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Inoue

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[54] **DEVICE FOR SETTING THE INCLINATION OF THE BUCKET IN A BULLDOZER**

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[51] **Int. Cl.²** **E02F 3/64**
[58] **Field of Search** ..... 214/764, 762; 37/DIG. 1, 37/DIG. 19; 91/358 A

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Primary Examiner—M. H. Wood, Jr.
Assistant Examiner—John A. Pekar
Attorney, Agent, or Firm—Armstrong, Nikaido & Wegner

[57] **ABSTRACT**

The device for setting the inclination of the bucket of a bulldozer of the present invention comprises a tiltable bucket, a bucket tilting cylinder-piston assembly having a bottom side chamber and a head side chamber and connected to the bucket for tilting the same upwards or downwards when the bottom side chamber or the head side chamber is pressurized. A piston pump is operatively coupled with said bucket tilting cylinder-piston assembly so that the head side chamber thereof is pressurized when the bucket tilting cylinder-piston assembly moves to a position to tilt the bucket upwards to a predetermined position, while the bottom side chamber thereof communicates at all times to a sump of working fluid. The head side chamber of the piston pump communicates with the head side chamber of the bucket tilting cylinder-piston assembly through a bypass valve connected between an actuator valve and the bucket tilting cylinder-piston assembly or an orifice connected between the bucket tilting cylinder-piston assembly and the piston pump so that the head side chambers of the piston pump and an actuator cylinder-piston assembly are at all times pressurized by the working fluid thereby preventing air from entering and deteriorating the actuation thereof, while the bucket is permitted to be tilted beyond the predetermined inclination.

3 Claims, 8 Drawing Figures

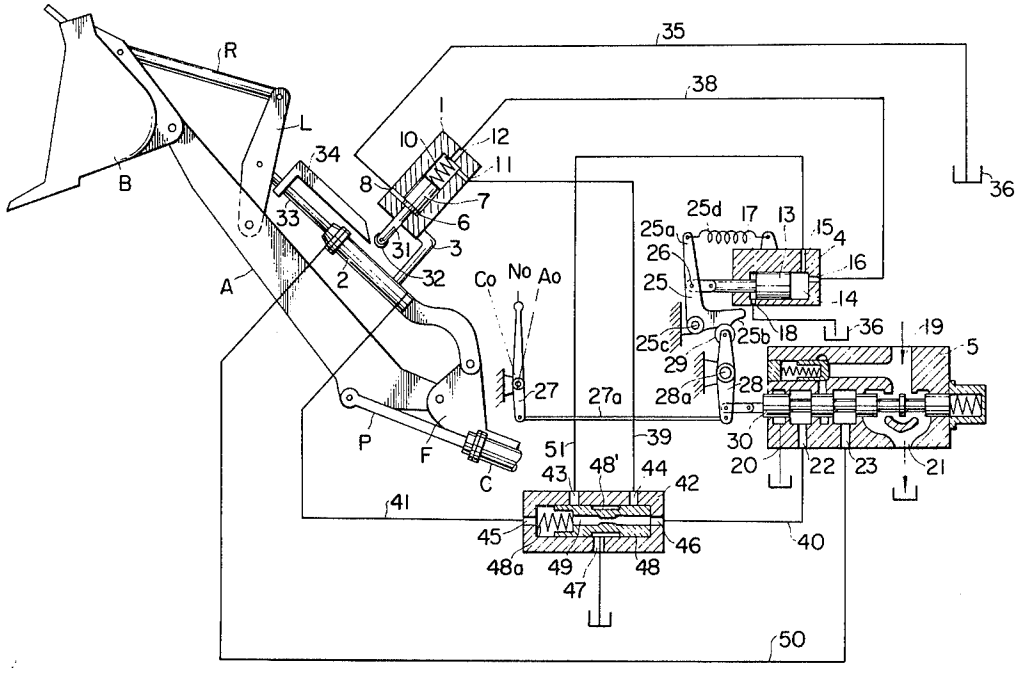
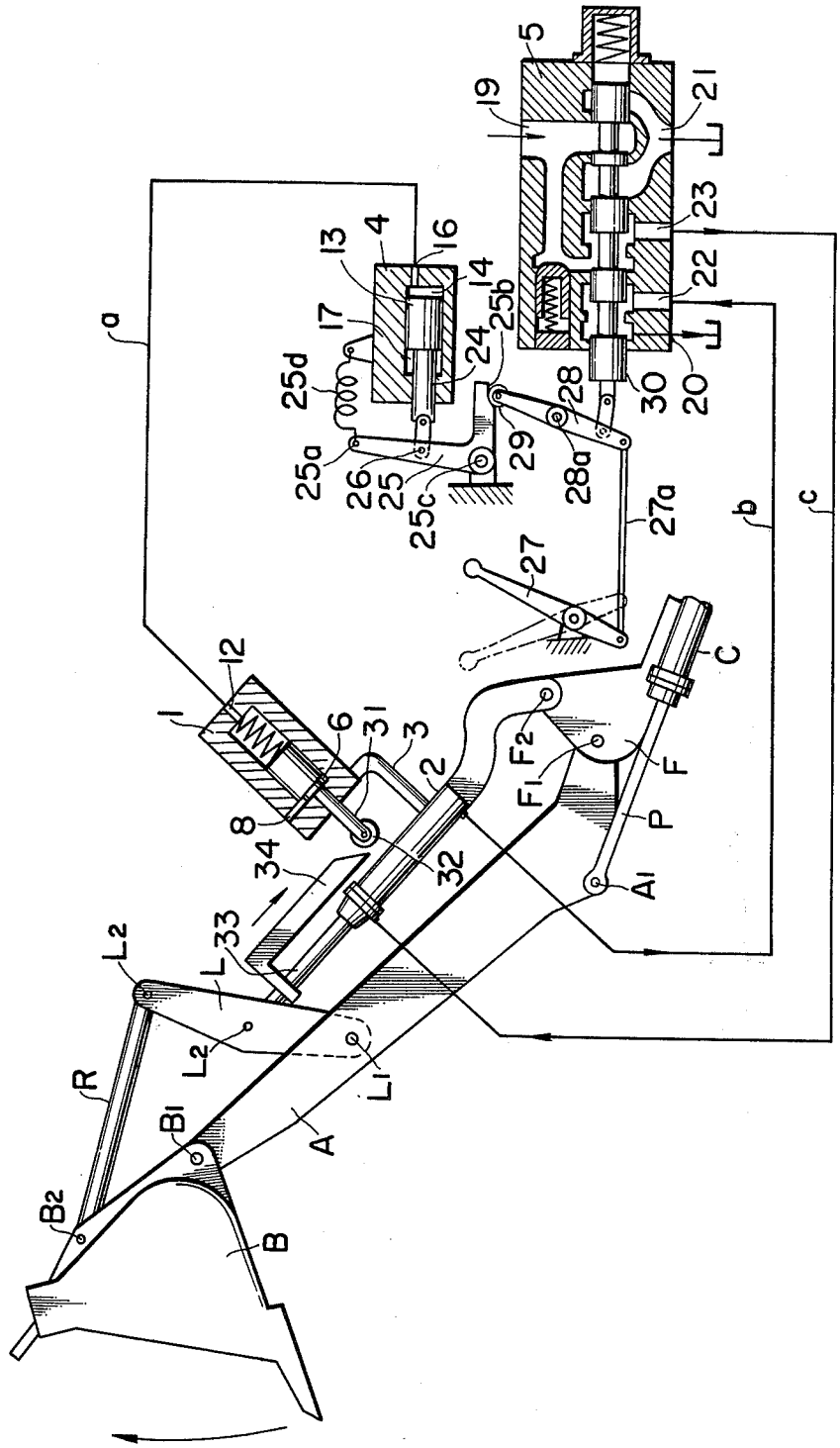


