Sept. 7, 1965 H. H. WASHBOND 3,204,794

AUTOMATIC BOOM CONTROL

Filed Nov. 4, 1963 2 Sheets-Sheet 1

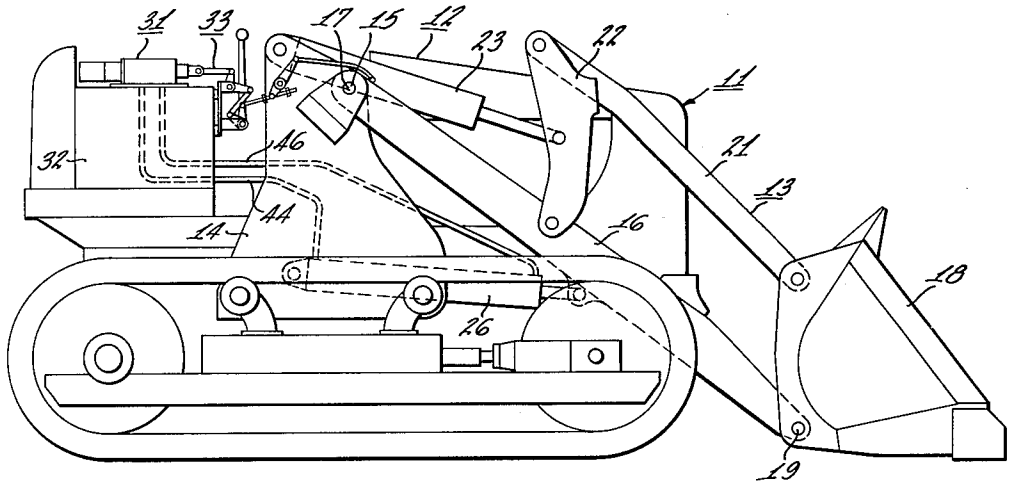


Fig. 1

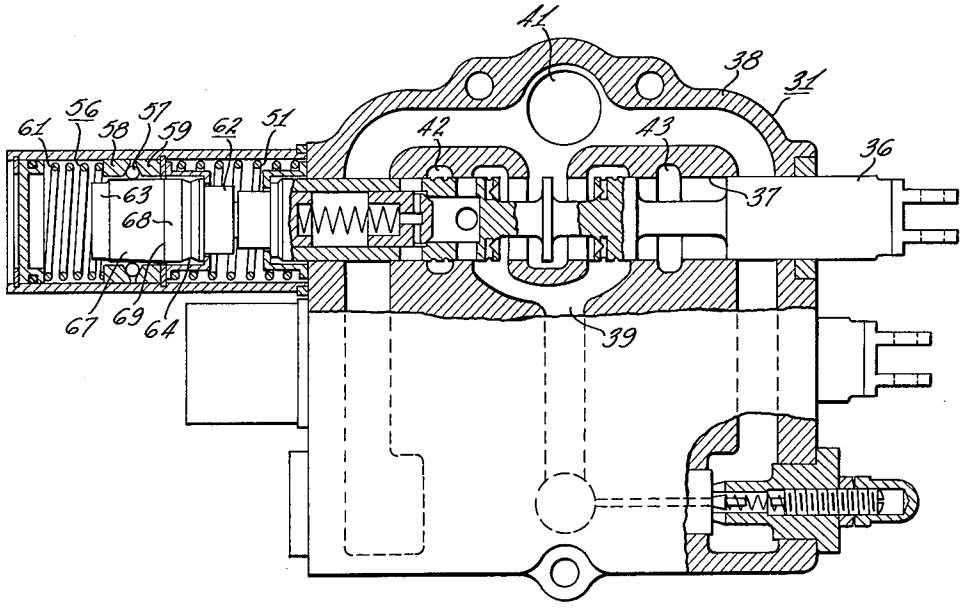


Fig. 2

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AUTOMATIC BOOM CONTROL

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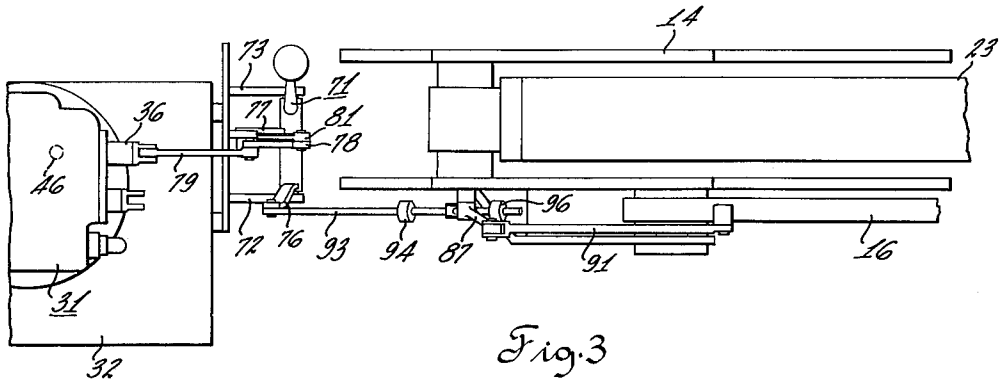


Fig. 3

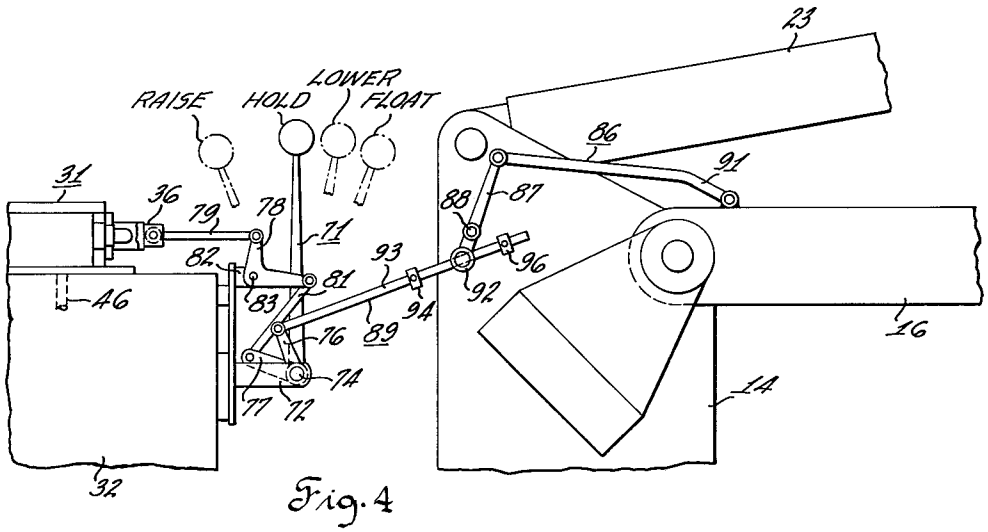


Fig. 4

