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D. R. MUELLNER ETAL
ADJUSTABLE VALVE CONTROL MECHANISM
FOR TRACTOR MOUNTED LOADERS

3,155,252

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2 Sheets-Sheet 1

FIG. 1.

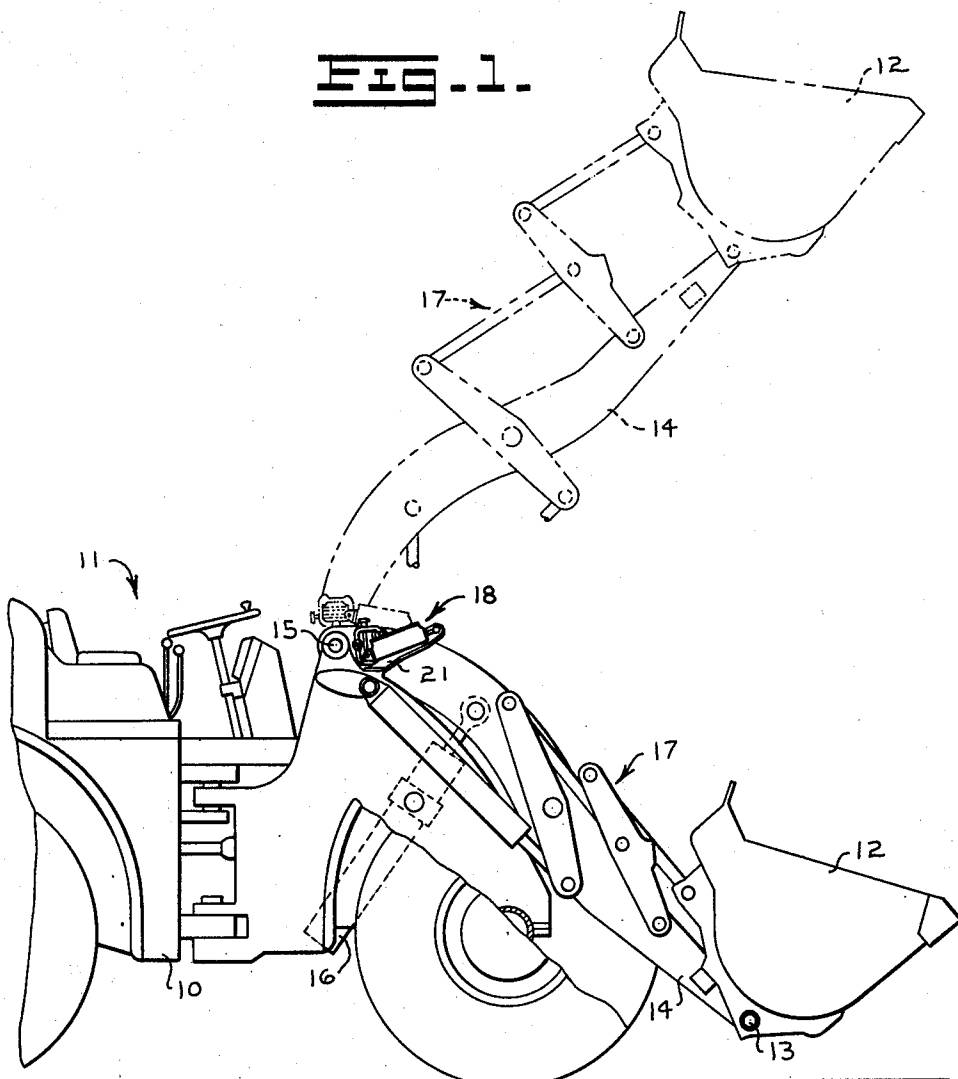
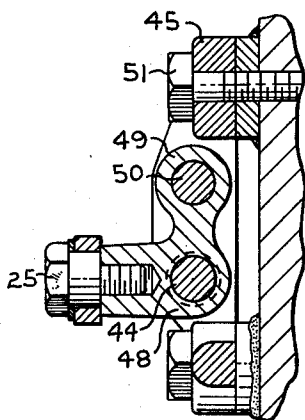


FIG. 4.