FIG. 1


a
b
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25a
25b
25c
25d
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27a
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28a
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30
31
32
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A1
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B1
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F
F1
F2
L
L1
L2
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P
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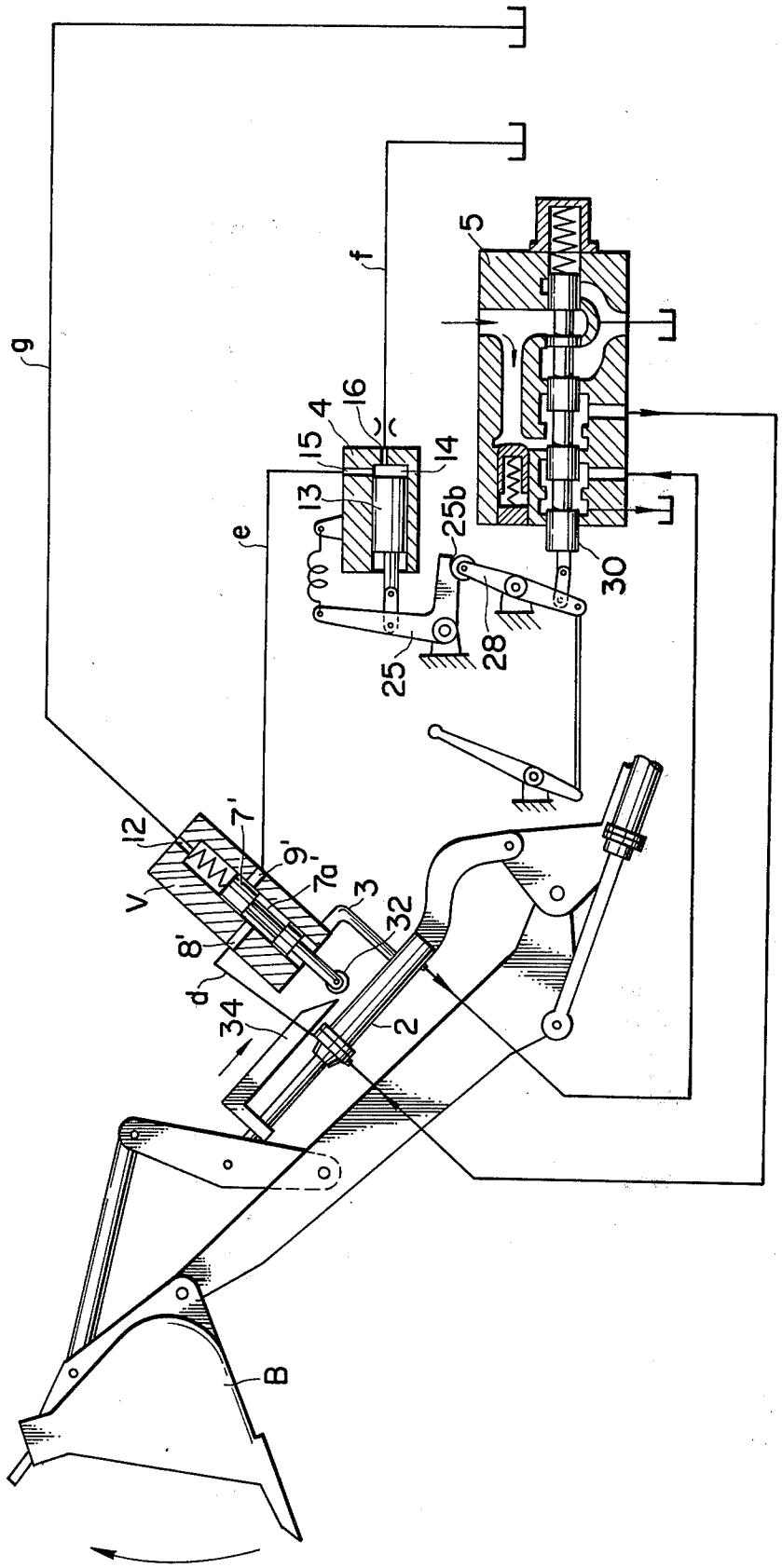


