

[54] **MEANS FOR CONNECTING HYDRAULIC CYLINDER TO MOVABLE COMPONENT**

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[51] Int. Cl. **F16h 21/44**

[58] Field of Search **74/102; 16/170-178; 285/12, 283; 214/138 R**

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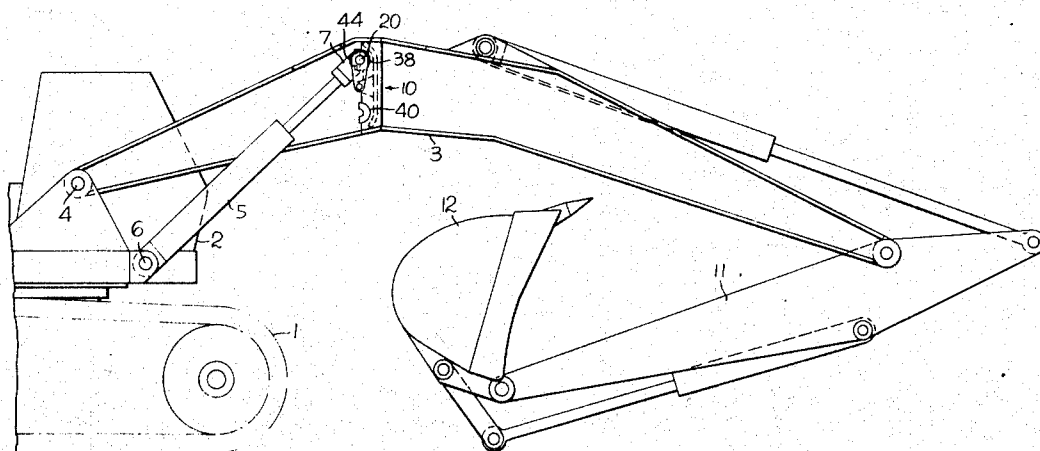
der having an extendable and retractable cylinder rod for raising and lowering the boom. The end of the cylinder rod is pivotably connectable by a pin to either an upper or lower pin attachment means on the side of the boom. The pin is mounted on a lock plate which is pivotably connected by a bolt to the side of the boom and is always engaged in a hole in a bushing on the cylinder rod. Consequently, the cylinder rod end can be selectively connected to either the upper or lower pin attachment means on the boom without the need to completely disconnect the cylinder rod from the boom. In one embodiment, each pin attachment means includes a solid inner boss having a hole therein and a split outer boss having a detachable cap. After removing the detachable cap from the split boss and loosening the bolt, the pin is moved axially to disengage the pin from the hole in the solid boss and the cylinder rod is operated to swing the pin into position for engagement with the other pin attachment means, whereupon the pin is moved axially into engagement with the hole in the other solid boss, the cap is replaced and the bolt retightened.

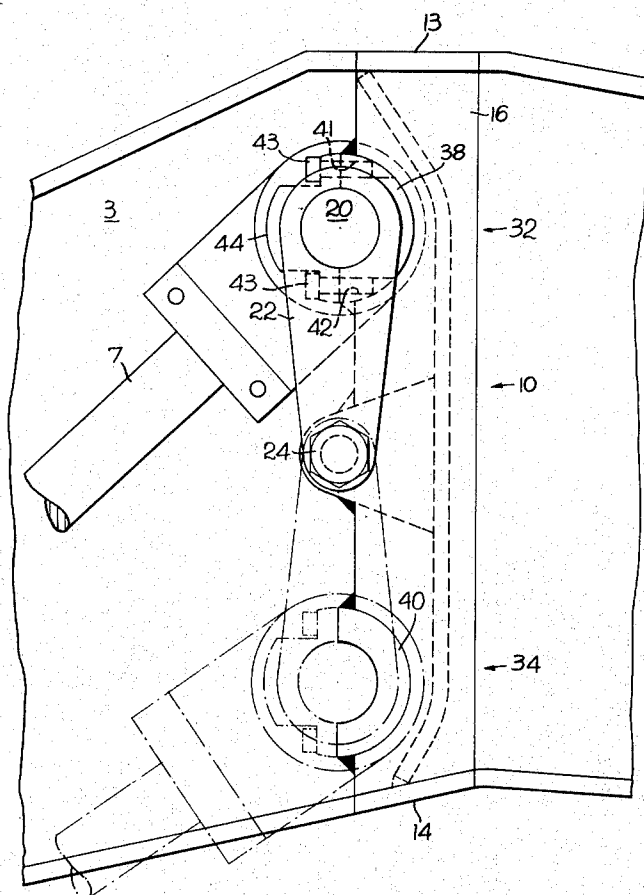
In another embodiment each pin attachment means includes a split inner boss and a split outer boss and detachable caps therefor. After removal of the caps and loosening of the bolt, the cylinder is operated to swing the pin into engagement with the other pin attachment means, whereupon the caps are replaced and the bolt retightened.

[57] **ABSTRACT**

A back hoe comprises a boom and a boom hoist cylinder

12 Claims, 7 Drawing Figures





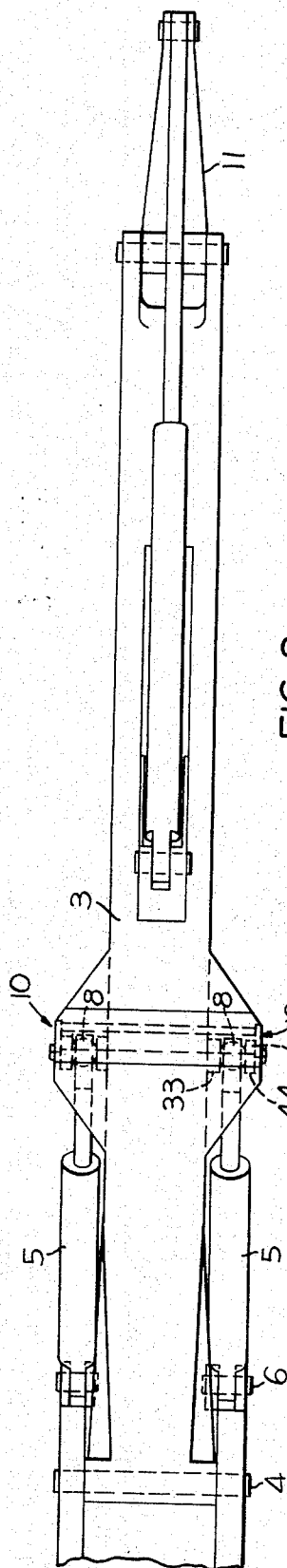


FIG. 2

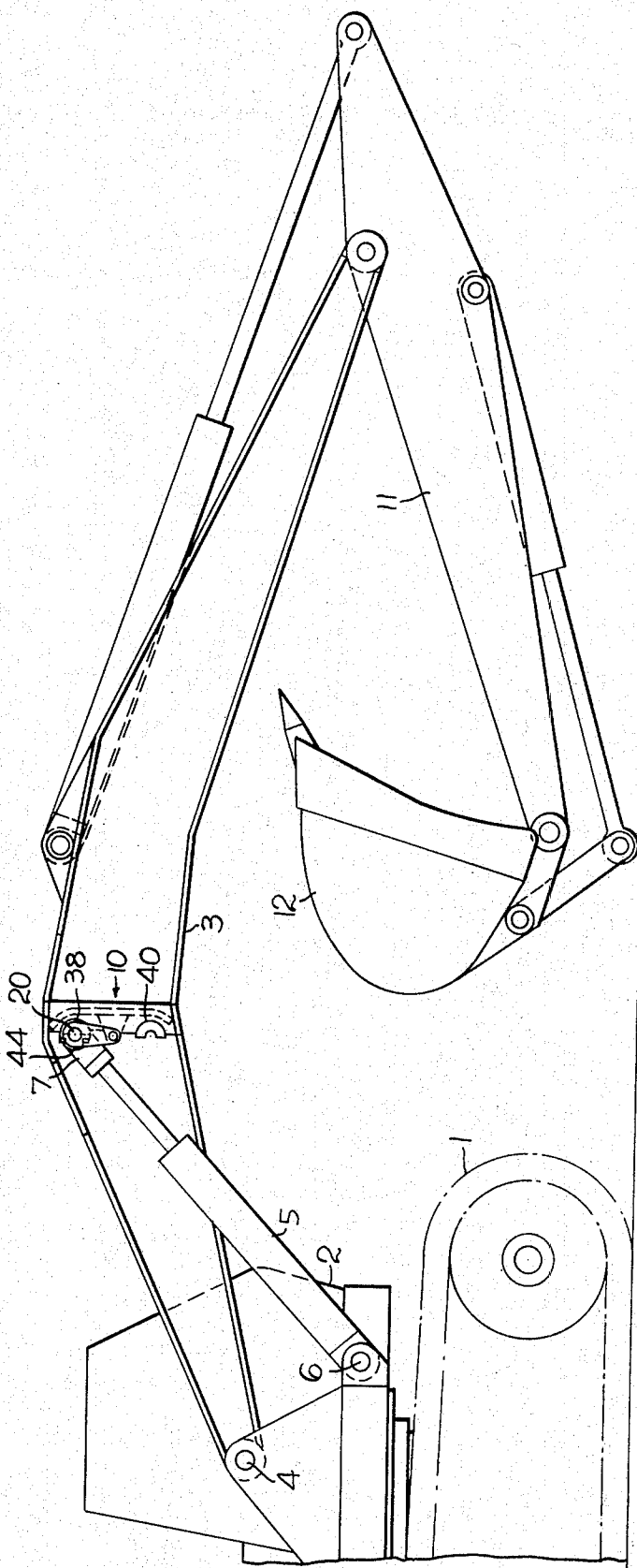


FIG. 1

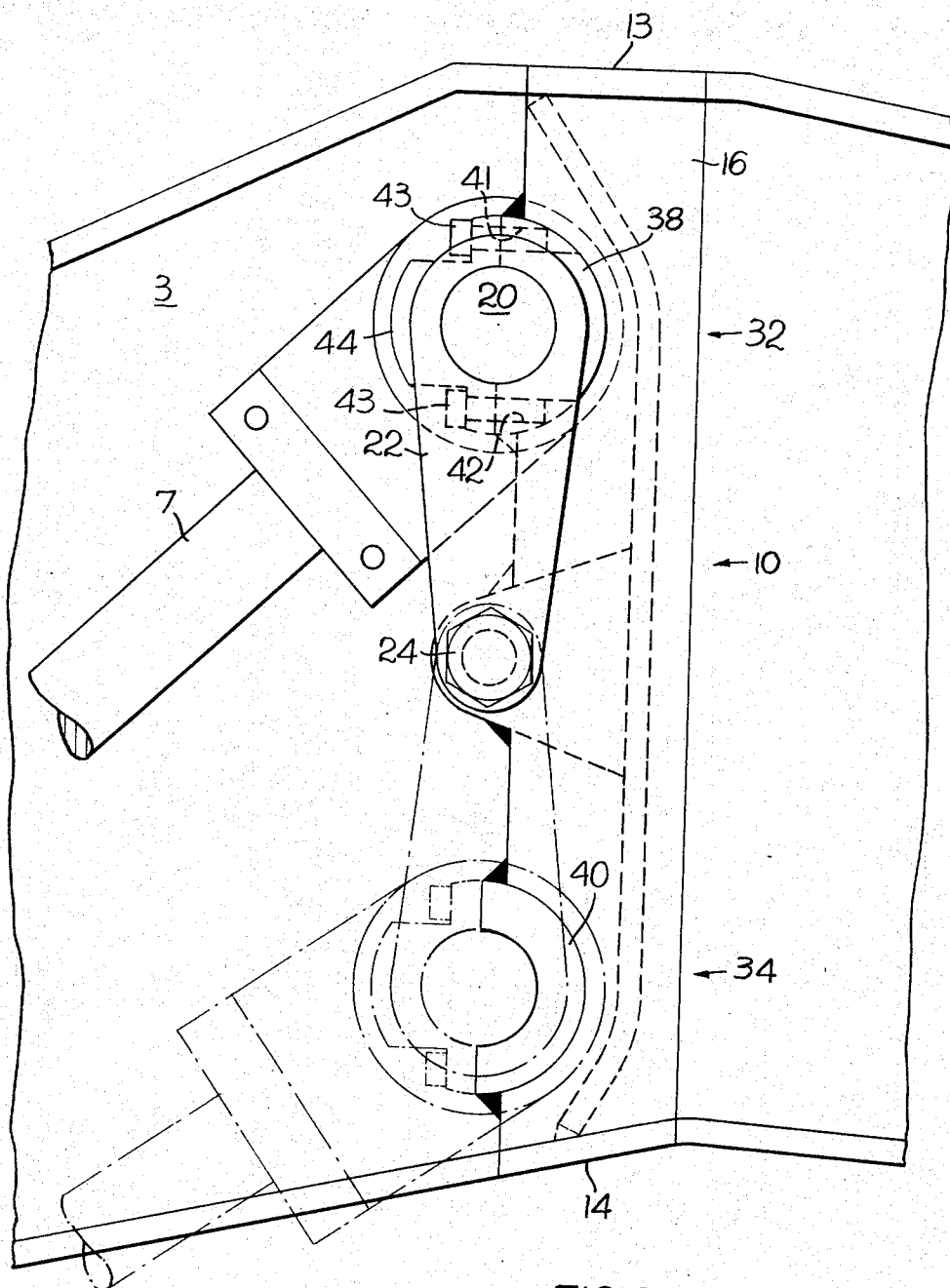


FIG. 3

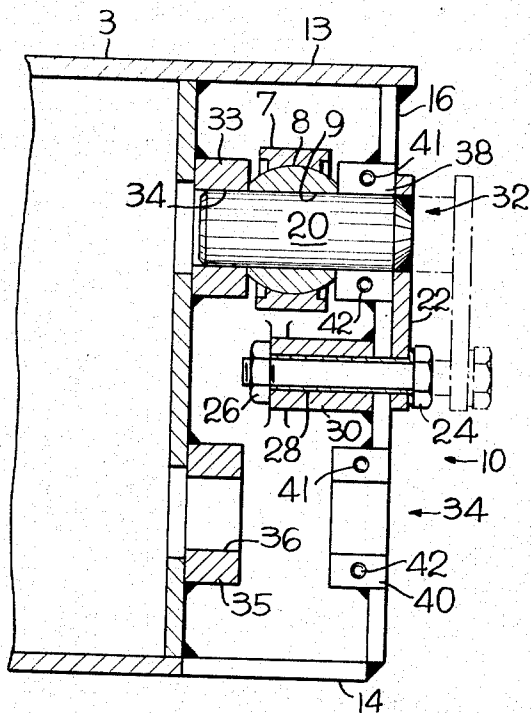


FIG. 4

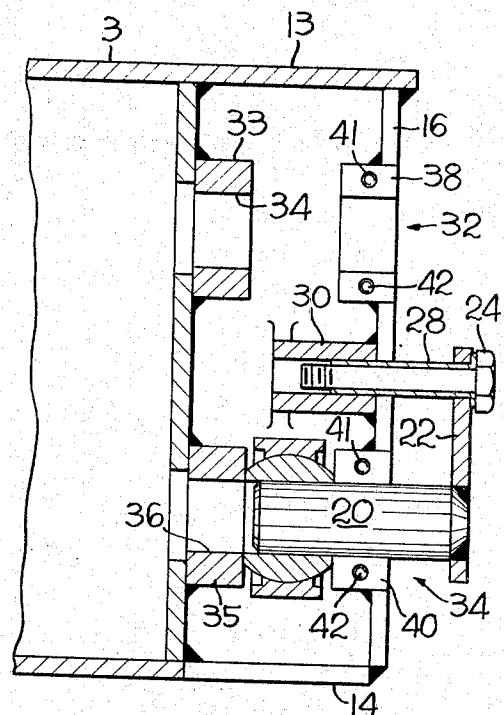


FIG. 5

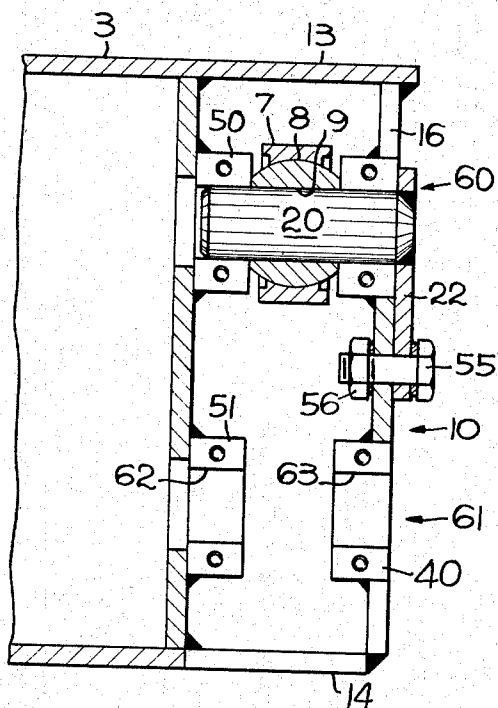


FIG. 6

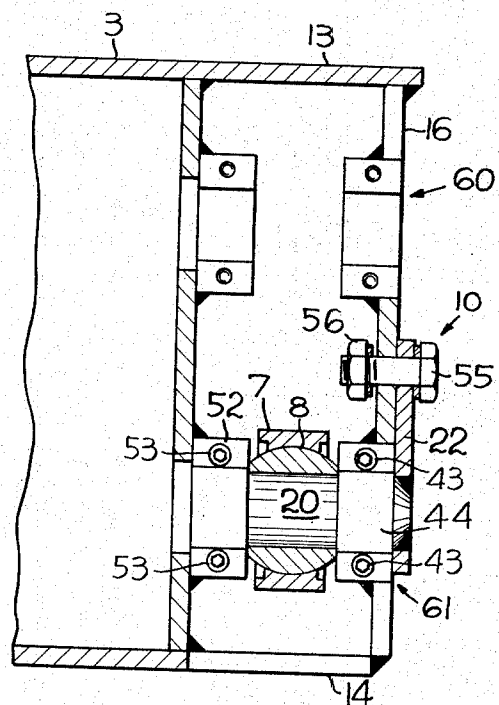


FIG. 7

MEANS FOR CONNECTING HYDRAULIC CYLINDER TO MOVABLE COMPONENT

BACKGROUND OF THE INVENTION

1. Field of Use

This invention relates generally to means for connecting a hydraulic operating cylinder to different pivot points on a movable component such as a boom.

2. Description of Prior Art