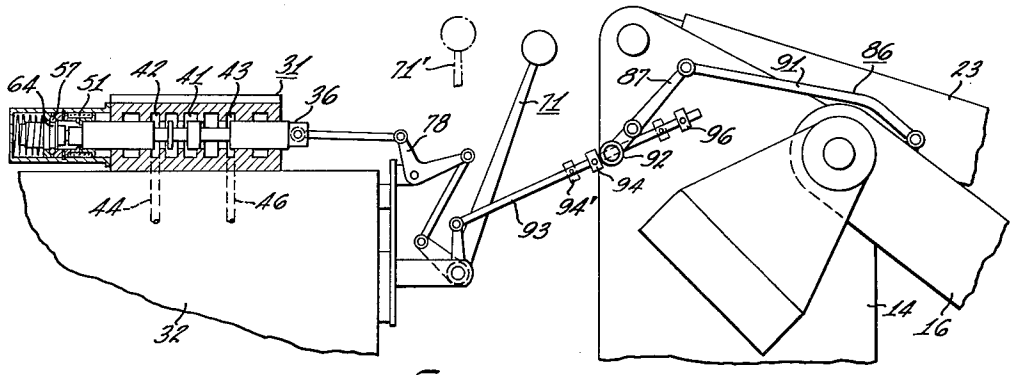


Fig. 5

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AUTOMATIC BOOM CONTROL

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3 Claims. (Cl. 214—140)

This invention relates to an automatic boom control wherein the valve for operating the boom controlling motor is automatically moved to its hold position when the boom has reached predetermined elevated and lowered positions.