FIG. 2

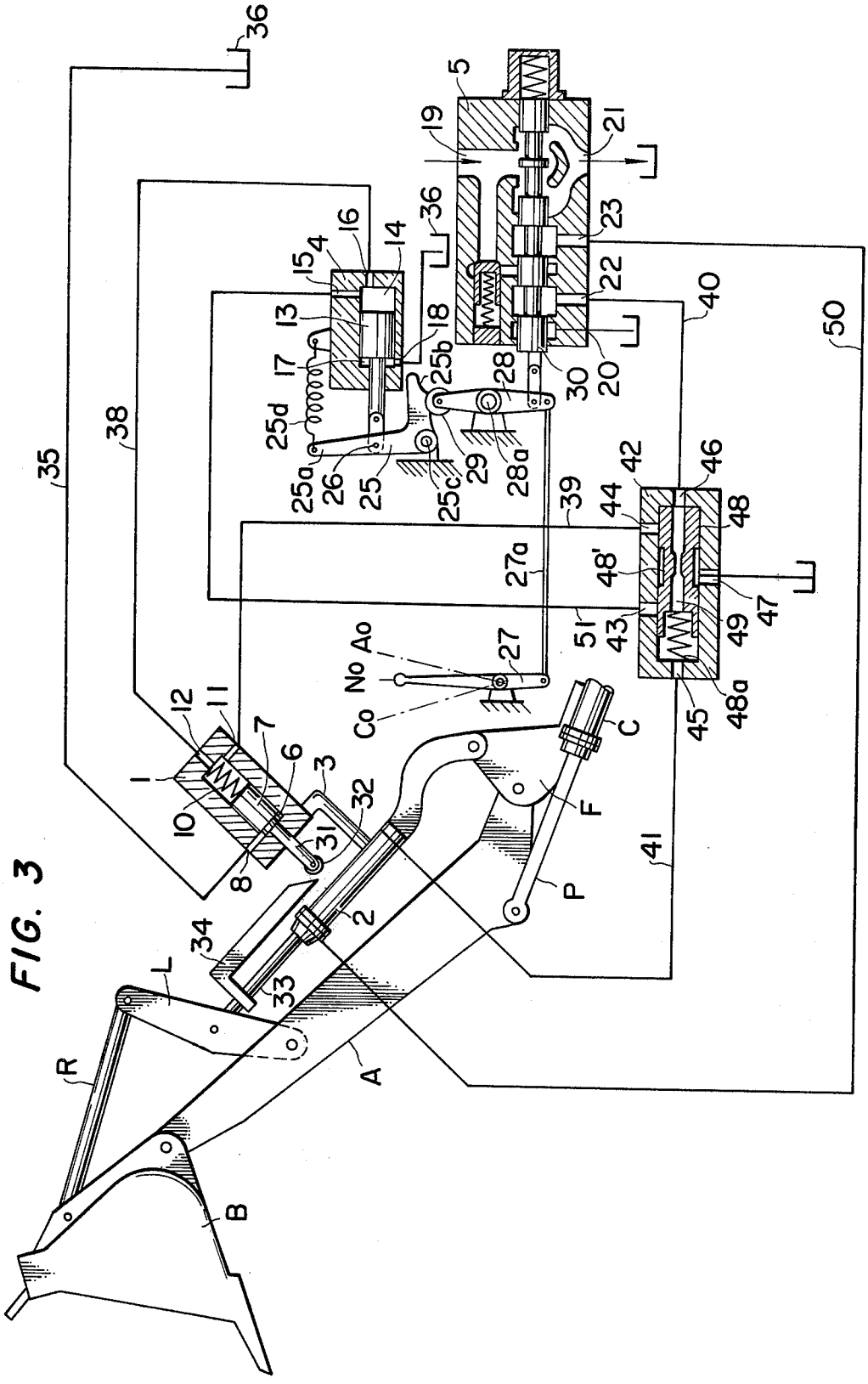

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36
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16
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4
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22
40
13
18
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17
25b
28
30
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38
25d
25a
26
25
25c
29
28a
42
46
35
39
44
48
27a
48'
47
51
43
49
27
No
Ao
Co
12
11
7
6
3
C
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32
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31
8
45
48a
41
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2
34
33
L
R
A
B

FIG. 3

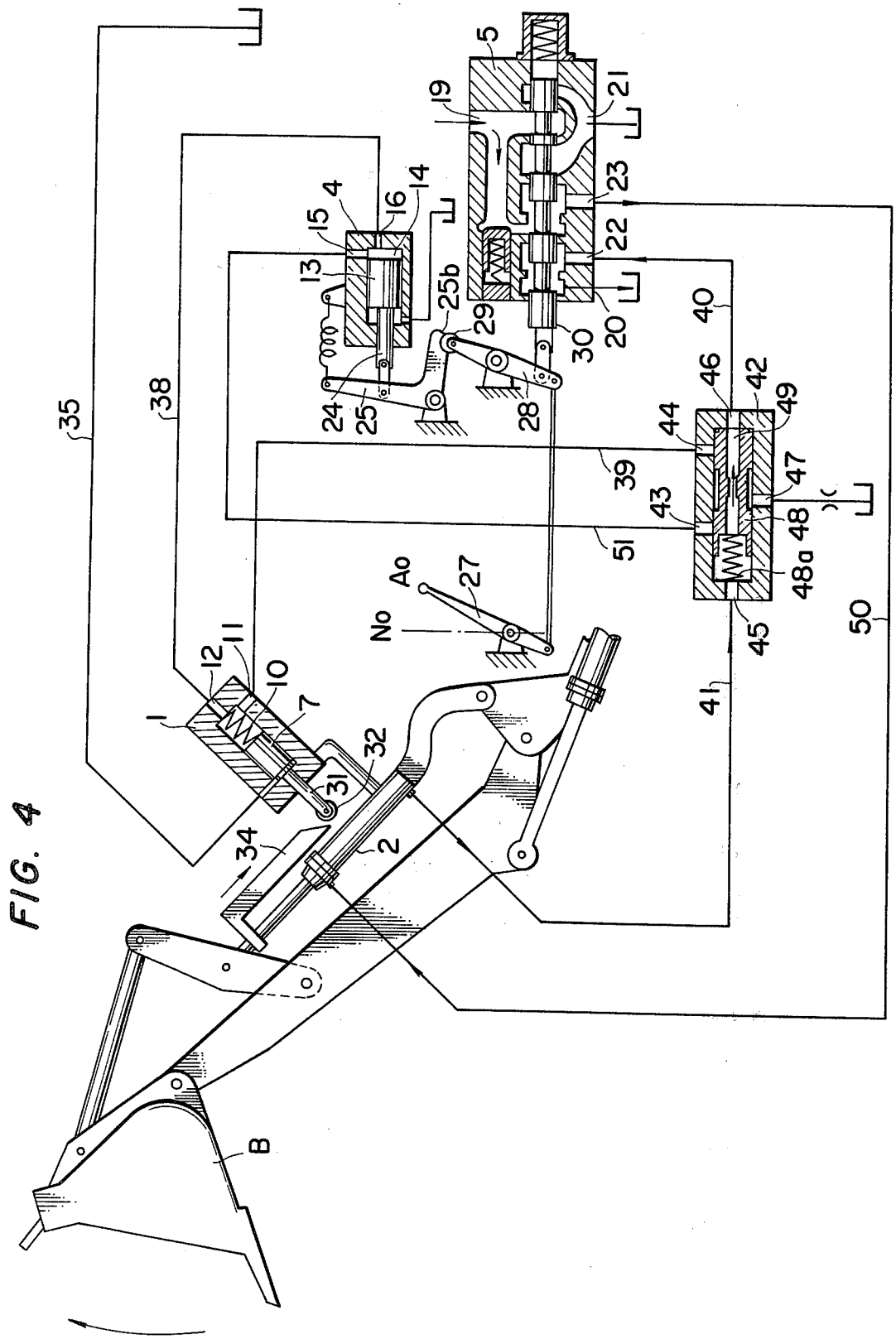

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48a
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34
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B