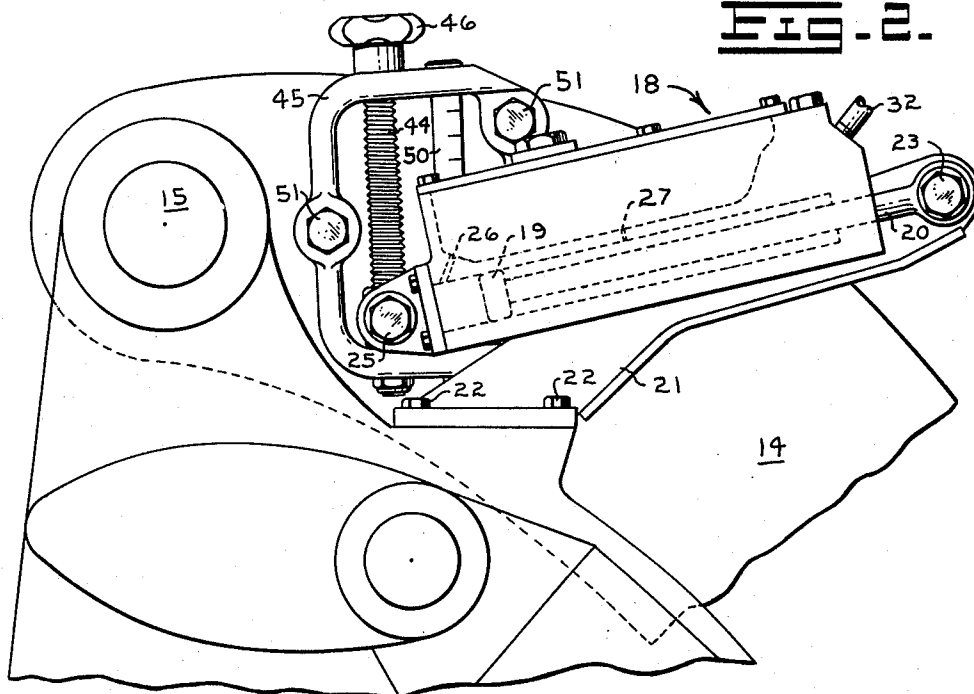
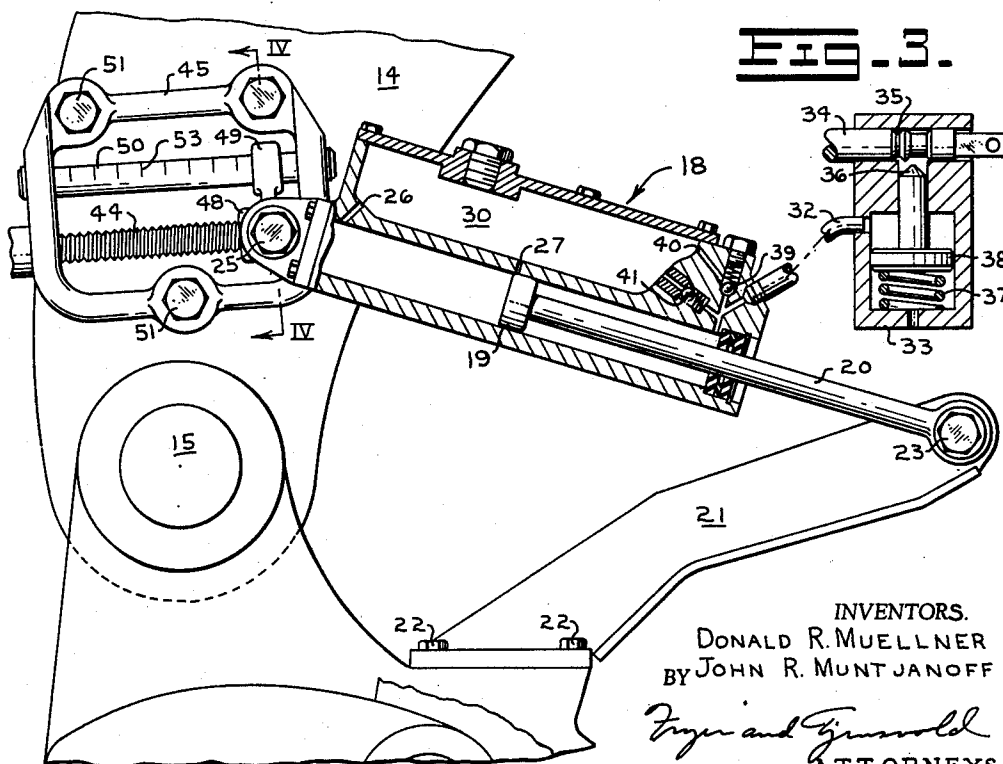
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ADJUSTABLE VALVE CONTROL MECHANISM FOR TRACTOR MOUNTED LOADERS

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4 Claims. (Cl. 214—140)

This invention relates to adjustable means for auto-
matically controlling the height to which a loader bucket
is raised by effecting release of detent mechanism which
holds a control valve in its bucket-raised position.

Operation of present day earth moving equipment re-
quires operator attention to numerous controls in addi-
tion to driving of the tractor upon which the equipment
is mounted. For example in a tractor mounted loader
bucket, after the bucket is loaded by crowding into the
material to be handled it must be racked back to a carry
position by operation of one valve, then raised by lift
arms which are pivotally attached to the tractor by op-
eration of another valve, then transported by manipula-
tion of the tractor control and thereafter dumped also
by operation of a valve. Raising of the bucket requires
time and attention of the operator to insure that the mo-
tion of the lift arms is stopped when the bucket has at-
tained a proper height. Consequently operator time and
the duration of a complete operating cycle can be short-
ened by means for automatically discontinuing the raise
cycle or stopping the bucket at a predetermined height.
Such a mechanism is shown for example in our assignee's
copending application of Robert G. McIndoo for "Trip
Mechanism for Automatically Positioning Vehicle
Loaders," filed July 9, 1962, Serial No. 208,303.

It is desirable that a bucket be raised only to a predeter-
mined height which varies during different operations.
For example in loading a truck or bin, the bucket should
be raised only to the height for convenient dumping to
insure that all of its contents are deposited in the truck
or bin without the necessity of lowering the bucket before
dumping its contents. Furthermore in operating in mines,
tunnels or other locations with height limiting overhead
structures, a limit is imposed upon the height to which
the bucket is raised. In many operations, it is essential
that the height at which the bucket is stopped be varied
many times during the day and it is, therefore, desirable
that the means for adjusting the height and controlling
mechanism be readily available to and easily operable
from the operator's station.

It is the object of the present invention to provide an
automatically operating and infinitely variable bucket
height adjusting means for a bucket loader meeting the
above requirements through simple and positively actu-
ating mechanisms.

Further objects and advantages of the invention and
the manner in which it is carried into practice are made
apparent in the following specification by reference to
the accompanying drawings.

In the drawings:

FIG. 1 is a view in side elevation of the front por-
tion of a tractor mounted bucket loader of a conventional
type with the adjustable valve control mechanism of the
present invention in place thereon;

FIG. 2 is an enlarged fragmentary view in side eleva-
tion of the mechanism of the present invention illus-
trated with the bucket lift arms in their lowered posi-
tion;

FIG. 3 is a similar view with parts in section with
the bucket lift arms in their raised position and showing
a portion of a valve controlled thereby; and

FIG. 4 is a sectional view taken on the line IV—IV
of FIG. 3.

In FIG. 1 of the drawings, a tractor is partially shown
at 10 as having an operator's station, generally indicated
at 11. A loader bucket 12 is pivoted as at 13 to the
forward ends of a pair of lift arms, one of which is
shown at 14. The lift arms are pivoted to the tractor
as at 15 so that they may be operated between the
lower position indicated in full lines and their raised
position shown in broken lines by means of hydraulic
jacks, one of which is shown at 16. Tilt linkage, gen-
erally indicated at 17, is operable in a well known manner,
not necessary to an understanding of the present inven-
tion, for tilting or varying the angularity of the bucket
about its pivotal connection 13 with the lift arms.

The present invention includes a master cylinder shown
at 18 in FIGS. 1, 2 and 3 with a piston 19 reciprocally
mounted therein and having a piston rod 20 pivotally
connected at its outer end at 23 with a bracket 21 fixed
with respect to the frame of the tractor to which it is
secured as by cap screws shown at 22. The cylinder
18 is pivotally connected to one of the lift arms 14 by
adjustable means presently to be described in detail,
the pivotal connection being in the form of a shoulder
screw 25 shown in FIGS. 2, 3 and 4. Consequently upon
raising movement of the lift arms 14, the pivot screw
25 describes an arcuate path about the center of the
pivot point 15 between the lift arms and the tractor mov-
ing from the position shown in FIG. 2 to that shown
in FIG. 3. During the initial part of this arcuate travel
of the pivot point 25, it moves a short distance toward
the pivotal connection 23 of the piston rod causing rela-
tive inward movement of the piston and cylinder. The
entire cylinder is filled with hydraulic fluid and this in-
ward movement is permitted by ports, one shown at 26
in the head end of the cylinder and one shown at 27
which is in the rod end of the cylinder when the piston
is advanced as shown in FIG. 2 and both communicat-
ing between the cylinder and a reservoir 30 for hydraulic
fluid adjacent thereto.