Some machines such as back hoes comprise a mobile carrier on which a rotatable upper section is mounted. A movable component such as a boom is pivotably connected to the upper section and is vertically movable by a boom hoist hydraulic cylinder which is pivotably connected to the upper section and to the boom. Heretofore, the cylinder rod end was connected to the side of the boom by a removable pin which extended through a hole in a bushing on the cylinder rod end and into a hole on the side of the boom. Sometimes two or more vertically spaced apart holes were provided on the side of the boom to enable the cylinder rod end to be selectively connected at any one of the holes in order to change the distance the boom would be raised by operation of the boom hoist cylinder. In order to disconnect the cylinder rod end from one hole and connect it to another, it was necessary to rest the boom on the ground or some other rigid support. Then, the pin was withdrawn from one hole in the boom and the boom hoist cylinder was moved to another position wherein the pin could be aligned with and inserted into another hole in the boom. During such a change, the boom hoist cylinder had to be physically supported so that it would not fall. Since the boom hoist cylinder was relatively large and heavy, several men or additional machinery were required to perform the change.

SUMMARY OF THE PRESENT INVENTION

The present invention contemplates a machine such as a back hoe having a component such as a boom which is pivotably attached to the machine and is vertically movable in either direction by at least one boom hoist cylinder. The cylinder is pivotably connected to some part of the machine and the end of the cylinder rod is pivotably connected to an attachment assembly in accordance with the invention located on the side of the boom.

The attachment assembly comprises a rigid support frame rigidly secured to the boom and including top and bottom members and an outer side plate rigidly secured to the members. The assembly further comprises spaced apart upper and lower pin attachment means mounted on the support frame. The assembly also comprises a pin mounted on a lock plate which, in turn, is pivotably connected to the side plate of the assembly by a releasable through bolt and nut therefor. The pin extends through a hole in a bushing mounted on the cylinder rod end and is selectively engagable with either the upper or the lower pin attachment means on the pin attachment assembly.

In one embodiment of the invention, each of the upper and lower pin attachment means comprises a solid inner boss rigidly mounted on the side of the boom and having a pin receiving hole therein. Each pin attachment means also comprises an outer split boss secured to the assembly side plate and a detachable cap portion therefor. In the said one embodiment, the cylinder rod end is detached from one pin attachment

means and attached to the other in the following manner. The nut for the through bolt is removed and the cap is removed from the outer split boss. Then, the pin is moved axially so that it is disengaged from the hole in the solid inner boss. Then, the cylinder rod is retracted to disengage the pin from the outer split boss and subsequently re-extended to bring the pin into engagement with the other split boss. During such movement the lock plate and the pin thereon travel in an arcuate path around the through bolt. Thereupon, the pin is moved axially to reinsert it into the hole in the other solid boss, the cap is replaced on the split boss and the nut for the through bolt is replaced and retightened.

In another embodiment of the invention, each of the upper and lower pin attachment means comprises a split inner boss mounted on the side of the boom and a split outer boss mounted on the assembly side plate. Both the inner and outer split bosses are provided with detachable cap portions. In said other embodiment, the cylinder rod end is detached from one pin attachment means and attached to the other in the following manner. The through bolt is loosened and the caps are removed from the inner and outer split bosses. Then, the cylinder rod is retracted to disengage the pin from the inner and outer split bosses of one pin attachment means and is subsequently re-extended to bring the pin into engagement with the other split bosses of the other pin attachment means. During such movement the pin and lock plate travel in an arcuate path around the through bolt. When the pin is in engagement with the split bosses of the other pin attachment means, the caps are replaced and the through bolt tightened.

In both embodiments of the invention the pin is always engaged with the cylinder rod. Consequently, the boom hoist cylinder is always attached, through movable with respect to, the boom and no other provisions need be made to support it. Furthermore, since the pin is mounted on the pivotable lock plate, the pin always pivots about a fixed point and is, therefore, accurately located with respect to either the upper or lower pin attachment means with which it must be aligned, thereby simplifying repositioning of the cylinder rod end. The advantage of the first embodiment is that the pin engages a hole in a solid inner boss thereby making for a stronger mechanical connection. Furthermore, only one cap needs to be removed and replaced during repositioning. The advantage of the second embodiment is that the pin does not need to be moved axially (i.e., pulled out and driven in) during repositioning. Also, the means for pivotably mounting the lock plate on the boom is simpler.

THE DRAWINGS

FIG. 1 is a side view of a machine, such as a back hoe, having a boom and two boom hoist cylinders which attach to the boom by attachment assemblies in accordance with the invention;

FIG. 2 is a top plan view of the boom shown in FIG. 1 and showing the two attachment assemblies;

FIG. 3 is an enlarged side view of one embodiment of a pin attachment assembly shown in FIG. 2;

FIG. 4 is a cross sectional view of the assembly of FIG. 3;

FIG. 5 is a view similar to FIG. 4 showing the cylinder and attachment in another position;

FIG. 6 is a cross sectional view, similar to FIG. 4, of another embodiment of a pin attachment assembly;

FIG. 7 is a view similar to FIG. 6 showing the cylinder rod attached in another position.

DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. 1 shows a machine such as a back hoe in accordance with the present invention which comprises a crawler type mobile carrier 1 and an upper section 2 which is mounted for horizontal rotation thereon. The base section 3 of a boom is pivotably attached to the upper section 2 of the machine by pin means 4 and is vertically movable in either direction by two identical boom hoist cylinders 5, only one of which is visible in FIG. 1. The lower end of each boom hoist cylinder 5 is pivotably connected by pin means 6 to the upper section 2 of the machine. The upper end of a cylinder rod 7 of the boom hoist cylinder 5 is provided with a bushing 8 which has a hole 9 therein and adapts the cylinder rod 7 for pivotable attachment to an attachment assembly 10 on a side of the boom base section 3, as shown in FIG. 4, 5, 6 and 7. An outer boom section 11 having a bucket 12 thereon is pivotably connected to the outer end of boom base section 3. FIG. 2 shows that two cylinder attachment assemblies 10 are provided, one on each side of boom base section 3.