Heretofore kickout devices have been provided for returning a control valve to a neutral or hold position when the boom of a loader is raised to a predetermined height. Such devices are desirable in that the operator's hands are free for other functions while the boom is being raised. The present invention not only returns the valve for the boom controlling motor to a hold position when the boom is raised to a predetermined elevation, but also returns the valve to a hold position when the boom is lowered to a predetermined position with the valve in its float position.

It is an object of this invention to provide an automatic boom control wherein the valve for operating the boom controlling motor is automatically returned to its hold position from its raise and float positions when the boom has moved to its elevated position and lowered position, respectively.

It is a further object of this invention to provide an automatic boom control wherein the float position of the valve for operating the boom controlling motor is detented and wherein the nondetented lower position of the valve is intermedliate the hold and float positions, thus permitting the operator to move the valve to its lower position to power down on the material handling attachment connected to boom subsequent to the valve having been kicked out of its detented float position.

It is a further object of this invention to provide an atuomatic boom control for a tractor shovel which is comprised of mechanical elements insuring good reliability, low cost manufacture and easy servicing.

These and other objects of this invention will be apparent to those familiar with the art when the following description is read in conjunction with the drawings, in which:

FIG. 1 is a side view of a tractor shovel in which my invention is incorporated;

FIG. 2 is a section view of the valve for controlling the double acting hydraulic jack employed for raising and lowering the shovel;

FIG. 3 is a top view of the control linkage for the valve illustrated in FIG. 2;

FIG. 4 is a side view of the valve operating linkage shown in FIG. 3; and

FIG. 5 is a side view similar to FIG. 4 but showing the control valve in its detented float position.

Referring to FIG. 1, the illustrated tractor shovel **11** is comprised of a tractor **12** with a frame **14** on which a loader **13** is mounted. The loader **13** includes a boom **16** pivotally connected at its rear end to the frame **14** of the tractor on a transverse pivot axis **17** by a pin **15**. A material handling attachment in the form of a bucket **18** is pivotally connected to the front end of the boom **16** by pin **19** and an adjusting linkage including link **21**, lever **22** and jack **23** is provided for pivoting the bucket **18** about pin **19** between carrying and dumping positions. The boom is raised and lowered by a fluid motor in the form of a double acting hydraulic jack **26** pivotally connected at its opposite ends to the frame **14** and boom **16**, respectively. A control valve **31** for operating the jack **26** is mounted on top of a fluid reservoir **32**. The valve

31 is operated by control means **33** at the operator's station.

Referring to FIG. 2, the control valve **31** includes a flow control element in the form of a spool **36** which is reciprocably mounted in a bore **37** of a valve housing **38**. The valve **31** is of the open center type and has raise, lower, hold and float positions. In the hold position illustrated in FIG. 2, fluid delivered through inlet passage **39** flows to reservoir return passage **41**. In the neutral or hold position, and jack supply ports **42**, **43** are blocked. The ports **42**, **43** are connected to hoses **44**, **46**, respectively, which in turn are connected to jack **26**, as shown in FIG. 1. A centering means **51** is provided to resiliently urge the control valve spool **36** to its hold position, as shown in FIG. 2. The centering means **51** does not exert sufficient force to urge the spool **36** out of its detented raise and float positions. The detent means **56** includes a series of circumferentially spaced balls **57**, wedging members **58**, **59**, a spring **61** and an end portion **62** on spool **36** which has recessed portions **63** and **64** in axially spaced relation to one another. The end portion **62** has a slightly tapered conical portion **67** which gradually increases in diameter from its left terminus to the cylindrical portion **68**. The juncture of surfaces **67**, **68** form a slight angular edge **69** which provides feel for the operator when the valve spool **36** is moved to a position where the balls **57** ride over the edge, which position is the lower position of the spool **36**.

Referring to FIGS. 3 and 4, a manual control member in the form of a lever **71** is pivotally connected by a pin **74** to a pair of brackets **72**, **73** extending from the reservoir **32**. The control lever **71** has a pair of arms **76**, **77** rigidly secured thereto, arm **77** being connected to the flow control element **36** through a bell crank **78** and links **79**, **81**. Bell crank **78** is pivotally connected by a pin **83** to a bracket **82** on the reservoir **32**.