FIG. 4

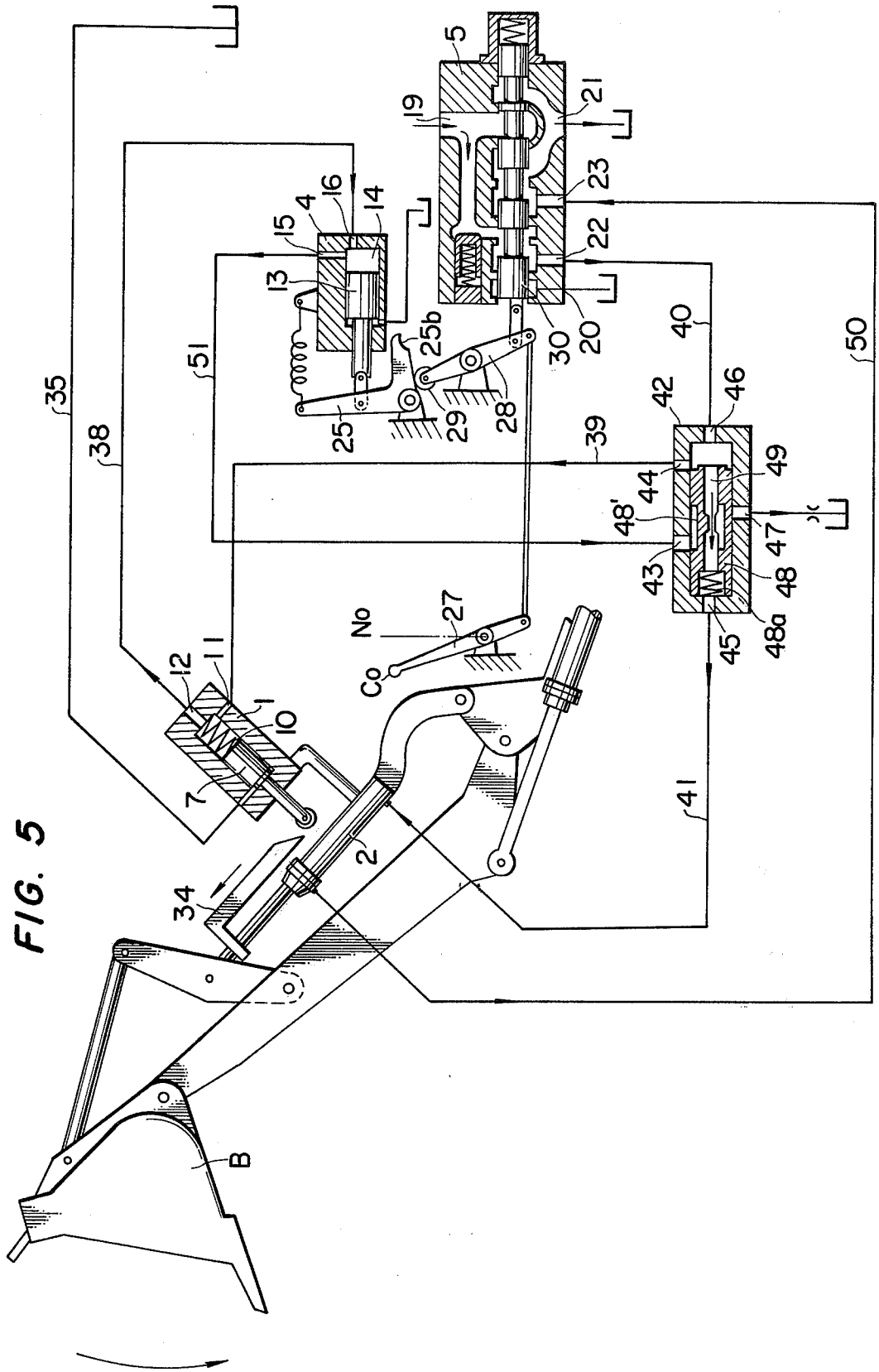

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48'
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48a
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No
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FIG. 5