As FIGS. 3, 4, 5, 6 and 7 show, each attachment assembly 10 comprises a support frame including top and bottom members or plates 13 and 14, respectively, which are rigidly secured as by welding to or integrally formed with base section 3. The support frame also includes an outer side plate 16 which is rigidly secured as by welding between the plates 13 and 14. The assembly 10 further comprises a cylindrical pin 20 which extends through the hole 9 in bushing 8 of cylinder rod 7 and is adapted to engage upper and lower pin attachment means in the attachment assembly 10, as hereinafter described. The outer end of pin 20 is secured as by welding to a lock plate 22 which is pivotably secured to outer side plate 16 as hereinafter described.

FIRST EMBODIMENT

FIGS. 1-5 show a first embodiment of the invention wherein lock plate 22 is secured to side plate 16 of assembly 10 by an elongated through bolt 24 which is provided with a nut 26. An inner sleeve 28 is disposed on bolt 24 and an outer sleeve 30 is disposed on the inner sleeve 28. Inner sleeve 28 is welded to plate 16.

Cylinder attachment assembly 10 comprises upper and lower pin attachment means 32 and 34, respectively, which are vertically spaced apart from each other and identical in construction to each other. Upper pin attachment means 32 comprises an inner boss 33 rigidly secured as by welding to the side of boom section 3. Inner boss 33 is provided with a circular hole 34 for receiving pin 20. Lower pin attachment means 34 also comprises an inner boss 35 having a circular opening 36 therein. The upper pin attachment means 32 comprises an outer split boss 38 which comprises a semicircular portion rigidly secured as by welding to side plate 16 of assembly 10. The lower pin attachment means 34 also includes an outer split boss 40 having a semicircular portion which is rigidly secured to side plate 16 by welding. Each of the outer split bosses 38 and 40 is provided with threaded holes 41 and 42 for receiving cap screws such as 43 which detachably secure a cap 44 to the outer split bosses 38 or 40. FIGS. 1-5 show that pin 20 is securing cylinder rod 7 to the upper pin attachment means 32. The inner end

of pin 20 is in engagement with solid inner boss 33, extends through the hole 9 in bushing 8, and is entrapped by the rigid portion of split boss 38 and cap 44. Lock plate 22 is prevented from rotating by tightening nut 26 on bolt 24 so that outer sleeve 30 is entrapped by the plate 16 and nut 26.

The procedure for detaching cylinder rod 7 (FIG. 4) from the upper pin attachment means 32 and attaching it to the lower pin means 34 (FIG. 5) is as follows. The cap screws 43 are removed and cap 44 is detached from boss 38. Nut 26 is then removed from through bolt 24 to free lock plate 22 and its pin 20 for rotational movement. Pin 20 is then moved axially outward so that it is disengaged from hole 34 in upper inner boss 33. Hoist cylinder 5 is then operated to retract its rod 7 to cause pin 20 to disengage from outer boss 38 and to swing pin 20 outwardly and downwardly around through bolt 24. Cylinder rod 7 is then extended to swing or move pin 20 to engage with the hole in lower split boss 40 and into axial alignment with hole 36 in lower solid boss 35. Pin 20 is then driven inwardly into hole 36. Cap 44 is then attached to lower outer split boss 40 by the cap screws 43 and the nut 26 is replaced on through bolt 24.

