Feb. 25, 1964 H. E. BECK 3,122,247

AUTOMATIC POSITIONING DEVICE FOR MATERIAL HANDLING BUCKET

Filed Dec. 27, 1960 2 Sheets-Sheet 1

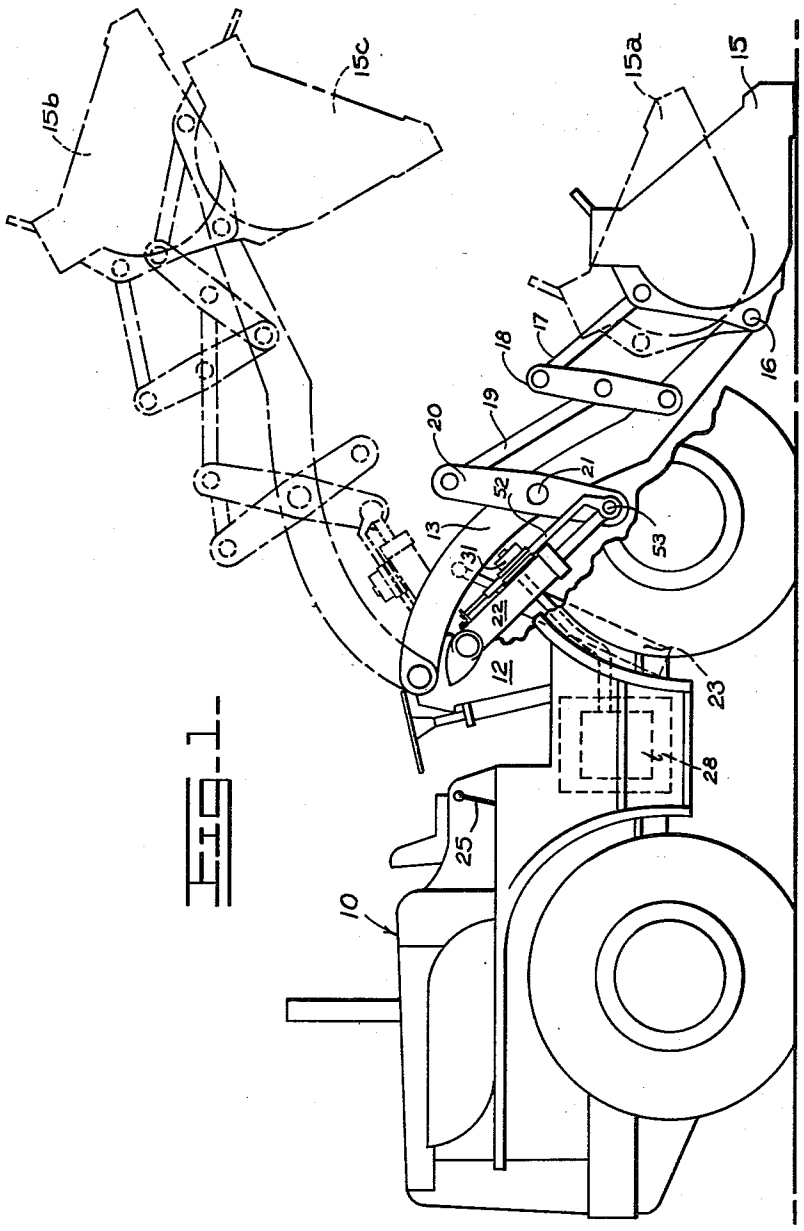



Fig. 1

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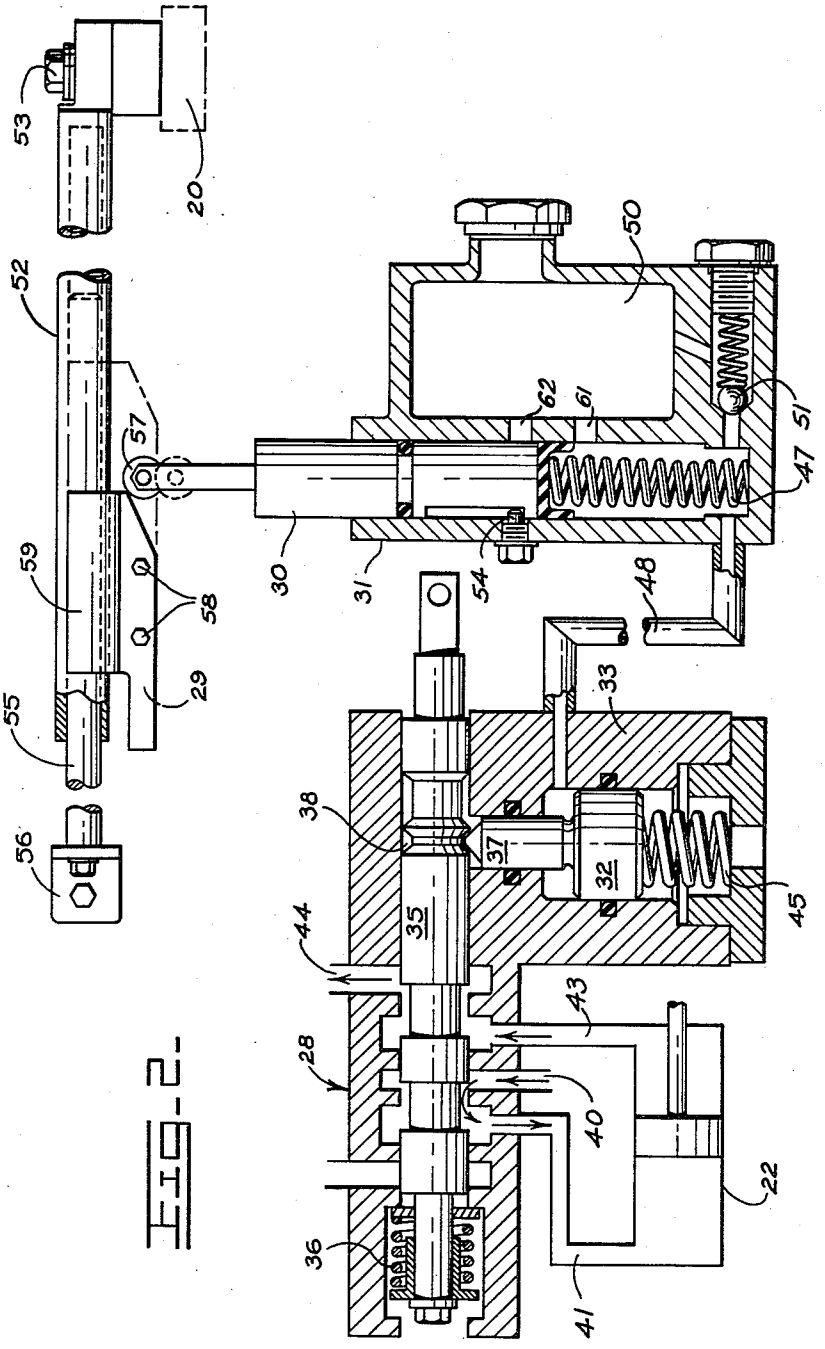



FIG. 2.

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# AUTOMATIC POSITIONING DEVICE FOR MATERIAL HANDLING BUCKET

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This invention relates to tractor mounted loaders of the kind employed for digging earth with a scoop or bucket, and more particularly to a control for positioning the bucket relative to its supporting frame.

In many conventional type loaders a bucket is carried at the end of lift arms or a lift frame which is raised and lowered with respect to a vehicle to move the bucket between the ground where it is loaded to an elevation where it is carried and dumped. The bucket is pivoted to the lift frame and connected to the vehicle through tilt linkage so that it may be tilted or rocked about its support. This tilt linkage enables the bucket to be held in a digging or load position to be tilted or "racked" back to a carry position and to be tilted forwardly to dump its contents. The lift frame and the tilt mechanism are usually hydraulically controlled with separate sets of jacks and separate control valves. The usual sequence of a loader operation is load, raise, carry and dump. At the end of this cycle an operator must lower the bucket with the lift jack valve and adjust the bucket from its dump position to its load position with the tilt jack valve. It is difficult to do both at once, particularly since the dig or load angle of the bucket is a critical one. The present invention provides improved means to latch the tilt valve in an open position to tilt the bucket toward its critical load angle, and then automatically to release the latch when the bucket reaches its load position. Consequently, after dumping the load, the operator can actuate both the tilt and lift valves, but need be concerned only with the lift valve in lowering the frame and bucket, since the tilt operation is automatically controlled to bring the bucket to its load position for the start of a new cycle of operation.

