United States Patent [19]

Leihgeber

[11] **3,812,979**

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[54] **LIFT BOOM FOR A FRONT LOADER TRACTOR**

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[52] **U.S. Cl.** ..... **212/35 R,** 212/46 R

[51] **Int. Cl.** **B66c 23/54**

[58] **Field of Search** ..... 212/35 R, 4, 8 R, 7

[56] **References Cited**

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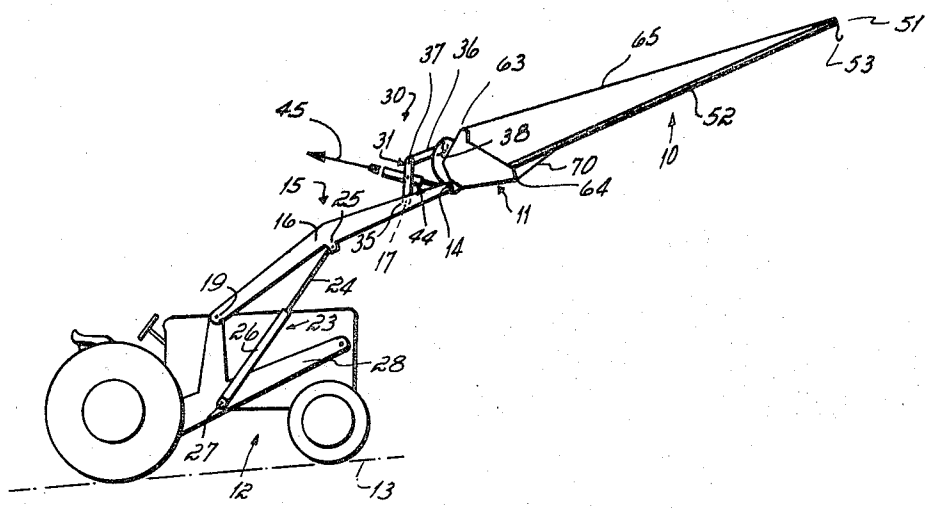
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Assistant Examiner—Hadd S. Lane
Attorney, Agent, or Firm—Wood, Herron & Evans

[57] **ABSTRACT**

The lift boom is of a generally T-shaped configuration, the stem of the T-boom being provided with a hook to which any suitable load may be attached. The head of the T-boom is seated within a front loader tractor's bucket in the floor/rear wall corner. An upper cable is attached at one end adjacent the hook end of the boom's stem, and is passed over the bucket's top edge and attached at the other end to the bucket. A lower cable is attached at one end to the boom's stem intermediate the ends thereof, and is passed beneath the bucket's floor and also attached at the other end to the bucket. The lower cable is provided with a turnbuckle assembly. The turnbuckle assembly is adjustable when the boom is seated in the bucket to provide a suitable tension on both the upper and the lower cables, thereby maintaining the T-boom in the initial assembled relation with the bucket no matter what the spatial orientation of the bucket (and, hence, the boom) as set by the tractor, and no matter what the load being carried by the boom.

8 Claims, 4 Drawing Figures



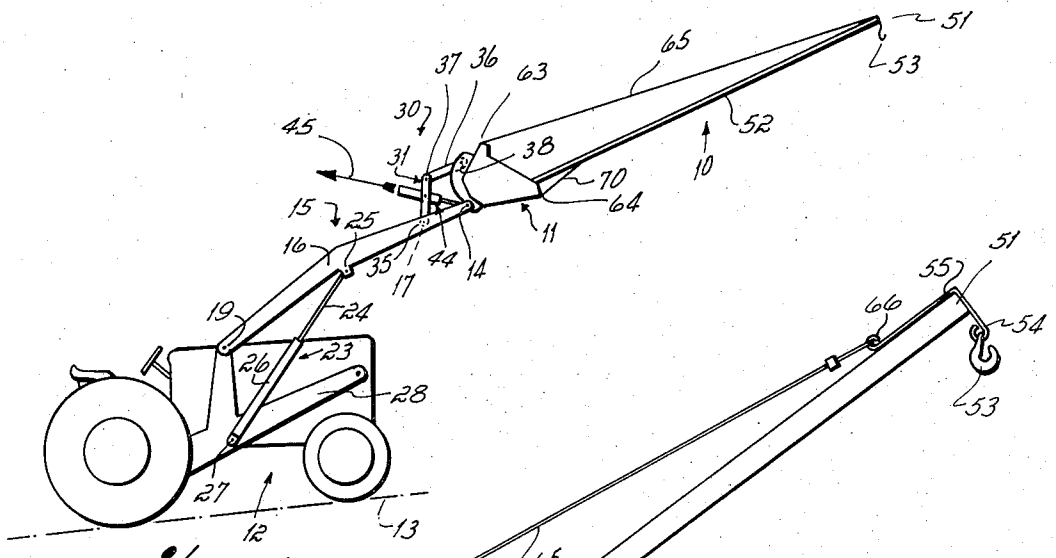


Fig. 1

Fig. 2

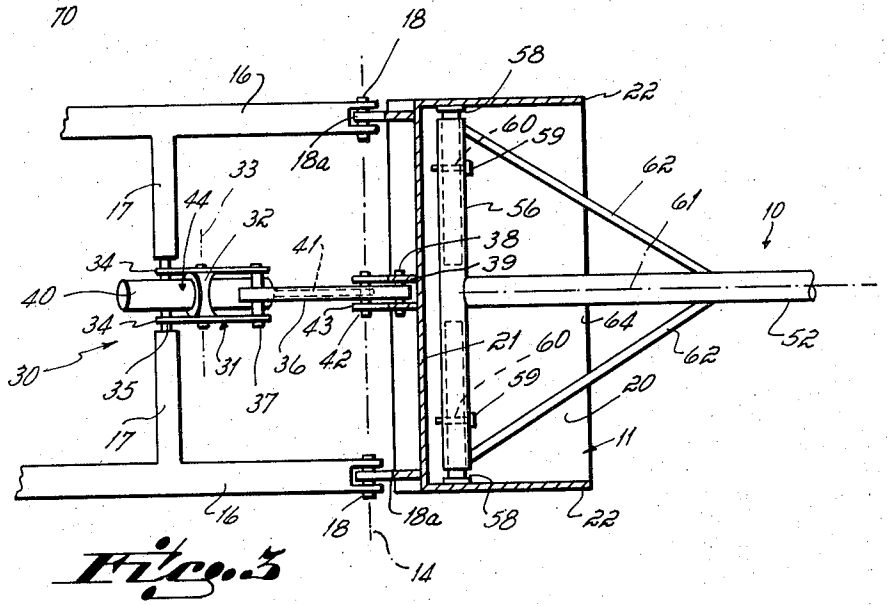


Fig. 3

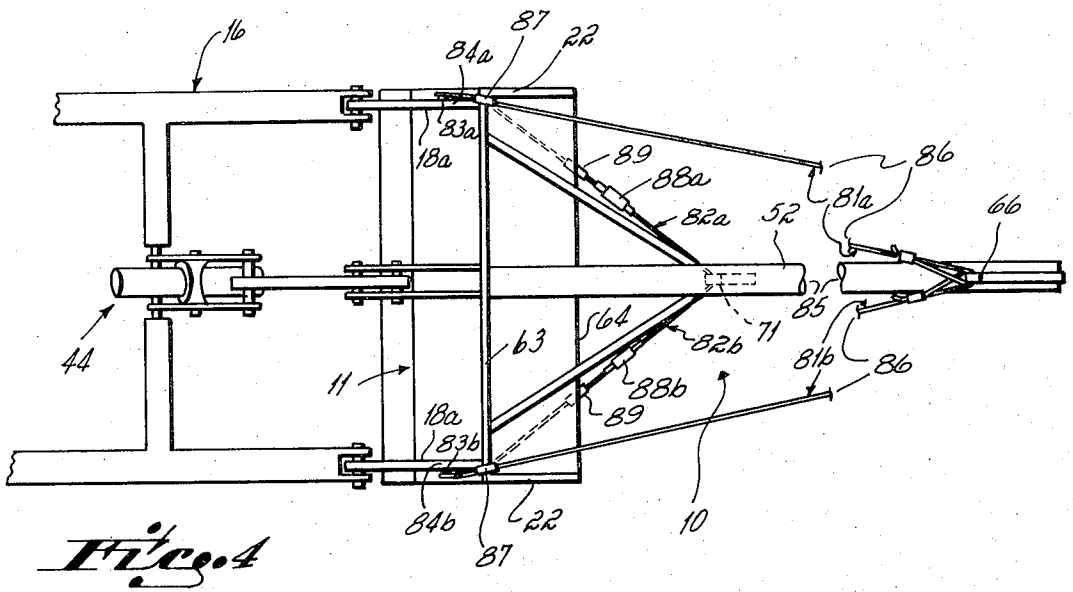

16
84a
87
22
83a
18a
89
88a
82a
86
81a
52
66
85
64
71
82b
81b
86
44
63
11
88b
89
18a
83b
84b
22
87
10

Fig. 4

LIFT BOOM FOR A FRONT LOADER TRACTOR

This invention relates to hoists or cranes. More particularly, this invention relates to a novel hoist frame particularly adapted for use with a front loader tractor.

Vertically swinging hoists are very well known, of course, to the prior art. Further, traveling cranes are also quite well known to the prior art. However, most prior art structures which are capable of performing these functions are relatively complicated in nature and quite expensive.

A small building contractor, for example, would not be able to afford a vertically swinging hoist or traveling crane. Nonetheless, a small building contractor must move heavy equipment or supplies from one location to another on a number of occasions during a construction job. Typical, for example, is the instance of air conditioning equipment which must be moved from ground level to roof level during construction of a two-story office building or small factory or the like. Therefore, even though a small building contractor does have occasions on which the use of a vertically swinging hoist and/or traveling crane would be useful, still these occasions are not substantial enough to justify heavy captial investment in equipment designed solely for that use.

However, most building contractors generally have available for their use, or own directly, a front loader tractor. A front loader tractor is simply a basic four-wheel tractor with a hydraulically operated bucket disposed forwardly thereof, the bucket providing a payload capacity which quickly and efficiently allows a contractor to pick up and transfer a payload, e.g., dirt, from one location to another. The tractor's bucket is pivotally mounted to the forward end of a pair of arms, those arms being pivotally connected at the rearward end to the tractor's main frame. The arms are pivotally moved about their connection with the tractor's main frame by first hydraulic means, thereby allowing the bucket to be raised and lowered relative to ground level. Further, a linkage system connects the arms with the bucket, the linkage system being independently powered by second hydraulic means. The linkage system/second hydraulic means allows the bucket to be pivoted on its pivotal connection with the arms, thereby disposing the bucket in that spatial orientation, i.e., upright or inverted, desired by the user. That is, the bucket can be disposed in an upright position for loading at ground level by properly orienting the arms and bucket through use of the first and second hydraulic means, the bucket and payload moved above ground level by the first hydraulic means for carrying the payload to a dumping location, and then the bucket pivoted or inverted on its pivotal connection with the arms by the second hydraulic means to dump the payload. This type of a bucket or front loader tractor is well known to the prior art, and is commonly available at construction sites of residential dwellings, small office buildings or factories, and the like.

It has been a particular objective of this invention to provide a T-shaped lift boom which may be selectively combined with the bucket of a bucket loader type tractor when desired by the user so as to provide, in effect, a traveling crane having a vertically swinging hoist frame.

It has been a further objective of this invention to provide a lift boom for a bucket of a bucket loader type tractor that is of relatively simple structure, relatively inexpensive to manufacture, and relatively easy to use, i.e., easy to mount on and dismount from the bucket.

It has been another objective of this invention to provide a lift boom which is adapted to be engaged with the bucket of a bucket loader type tractor regardless of the width of that bucket.

In accord with these objectives, this invention provides a lift boom of a generally T-shaped configuration, the stem of the T-boom being provided with a hook to which any suitable load may be attached. The head of the T-boom is seated within a front loader tractor's bucket in the floor/rear wall corner. An upper cable is attached at one end adjacent the hook end of the boom's stem, and is passed over the bucket's top edge and attached at the other end to the bucket. A lower cable is attached at one end to the boom's stem intermediate the ends thereof, and is passed beneath the bucket's floor and also attached at the other end to the bucket. The lower cable is provided with a turnbuckle assembly. The turnbuckle assembly is adjustable when the boom is seated in the bucket to provide a suitable tension on both the upper and the lower cables, thereby maintaining the T-boom in the initial assembled relation with the bucket no matter what the spatial orientation of the bucket (and, hence, the boom) as set by the tractor, and no matter what the load being carried by the boom.