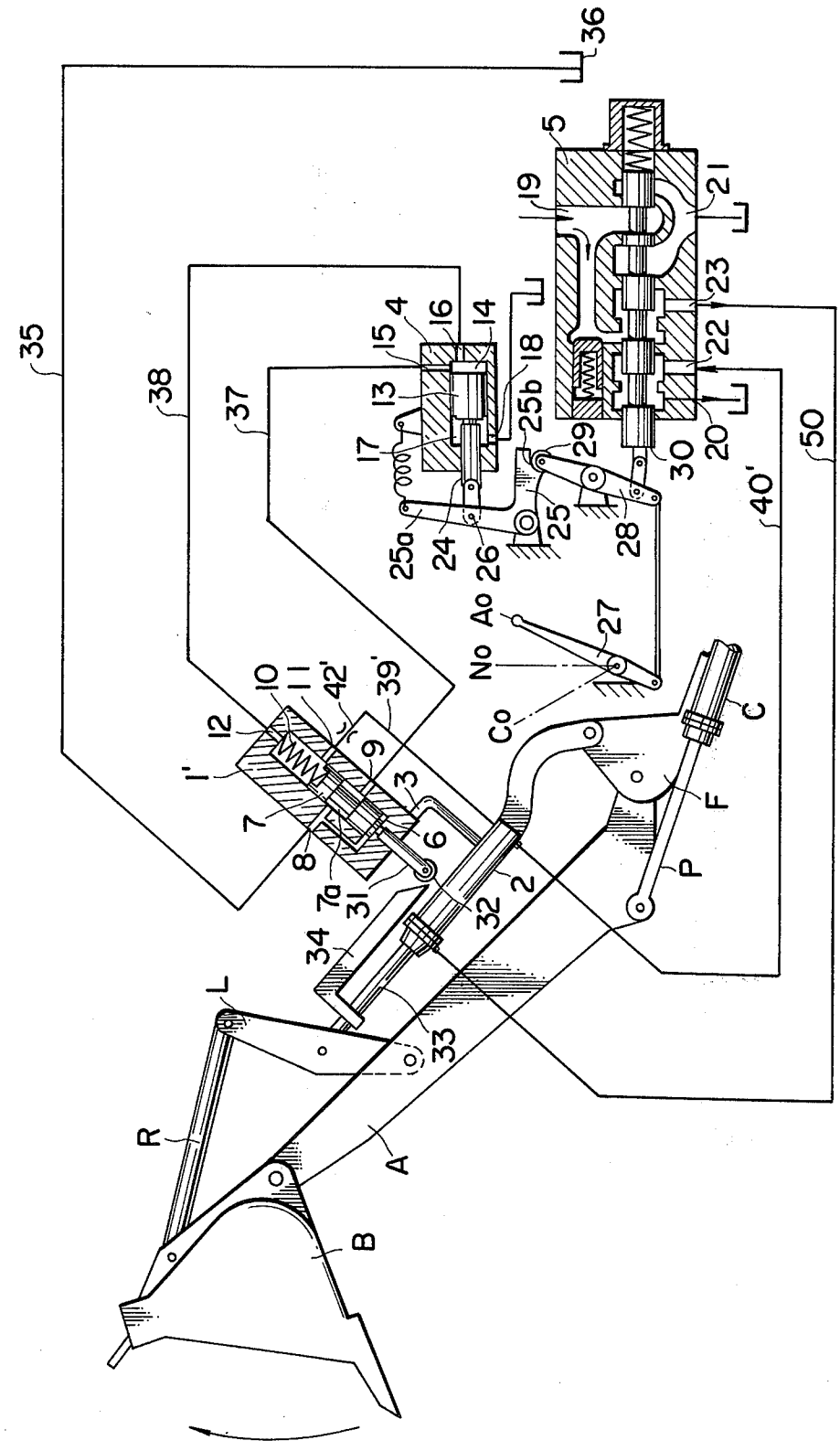

36
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22
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37
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25b
17
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30
50
40'
25a
24
26
25
28
Ao
No
27
Co
C
F
P
10
11
42'
39'
12
9
3
1'
7
8
6
7a
31
2
32
34
33
L
R
A
B