Thus upon inward movement of the piston from the
position shown in FIG. 2, fluid is free to flow between
the head end and rod end of the cylinder. Upon con-
tinued upward movement of the lift arms 14, and when
the pivot point 25 passes through a line between pivot
points 15 and 23, the arcuate path recedes from the pivotal
connection 23 between the piston rod and the bracket 21
so that the effective movement of the piston in the cylinder
is toward the right as viewed in FIGS. 2 and 3. This
movement is also accommodated by the ports 26 and 27
which permit flow of fluid between the head and the rod
ends in the cylinder until such time as the piston passes
the port 27 as shown in FIG. 3 when the fluid in the rod
end is subject to pressure and this pressure is communi-
cated through a line 32 to a slave cylinder as shown at 33.
This slave cylinder is associated with a spool valve which
controls raising and lowering of the lift arms and includes
detent mechanism for holding the spool of the valve in
the position to which it is moved for raising the lift arms.
Such spool valves are well known, one being shown in
the copending application referred to above and another in
our assignee's copending application of Henry E. Beck
entitled "Automatic Positioning Device for Material Hold-
ing Bucket," Serial No. 78,631, filed December 27, 1960.
For the purposes of the present invention, it will suffice
to know that the spool of such a valve, a portion of which
is shown at 34, has a notch 35 engaged by a detent 36
when the spool has been shifted to effect raising of the lift
arms by directing fluid to the head end of jacks 16 shown
in FIG. 1. The detent 36 is held in engagement with the
notch 35 by the force of a spring 37 behind a piston 38
in the slave cylinder 33. Thus when pressure rises in the
rod end of master cylinder 18, it is communicated to the
slave cylinder 33 to retract the piston and detent against

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the force of the spring 37 permitting the spool 34 to return to its neutral position under influence of a centering spring (not shown) which forms a part of the spool valve. Excessive pressure in the rod end of the master cylinder 18 is relieved to the reservoir by means of a check valve 39 and a port 40 and any deficiencies of fluid in the rod end of the master cylinder can be made up through a check valve 41.

In order to vary the height at which the lift arms and bucket are automatically stopped, the distance between the pivotal support 25 of the master cylinder and the pivotal connection 23 is made adjustable so that the position of the lift arms when the port 27 is closed by the piston 19 is varied. This adjustment is accomplished by a jack screw 44 mounted for rotation in a bracket 45 and having a hand wheel 46 for effecting rotation thereof. The jack screw has a threaded connection with a nut 48 (see also FIG. 4) to which the slave cylinder is also connected by the screw 25. The nut 48 has an extension 49 slidable on a rod 50 which is also carried by the bracket 45 and the bracket is fixed to one lift arm 14 as by cap screws 51. Thus rotation of the jack screw effects movement of the pivot point 25 longitudinally of the screw and varies the position with respect to the pivotal connection 23 so that raising movement of the bucket is stopped at any desired point above a substantially horizontal lift arm position utilizing the geometry of the disclosure. It should be realized that the linkage involved can be modified to stop the bucket at any desired elevation without departing from the scope of the invention. The pitch of the threads on the jack screw is such as to allow infinitely small adjustments quickly and easily. The rod 50 upon which the extension 49 of the nut slides may be calibrated as indicated at 53 to provide visible indication of the elevation at which the bucket will automatically come to rest. The location of the adjusting means

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is such that it is readily available to a person at the operator's station and thus very easily manipulated.

We claim:

1. In a tractor mounted loader having a bucket supported on lift arms pivoted to the tractor and adapted to be raised by fluid motor means, a control valve for directing fluid to said motor means upon adjustment away from a normal neutral position, means to hold the valve in said position of adjustment and means to release the valve when the bucket attains a predetermined height, said last named means comprising, a master cylinder and piston pivoted between a fixed point on the tractor and a point on a lift arm whereby movement of the lift arm creates pressure in the master cylinder, a slave cylinder having a piston operable under pressure to release the control valve, and means for communicating pressure from the master cylinder to the slave cylinder.

2. The combination of claim 1 with a reservoir for fluid communicating with the master cylinder through a port adjacent one end of the master cylinder and a second port intermediate its ends whereby movement of the piston in the cylinder between said ports is free and movement beyond the second port creates pressure.

3. The combination of claim 2 in which one pivotal connection of the master cylinder and piston is adjustable to vary the position at which the control valve is released to stop raising of the bucket.

4. The combination of claim 3 in which the adjustable means includes a rotatable jack screw, a nut on said screw, and in which one pivotal connection of the master cylinder and piston is carried by said nut.

References Cited in the file of this patent

UNITED STATES PATENTS

3,122,247 Beck Feb. 25, 1964