Other objectives and advantages of this invention will be more apparent from the following detailed description of the invention taken in conjunction with the drawings in which:

FIG. 1 is a side view illustrating the T-shaped lift boom of this invention in operative combination with a front loader tractor;

FIG. 2 is a side view illustrating the lift boom of this invention in greater detail, the front loader tractor's bucket being shown in partial cross section;

FIG. 3 is a top view illustrating a portion of the lift boom shown in FIGS. 1 and 2 in even greater detail, the tractor's bucket again being shown in partial cross section; and

FIG. 4 is a top view similar to FIG. 3 but illustrating an alternative embodiment of the invention.

The T-shaped lift boom **10** of this invention is shown in combination with a bucket **11** on a front loader tractor **12** in the Figures, see particularly FIG. **1.** Note particularly that the bucket **11** includes a base or bottom floor **20,** a curved rear wall **21,** and planar side walls **22,** all such walls cooperating to define a cup-shaped bucket configuration. The bucket **11** may be selectively raised and lowered relative to ground level **13** for picking up and transporting a payload, and the bucket may be selectively pivoted about pivot axis **14** for dumping the payload, by a structural assembly described in detail below.

The structural assembly by which the bucket **11** is operatively connected to the tractor **12** is shown particularly in FIGS. **1** and **3.** A lift assembly **15** provides a pair of lifting arms **16** connected adjacent the bucket by a crossbar **17,** one arm being disposed on each side of the tractor **12.** One end of each arm **16** is pivotally connected, as at **19,** to an associated Y-shaped reinforcing frame **28** fixed in place on the tractor's chassis

(each side of the chassis is provided with a reinforcing frame 28). The other end of each arm 16 is pivotally connected, as by pin 18, to ear 18*a* fixed to the bucket's rear wall 21 adjacent a side wall 22, thereby defining pivot axis 14.

A hydraulic motor 23 is provided for each arm 16. The hydraulic motor 23 has its rod 24 pivotally connected, as at 25, intermediate the ends of the arm 16, and has its housing 26 pivotally connected, as at 27, to the associated reinforcing frame 28. The arms 16 and hydraulic motors 23, therefore, comprise the lift assembly 15 by which the bucket 11 may be raised and lowered relative to ground level 13. That is, upon energization of the hydraulic motors 23 by the tractor's driver, the arms 16 are raised or lowered relative to ground level, thereby raising and lowering the bucket 11 relative to ground level.

A pivot assembly 30 controls the pivot motion, i.e., the upright or inverted attitude, of the bucket 11 about pivot axis 14. The pivot assembly 30 includes a bracket 31 having a collar 32 pivotally carried (on axis 33) between the ends thereof, the bracket's arms 34 being pivotally connected, as at 35, to crossbar 17. A link 36 is pivotally connected by pin 37 to the outer end of the bracket 31 at one end, and is pivotally connected by pin 38 between ears 39 fixed to the bucket's rear wall 21 at the other end.

The collar 32 holds a hydraulic motor's housing 40 in fixed relation, the motor's housing thereby being pivotally connected relative to the bracket 31. The hydraulic motor's piston rod 41 is pivotally connected by pin 42 between ears 43 also fixed to the bucket's rear wall 21, that pivotal interconnection being on the bucket's pivot axis 14 as defined by pins 18 which connect the bucket 11 to the lift arms 16. Note that the pivot assembly 30 is effectively located in a vertical plane midway between the bucket's side walls 22. Thus, the bucket 11 is pivotable about the horizontal axis 14 by virtue of the pivot assembly 30 which includes the hydraulic motor 44, bracket 31 and link 36. That is, and since the motor's rod 41 is fixed at one end to the bucket 11, as the motor's housing 40 is forced outwardly along arrow 45 (see FIG. 1) bracket 31 is caused to pivot counterclockwise, thereby causing the bucket's mouth to face upwards or upright so as drawn by the link 36. The bucket's mouth is caused to face downwards or inverted (in a dumping attitude) by forcing the motor's housing in a direction opposite to that of arrow 45.

The lift boom 10 is of a generally T-shaped configuration, see FIG. 3. The bottom or free end 51 of the T-boom's stem 52 is provided with a hook 53; note that the hook 53 is nonadjustable relative to the stem 52, i.e., that the hook is retained on the stem in a permanent or fixed location. The hook 53 is hung through an eye 54 formed on plate 55 fixed to the stem 52. It is, of course, by means of the hook 53 that suitable loads may be connected to the boom 10 and, thereby, lifted and carried by the boom as explained in detail below.

The top or head 56 of the T-boom is adapted to be seated in the rear wall/floor corner 57 of the bucket 11 itself. Note that the boom's head 56 is transverse to the stem 52, and is basically tubular in configuration. The head 56 is reinforced in its orientation relative to the boom's stem 52 by struts 62 on both sides. An extension 58 is telescoped into each end of the tubular head 56, that extension being extendable from each end of the head into face contact with the inside surface of the bucket's side walls 22. The extensions 58 are retained in predetermined, extended positions by suitable lock devices such as a key 59 that passes through concentric holes 60 aligned in the extension 58 and head 56. It is this telescoping structure of the head 56 that allows the stem 52 of the boom 10 to be located in substantially planar relation with the center plane 61 of the tractor's bucket 11. Further, telescoping extensions 58 allow the boom 10 to be cooperatively engaged with a bucket 11 of substantially any width.

In operative position with the bucket 11, the head 56 of the T-boom 10 is seated against the rear corner 57 of the bucket where the floor 20 meets the curved rear wall 21, the boom's stem 52 touching neither the top edge 63 nor the bottom edge 64 of the bucket; this attitude is shown in FIG. 2. The T-boom 10 is maintained in this attitude by cable means which are adjustably connected in tension to the bucket's ribs or ears 39, 43 on the rear face of the rear wall 21.

An upper cable 65 is fixed at one end to eye 66 of member 55 mounted on the free end 51 of the T-boom's stem. The upper cable 65 is passed over the top edge 63 of the bucket 11, and is looped (as at 67) around a pin 68 mounted on one of the bucket's ears 39 at the other end. Tubular shield 69 is located on the upper cable 65 where the cable passes over the bucket's upper edge 63, thereby eliminating chafing and possible breakage of the cable due to rubbing on the bucket's upper edge.

A lower cable 70 is attached at one end to an eye 71 defined by member 72 fixed to the boom 10 intermediate the ends of the boom's stem 52. The lower cable 70 passes under the bottom edge 64 and floor 20 of the bucket 11, and is fastened by a loop 73 onto a pin 74 mounted on one of the bucket's ears 43 at its other end. Tubular shields 75, 76 for the lower cable 70 are located at potential places of binding such as the bucket's bottom edge 64 and the corner 57 edge for the same reasons noted above in connection with shield 69.

A turnbuckle assembly 77 is interposed in the lower cable 70 between that end where it is fixed to the T-boom's stem 52, and that end where it is connected to the bucket 11. This turnbuckle assembly 77 is provided for the purpose of adjusting the tension on the upper 65 and lower 70 cables, tightening of the turnbuckle assembly in the usual manner causing an increase in the cable tension, i.e., a tightening of the cables. The tension on the calbes 65, 70, as provided by the turnbuckle assembly 77, maintains the T-boom 10 in the desired attitude shown in FIG. 2 no matter what the spatial orientation of the bucket 11 (and, hence, of the boom 10). That is, no matter how close to vertical the boom 10 is oriented, the boom is prevented from pivoting on an axis defined by head 56 by means of the cable 65, 70 attachment system.

In use, the T-shaped boom 10 is fixedly connected to and, in effect, made an integral part of the tractor's bucket 11 by virtue of the cables 65, 70 and the turnbuckle assembly 77. Thus, as the bucket 11 is moved vertically relative to ground level 13, and as the bucket is tilted or moved about pivot axis 14, by the relevant hydraulic motors 23, 44, as desired by the operator, the boom's hook 53 (and, hence, the load thereon) may be located relative to ground level and relative to the tractor itself as desired by the operator. Therefore, the

boom 10/bucket 11/lift 15 and pivot 30 assemblies is in the nature of a hoist frame which can be moved from side to side by repositioning the tractor, and which can be swung vertically by means of the hydraulic motors 23, 44. Further, the overall combination is in the nature of a traveling crane in that any load carried thereon may be moved from location to location as desired by the operator.

The T-boom 10 structure and configuration of the alternative embodiment is basically the same as illustrated in connection with the embodiment shown in FIGS. 1–3. The main difference lies in the cable means by which the T-boom 10 is retained in desired spatial orientation within the bucket 11 itself. The tractor's bucket 11 structure, arm 16 structure, and hydraulic motor 23, 44 structure is the same as for that embodiment illustrated in FIGS. 1–3.