FIG. 6

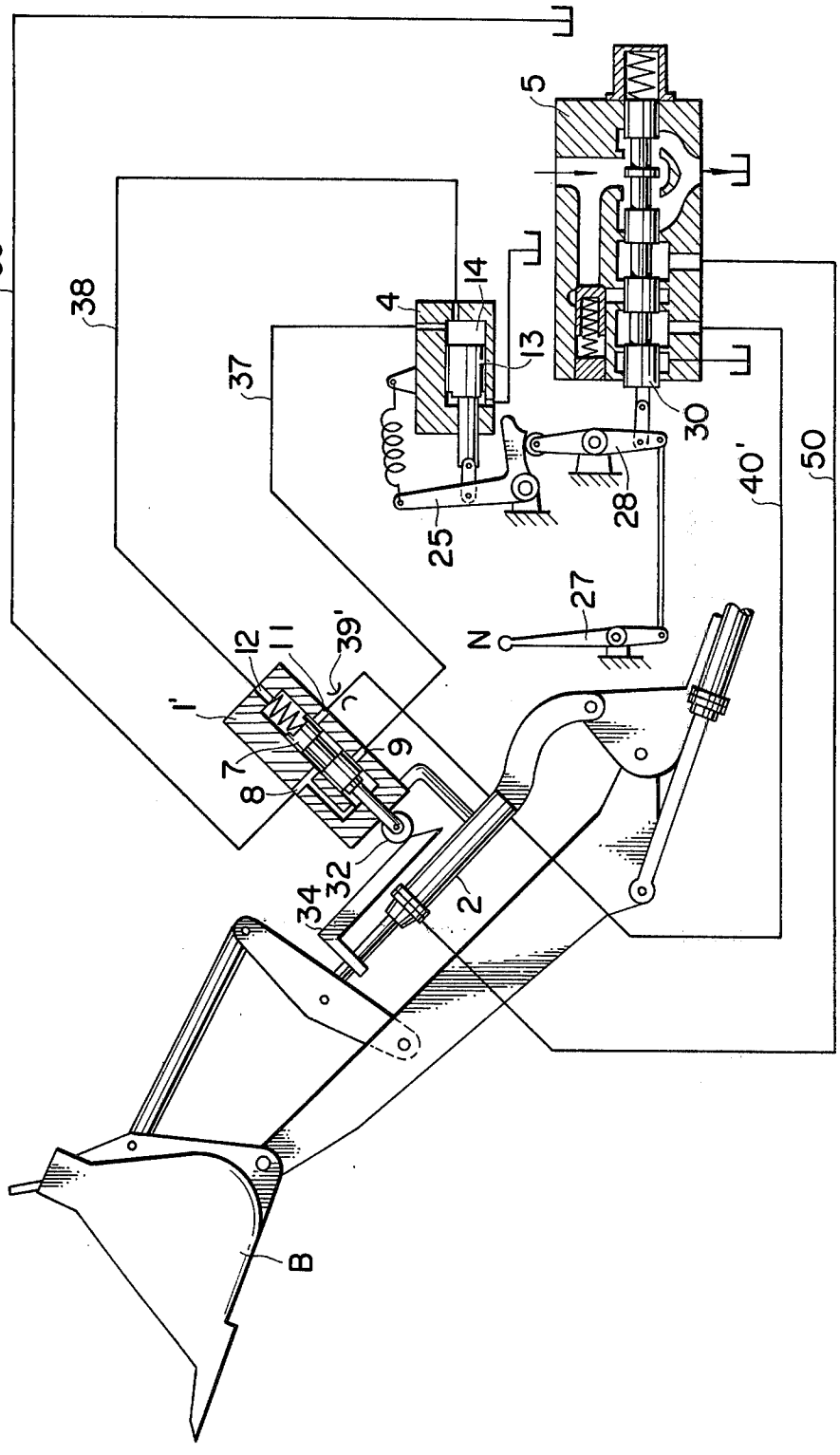


FIG. 7

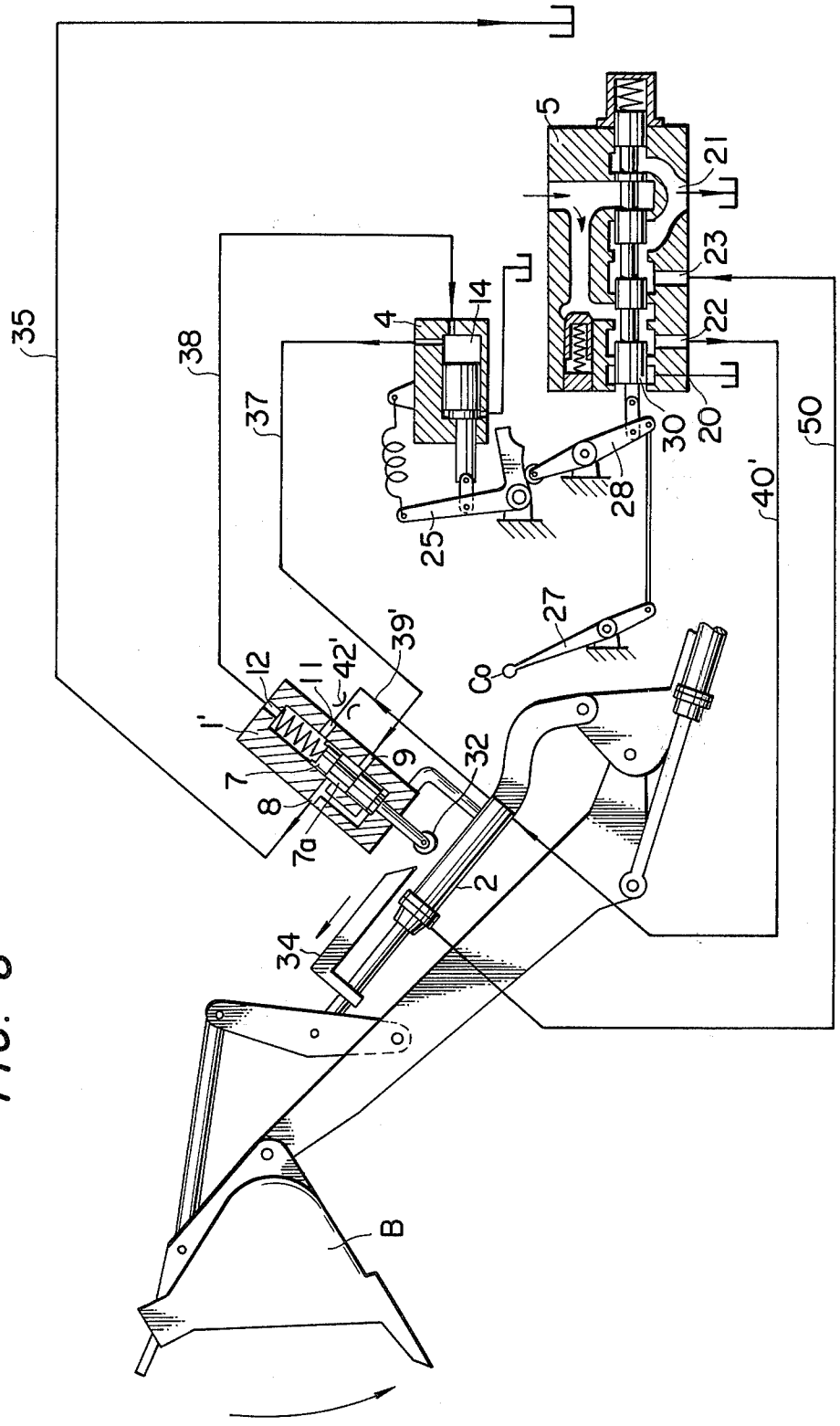

35
38
37
4
14
5
21
23
22
20
30
50
40'
28
25
27
39'
42'
12
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1'
7
8
7a
9
32
2
34
B
Co

FIG. 8

DEVICE FOR SETTING THE INCLINATION OF THE BUCKET IN A BULLDOZER

BACKGROUND OF THE INVENTION

The present invention relates to a device for automatically setting the inclination of a bucket of a bulldozer.

Heretofore, such a device having been proposed has disadvantages in that a closed working fluid circuit interconnecting a piston pump, which is actuated by a bucket tilting cylinder-piston assembly when it comes to a position at which the bucket is tilted upwards to a predetermined inclination, and an actuator cylinder-piston assembly, which is actuated by the piston pump for terminating the actuation of the bucket tilting cylinder-piston assembly through an actuator valve which is connected to the bucket tilting cylinder-piston assembly for actuation thereof, is liable to have fluid leakage and allows the entrance of air into the circuit thereby causing malfunctioning of the device and deterioration the proper actuation of the device particularly in low temperature conditions.

In order to avoid the above described disadvantages, a device has been proposed in which a switching valve is provided in place of the piston pump described above into which working fluid is introduced from the bucket tilting cylinder-piston assembly so that, when the bucket is tilted upwards to the predetermined inclination, working fluid is introduced through the switching valve into the actuator cylinder-piston assembly and then to a sump of fluid thereby actuating the actuator cylinder-piston assembly so as to terminate the actuation of the bucket tilting cylinder-piston assembly when the bucket is tilted to the predetermined position. In such a device, the working fluid is pressurized and flows in the circuit when the switching valve is actuated thereby preventing the entrance of air and the sticking of fluid in the conduit of the circuit. However, in such a device, the bucket can not be tilted upwards beyond the predetermined inclination, because the actuator cylinder-piston assembly is continuously maintained to terminate the actuation of the bucket tilting cylinder-piston assembly.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a novel and useful device for automatically setting the inclination of the bucket of a bulldozer which avoids the above described disadvantages of the prior device.