SECOND EMBODIMENT

FIGS. 6 and 7 show a second embodiment of the invention which is similar to the first embodiment except that in the second embodiment the upper and lower inner bosses 50 and 51 are split bosses and not solid bosses. Therefore, a cap 52 and cap screws 53 are provided for the inner split bosses. Furthermore, in the second embodiment the lock plate 22 is secured to side plate 16 by a relatively short bolt 55 which is provided with a nut 56. No sleeves are required for bolt 55. FIG. 6 shows cylinder rod 7 secured by pin 20 to the upper pin attachment means 60. The procedure for detaching cylinder rod 7 from the upper pin attachment means 60 and for securing it to the lower pin attachment means 61 is as follows. The cap screws 53 and 43 are removed to enable removal of the caps 52 and 44. The nut 56 on bolt 55 is loosened to enable rotation of lock plate 22. Cylinder rod 7 is retracted and then extended to rotate pin 20 about bolt 55 from the upper to the lower position. Pin 20 automatically engages the holes 62 and 63 in the lower split bosses 51 and 40 and the caps 52 and 44 are secured to the lower bosses 51 and 40 respectively, by the cap screws 53 and 43. The nut 56 on bolt 55 is then retightened.

It is apparent from the foregoing description that both embodiments of the invention insure that pin 20 is always engaged with bushing 8 on cylinder rod 7 and, therefore, cylinder rod 7 is never completely detached from the boom section 3. Thus there is no need to provide additional support means for boom hoist cylinder 5 while changing its point of attachment. Furthermore, the pin 20 is always accurately aligned with the pin receiving holes at the new point of attachment. It is apparent, of course, that changing the attachment point for cylinder rod 7 requires that boom section 3 be rigidly supported in a conventional manner as shown in FIG. 1.

Although the invention is described herein as providing two different points of attachment or connection for cylinder rod 7, it is apparent that additional points of attachment could be provided for.

I claim:

1. In a machine having a movable component and at least one hydraulic cylinder including an extendable and retractable cylinder rod for moving said component,

at least two spaced apart pin attachment means on said component,
a pin attached to said rod and releaseably engagable with either of said pin attachment means on said component, and
means for pivotably connecting said pin to said component.

2. A machine according to claim 1 wherein each of said pin attachment means comprises at least one pin receiving opening.

3. A machine according to claim 2 wherein said pin is axially movable into and out of engagement with said one pin receiving opening.

4. A machine according to claim 3 wherein each of said pin attachment means comprises two spaced apart bosses, each of which is provided with a pin receiving opening, one of said bosses being solid and the other of said bosses being split and having a removable cap.

5. A machine according to claim 2 wherein each of said pin attachment means comprises two spaced apart bosses, each of which is provided with a pin receiving opening, both of said bosses being split and having removable caps.

6. In a machine having a movable component and at least one hydraulic cylinder including an extendable and retractable cylinder rod for moving said component, said rod having a pin receiving opening therein,

at least two spaced apart pin attachment means on said component,

a pin in said pin receiving opening of said rod and releaseably engageable with either of said pin attachment means on said component,
and means for pivotably connecting said pin to said component,

said means comprising a lock plate to which said pin is attached and a fastener for pivotably securing said lock plate with respect to said component.

7. A machine according to claim 6 wherein each of

said pin attachment means comprises a pair of spaced apart bosses having pin receiving holes therein.

8. a machine according to claim 7 wherein at least one boss in each pair is a split boss to which a cap is releasably attachable.

9. A machine according to claim 8 wherein at least one boss in each pair is a solid boss having an opening therein into and out of which said pin is axially movable.

10. In a machine having a boom and at least one hydraulic cylinder including an extendable and retractable cylinder rod for effecting pivotal movement of said boom, said rod having a pin receiving opening therein, an outer side plate spaced from and rigidly mounted with respect to one side of said boom, an upper inner boss mounted on said one side of said boom, an upper outer split boss mounted on said side plate, each of said upper bosses having a pin receiving opening therein, a lower inner boss mounted on said one side of said boom, a lower outer split boss mounted on said side plate, each of said lower bosses having a pin receiving opening therein,

a cap for releasable attachment to either of said split bosses,

said rod being selectively movable between either the upper or lower bosses,

an axially slidable pin in said pin receiving opening of said rod extending outwardly on either side of said rod when centered,

a lock plate connected to said pin,

and a bolt and a nut therefor for pivotably securing said lock plate to said side plate,

said bolt extending through a bolt hole in said side plate.

11. A machine according to claim 10 including a tubular sleeve rigidly mounted on said side plate for supporting said bolt.

12. A machine according to claim 10 wherein both of said inner bosses are split bosses and including a cap for releasable attachment to either of said inner bosses.

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