It is an object of this invention to provide an improved and simple control means for positioning the bucket on its support automatically.

A further object of the invention is to provide a mechanism for accomplishing this purpose which functions through a simple closed hydraulic circuit and is therefore readily adaptable to environments where the control valves are remote from the lift frame and tilt mechanism and communication may be had through a simple hose or conduit, thus eliminating the necessity of a complex and cumbersome system of levers and links.

Still further and more specific objects and advantages of the invention are made apparent in the specification wherein the invention is described in detail by reference to the accompanying drawings.

In the drawings:

FIG. 1 is a view in side elevation of a tractor mounted shovel or loader embodying the present invention with the bucket shown in several positions which it occupies during a full cycle of operation; and

FIG. 2 is an enlarged schematic view illustrating the hydraulic circuits and mechanisms of the invention.

A tractor, generally indicated at 10, is shown in FIG. 1 as having an auxiliary frame 12 supporting a pivotally mounted bucket lift frame 13. A material handling bucket 15 is pivotally supported as at 16 on the forward end of the frame 13 and is positioned relative thereto by means of conventional linkage such for example as the combination of levers and links shown at 17, 18, 19 and 20. The levers 20, only one of which is shown, are pivoted on the frame 13 as at 21 and are actuated by a pair of double acting hydraulic jacks one of which is shown



at 22 for tilting the bucket 15. A second pair of double acting hydraulic jacks, one of which is shown at 23, actuate the frame 13 for lifting and lowering the bucket. Hydraulic jacks 22 and 23 are actuated by hydraulic pressure through suitable valves controlled by a pair of levers, one of which is shown at 25 adjacent the operator's station. In a normal operating cycle of the bucket, the machine is driven forwardly while the bucket is positioned at ground level in its load position as shown in full lines. A maximum amount of material is maintained in the bucket by rack-back movement to the position indicated at 15*a* in broken lines, after which the lift frame 13 is raised by extending the jacks 23. The load is transported with the bucket in its carry position shown in broken lines at 15*b* and the load is discharged from the bucket by retracting jacks 22 so that the bucket tilts forwardly as indicated at 15*c*.

To return the bucket to its loading position, as illustrated in full lines, for the initiation of another cycle of operation the jacks 23 are retracted to lower the frame 13 and the jacks 22 are extended to swing the bucket upwardly from its dump position to its load position.

The mechanism for automatically stopping the tilting action of the bucket when it reaches its load position, which enables the operator to give his entire attention to the proper positioning of the lift frame 13, is best shown in FIG. 2 wherein the bucket tilt control valve is generally indicated at 28 and a control cam 29 is shown for actuating a piston 30 of a master cylinder 31 which actuates a piston 32 in a slave cylinder 33. In this view, a spool 35 of the control valve 28 is shown in an open position to which the operator moves it just prior to actuating the control valve for lowering the lift frame 13. The valve is held in this open position against the force of a spool centering spring 36 by a detent 37 which engages a notch 38 in the spool. In this open position hydraulic fluid under pressure from a source not shown enters the valve through an opening 40 and is free to flow as through a conduit 41 to the head ends of the tilt jacks represented at 22. This extends the jacks for moving the bucket toward its load position and permits the discharge of fluid from the rod ends of the jack through a conduit 43 for return to the reservoir, not shown, through an outlet 44 of the valve.

The detent 37 is biased toward its latching position in the notch 38 by a spring 45 which engages the piston 32 in the slave cylinder of which the detent 37 is a part, and it is retracted to permit closing of the valve 38 by its centering spring 36 when the bucket reaches its load position. This is accomplished by actuating piston 30 of the master cylinder 31 to advance the piston against the retracting bias of a spring 47 in the cylinder. When the piston 30 is advanced into its cylinder, hydraulic fluid therein is directed through a conduit 48 to the slave cylinder 33 to retract the piston 32 therein freeing the detent 37 from the notch 38.

A reservoir 50 communicates with the closed hydraulic circuit including the master and slave cylinders through suitable passages and a spring closed check valve 51 to maintain the system full and to receive excess fluid therefrom if the valve spool 35 is adjusted to the position shown while the piston 30 is advanced into the master cylinder. A pin 54 projects into a slot in the piston 30 to limit its stroke. An oil make-up port 61 and a pressure relief port 62 communicate between the reservoir 50 and cylinder 31. Port 61 supplies oil to the cylinder when the piston is retracted and port 62 vents pressure, which might escape past the piston head, back to the reservoir. Advancing the piston 30 to effect retraction of the detent 37 is accomplished by the cam 29 which is carried on a tubular member 52 pivoted as at 53, as also shown in FIG. 1, concentric to the pivotal connection between the rod of one of

the jacks 22 and one of the levers 20. The tubular member 52 is guided for sliding movement on a rod 55, the outer end of which is secured as by a bracket 56 to the jack 22 so that upon extension and retraction of the jack the tubular member and the cam 29 move relative to the jack and to a roller 57 on the rod of the master cylinder piston 30, the master cylinder being fixed with respect to the jack 22. Consequently, by positioning the cam on the tube 52 the control valve 28 may be caused to close with the bucket in any desired position for loading. Adjustment of the cam relative to the rod 52 is accomplished by loosening two bolts 58 which clamp together complementary separable halves, one of which is shown at 59, formed as a part of the cam to embrace the rod 52. In this manner the loading position of the bucket may be varied when it is being operated under different conditions or in different types of material.

I claim:

1. In combination with a material handling bucket which is pivoted to a lift frame of a loader for movement between a load position and a carry position, a hydraulic jack for effecting such movement and a spring closed valve for controlling the flow of fluid under pressure to said jack means including a detent for latching said valve in an open position to cause movement of the bucket toward load position, said last named means including a closed hydraulic circuit separate from the circuit which actuates said jack means to retract the detent through the medium of hydraulic pressure in said closed circuit, and means actuated in response to relative movement of the jack cylinder and piston to produce said pressure.

2. The combination of claim 1 in which the means to retract the detent comprises a slave cylinder with a piston connected to the detent and a master cylinder communicating with the slave cylinder and disposed adjacent the jack.



3. The combination of claim 2 in which the master cylinder has a piston with a projecting rod, and cam means movable relative to the jack upon actuation thereof to engage the rod and advance the piston into the master cylinder.

4. The combination of claim 3 in which the cam means is adjustable to vary the load position of the bucket.

5. In a loader having a lift frame, a bucket pivoted to the lift frame for movement between a carry position, a dump position and a load position, lever means connected to the bucket, a hydraulic jack having a piston rod connected to said lever means for moving the bucket, and a spring closed valve for directing fluid under pressure to said jack, a latch for holding said valve open to direct fluid to the jack for moving the bucket toward load position, a master-slave hydraulic cylinder assembly to retract said latch when the bucket reaches load position, means connecting the slave cylinder with the latch, and means actuated by movement of the piston rod relative to the jack for energizing the master cylinder.


References Cited in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| Re. 24,746 | Pilch | Dec. 8, 1959 |
| 2,065,176 | Engel | Dec. 22, 1936 |
| 2,305,302 | Mazur | Dec. 15, 1942 |
| 2,755,776 | Morris | July 24, 1956 |
| 2,759,456 | Court | Aug. 21, 1956 |
| 2,883,077 | Pilch | Apr. 21, 1959 |
| 2,884,222 | Oakes | Apr. 28, 1959 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 1,068,273 | France | Feb. 3, 1954 |