As mentioned, the difference between the alternative embodiment and the FIGS. 1–3 embodiment lies in the structure of the cable means. In the alternative embodiment, a double top cable 81*a*, 81*b* and a double bottom cable 82*a*, 82*b* is provided each pair of these cables defining a V-like configuration relative to the stem 52 of the T-boom 10. Each of the top cables 81*a*, 81*b* is connected to eye 66 fixed to the top of the boom's stem 52. Each cable 81*a*, 81*b* extends from the eye 66 to a point where it is connected to pin 83*a*, 83*b*, respectively, fixed at 84*a*, 84*b* to side ribs 18*a* closely adjacent the side walls 22 of the bucket 11. As illustrated in FIG. 4, the stem 52 of the T-boom 10 is broken as at 85, and the top cables 81 are broken at 86, so that the location of each top cables' joinder to the stem, as well as the joinder of each top cable to the bucket 11, may be shown. Each top cable 81*a*, 81*b* is provided with a tubular shield 87 adapted to overlie the top edge 63 of the bucket 11 to prevent chaffing of the cable as it passes over the bucket.

As noted, the alternative embodiment shown in FIG. 4 also includes double bottom cables 82*a*, 82*b*, each of the bottom cables being connected at one end to eye 71 fixed to the underside of the boom's stem 52 and at the other end to a pin, (not shown) fixed to the bucket's ribs 18*a* adjacent the side walls 22 in a manner similar to that illustrated in FIG. 2 for the single cable 70 embodiment. Each of the lower cables 82*a*, 82*b* is provided with a turnbuckle assembly 88*a*, 88*b* thereby allowing tension on the upper cables 81*a*, 81*b* to the suitably adjusted so that the T-shaped boom is maintained in a desired spatial orientation within the bucket 11. Further, shields 89 are provided on each of the lower cables to prevent chaffing of the cable on the lower edge 64 of the bucket as they pass thereunder.

Having described in detail the preferred embodiment of my invention, what I desire to claim and protect by Letters Patent is:

1. The apparatus combination comprising:

a lift boom and a front loader tractor, said tractor including an open-mouth bucket having a rear wall and opposite side walls, said bucket being movable up and down relative to ground level by a lift assembly and pivotable about a pivot axis between upright and inverted positions by a pivot assembly,

said lift boom including a head and a stem of generally T-shaped configuration,

the head of said lift boom being seated inside said bucket against said rear wall thereof, and the stem of said lift boom extending outwardly from said bucket,

hook means connected to said stem for connecting a payload to said boom, and

cable means interconnecting the bucket and the stem of said lift boom at a point forward of the mouth of said bucket, said cable means serving to maintain said lift boom in immobile operational assembly with said bucket in a vertical plane, thereby permitting said hook means to be oriented relative to said ground level as desired by an operator through the use of said lift and pivot assemblies.

2. The apparatus of claim 1 wherein said cable means includes a member extending from said boom outwardly of said bucket to said bucket and having a turnbuckle assembly allowing the tension on said cable means to be suitably adjusted for maintaining said boom in immobile operational assembly with said bucket.

3. The apparatus of claim 2 wherein said cable means includes an upper cable and a lower cable, each attached to the lift boom's stem outwardly of said bucket at one end, and said lower cable being adapted to pass under the bottom edge of said bucket and connect therewith at its other end, said turnbuckle assembly being connected with one of said cables.

4. The apparatus of claim 3 including shields interposed on said cable at points of potential chaffing of said cable on said bucket's structure.

5. The apparatus of claim 3 wherein said cable means includes at least a pair of upper cables each attached to the lift boom's stem at one end, the other end of each of said cables being connected with said bucket adjacent said opposite side walls.

6. The apparatus of claim 1 wherein said head is tubular, and including

an extension in telescoped assembly with at least one end of said tubular head, said extension being extendable from said head so as to allow said head to extend between said side walls, thereby providing lateral stability to said boom when said boom is seated in said bucket.

7. The apparatus of claim 6 including

an extension telescoped into each end of said head, thereby allowing said stem to be located at a desired plane between said bucket's side walls.

8. The apparatus of claim 7 wherein said plane is midway between said side walls.

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