Motion responsive means **86** are provided between the flow control element **36** and the boom **16** for automatically moving the flow control element out of its detented raise and float positions toward its hold position when the boom is moved by the jack **26** to predetermined elevated and lowered positions, respectively. The motion responsive means **86** includes a first thrust transmitting member in the form of a lever **87** pivoted by pin **88** to the frame **14** and a second thrust transmitting member **89** pivotally connected to arm **76** of the control lever **71**. A link **91** pivotally interconnects the lever **87** to the boom **16**. The lever **87** has a thrust transmitting head portion **92** which slidably engages the rod **93** of member **89**. A pair of spaced abutments **94**, **96** are secured to the rod **93**, abutment **96** being engaged by the thrust transmitting member **87** when the boom is moved by the jack **26** to its elevated position and abutment **94** being engaged by member **87** when the boom is moved to its lowered position with the flow control element **36** in its float position.

Referring to FIG. 5, the flow control element **36** is shown in its float position and it will be noted that in this position the ports **42**, **43** are open to the reservoir return passage **41**. In the float position of the spool **36** the balls **57** of the detent means engage recess **64** and control lever **71** occupies its extreme forward position as illustrated. The boom, as illustrated in FIG. 5, has just reached its predetermined lowered position wherein the thrust transmitting member **87** engages abutment **94** which results in the spool **36** being moved to the right sufficiently to cause balls **57** to cam out of the groove **64**. When this occurs the centering means **51** will move the valve through the lower position to the hold position illustrated in FIG. 2. When the control valve is moved to its hold position, lever **71** will move to its hold position as illustrated by the dash lines **71'** in FIG. 5, and

abutment **94** will move to the position illustrated by dash lines **94'** in FIG. 5. Thus, after the automatic kickout mechanism **86** has moved the control valve out of its detented float position through engagement of the thrust transmitting member **87** and abutment **94**, the operator can move the control valve to its lower position by virtue of the spacing of the abutment member **94** and thrust transmitting member **87** in this position. Accordingly, the operator can power down on the shovel to effect digging or excavating operation after the control valve spool **36** has been kicked out of its detented float position.

From the foregoing description, it is apparent that this invention provides additional operator convenience which saves operator time in that the control valve for the boom jack is automatically returned to a hold position when the loader boom reaches a predetermined elevated position and a predetermined lowered position, with the valve in float position. Also my automatic boom control is designed so that the operator can move the boom control valve to its lower position, which is not detented, to power down on the shovel after the kick out mechanism has returned the valve to its hold position from its float position.

Having now particularly described and ascertained the nature of my said invention and the manner in which it is to be performed, I declare that what I claim is:

1. In combination with a tractor,

a longitudinally extending boom pivoted at its rear end on said tractor for vertical swinging movement about a transverse pivot axis,

a material handling attachment secured to the front end of said boom,

a fluid motor interconnected between said tractor and boom for moving the latter about said transverse pivot axis between elevated and lowered positions,

a control valve on said tractor for said motor including a shiftable flow control element having spaced raise and float positions, a hold position between said raise and float position and a lower position between said hold and float position,

detent means for releasably holding said element in said raise and float positions only and

centering means operative to move said element to said hold position when moved out of said detented raise and hold positions, and

motion responsive means positioned between said flow control element and boom for automatically moving said flow control element out of its detented raise and float positions toward said hold position when said boom is moved to predetermined elevated and lowered positions, respectively, said control element being shiftable to said lower position immediately after its being automatically moved out of its float position without its incurring interference with said motion responsive means.

2. The structure set forth in claim **1** wherein said motion responsive means includes a first thrust transmitting member connected to said boom, a second thrust transmitting member connected to said flow control element and a pair of spaced abutments formed on one of said thrust transmitting members and engageable, respectively, by the other of said thrust transmitting members when said boom is moved by said motor to said predetermined elevated position and when said boom moves to said predetermined lowered position with said flow control element in its float position.

3. The structure set forth in claim **2** wherein said flow control element is movable to its lower position after having been moved out of its float position by said motion responsive means thereby permitting the boom to be moved below said predetermined lowered position.

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HUGO O. SCHULZ, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,204,794 September 7, 1965

Harry H. Washbond

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 5, "hold" should read -- float --.

Signed and sealed this 26th day of August 1969.

;EAL)
ttest:

lward M. Fletcher, Jr.
ttesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents