot points **17** and **22**. The importance of the vehicle's geometry will be apparent as the description proceeds.

The boom is a fabricated structure comprised of two beams **25** occupying paralleling spaced positions at opposite sides of the vehicle's longitudinal median line and rigidified by cross-members at or adjacent each of the two ends. The outer end of the boom connects pivotally, as at **26**, with the standard portion **27** of a material-handling head, the connection being located adjacent the lower end of the standard. The outer end of the hydraulic jack **14** connects at **28** with the boom at approximately the mid-length of the latter.

Between the jack connection **28** and the root pivot **23** of the boom a walking-beam **30** is fulcrumed at **31** to the boom for rocker movement about a transverse horizontal axis. The lower end of the walking-beam connects by a fixed-length link **32** with the mounting leg. The jack **19** links the upper end of the walking-beam to the upper end of the head standard **27**, connecting at **34** with the walking-beam and at **35** with the standard.

The material-handling head has a forked load-carrying deck extending forwardly from the bottom end of the standard. The rear portions **36** of the forks are made rigid with the standard. Front portions **37** are pivoted in a manner permitting the same to tilt upwardly while being precluded from tilting downwardly beyond a normal position co-planar with the fixed portion of the deck.

When the head has received a load it is elevated to a level represented, say, by the broken-line position A shown in FIG. 1, incident to transporting said load to a point of deposit. Reaching destination, the load is deposited by tilting the head. The aforementioned significance of the vehicle's geometry is that this tilting is made to occur automatically simply by contracting the "reaching" jacks which perforce gives to the boom the reaching action usually desired when a load is to be dumped. As such "reach" motion takes place the arm works toward the perpendicular occupied by the forwardly moving root pivot of the boom, responsively rocking the walking-beam in a counter-clockwise direction as viewed from the vantage point of FIG. 1 so that the upper end of the head standard moves forwardly in a greater degree than the reach travel of the boom. The elevating jack **14** is extended coincident with a contraction of the reaching jacks where it is desired to reach and tilt on the same level.

It is believed that the invention will have been clearly understood from the foregoing detailed description of my now-preferred illustrated embodiment. Changes in the details of construction may be resorted to without departing from the spirit of the invention and it is accordingly my intention that no limitations be implied and that the hereto annexed claims be given the broadest interpretation to which the employed language fairly admits.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In combination with a vehicle main frame, a mounting leg pivoted to the frame for fore-and-aft swing movement between an erect rear position and an inclined front position, a boom pivoted at its inner end to the upper end of the leg for vertical swing movement about a transverse horizontal axis through an arc extending more or less equal distances above and below the horizontal plane occupied by its swing axis, a load-handling head pivoted at its lower end to the outer end of the boom for vertical tilting movements, an upright walking-beam fulcrumed to the boom intermediate the ends thereof for rocker movements about an axis paralleling the boom's swing axis, two pivoted links one being extensible and connecting the upper end of the walking-beam to the upper end of the head and the other having a fixed length and connecting the lower end of the walking-beam to the mounting leg at the approximate mid-height of the latter, said extensible link comprising a double hydraulic jack, hydraulic jack means for raising and lowering the boom, and hydraulic jack means for swinging the mounting leg, the geometry of the mounting leg's pivot, the boom's root-end pivot, the walking-beam's rocker axis, and the two pivots of the fixed length link being such that the vehicle's load-handling head is tilted forwardly automatically by the act of swinging the leg to give a reach movement to the boom.

2. Structure as claimed in claim 1 in which the jack which raises and lowers the boom connects therewith at a point spaced forwardly from the rocker axis of the walking-beam and foots upon the frame at a point no further to the rear than a perpendicular dropped from said point of the boom connection when the boom is in retracted position.

3. Structure as claimed in claim 2 in which the distance between the boom's root-end pivot and the connection with the jack which raises and lowers the boom is less than the horizontal spacing between said jack's frame footing and the mounting leg's frame pivot.

4. Structure as claimed in claim 2 in which the boom is comprised of two rigidly connected paralleling beams spaced one from the other at opposite sides of the longitudinal median line of the vehicle, the jack means which raises and lowers the boom being secured to the main frame adjacent the forward end thereof.

5. Structure as claimed in claim 1 in which the mounting leg has a channel shape in horizontal section providing flanges at each of the two sides extending forwardly from a back plate which spans the width of the vehicle frame.

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HUGO O. SCHULZ, Primary Examiner

U.S. Cl. X.R.

214—770, 778