Another object is to provide a novel and useful device of the type described above which positively avoids air entering the hydraulic circuit of the device and permits the bucket to be tilted upwards beyond the predetermined position of the bucket.

The above objects are achieved in accordance with the characteristic feature of the present invention by providing a device for setting the inclination of the bucket of a bulldozer comprising a tiltable bucket, and a bucket tilting cylinder-piston assembly having a bottom side chamber and a head side chamber connected to the bucket for tilting the same upwards or downwards when the bottom side chamber or the head side chamber is pressurized. A piston pump is operatively coupled with said bucket tilting cylinder-piston assembly so that the head side chamber thereof is pressurized when the bucket tilting cylinder-piston assembly moves to a position to tilt the bucket upwards to a predetermined position, while the bottom side chamber thereof communicates at all times to a sump of working fluid. An actuator cylinder-piston assembly is provided with its head side chamber communicating with the head side chamber of the piston pump so as to be actuated thereby. A detent lever is connected to the actuator cylinder-piston assembly so as to be actuated thereby, and an actuator valve having a movable spool therein is connected to a working fluid source and communicates with the head side chamber and the bottom side chamber of the bucket tilting cylinder-piston assembly for actuating the same to tilt the bucket upwards and downwards by the actuation of the spool of the actuator valve. A switching lever is connected to the spool of the actuator valve and engageable with the detent lever, and an operating handle is connected to the switching lever for actuating the same so that, when the handle is operated so as to move the spool in a position for tilting the bucket upwards by the bucket tilting cylinder-piston assembly, the detent lever is engaged with the switch lever for maintaining the spool in the position for tilting the bucket upwards, while, when the piston pump is actuated by the bucket tilting cylinder-piston assembly so as to pressurize the head side chamber thereof, it actuates the actuator cylinder-piston assembly so that the detent lever is disengaged from the switching lever thereby permitting the spool to move to the neutral position thereof for terminating the actuation of the bucket tilting cylinder-piston assembly. The head side chamber of the piston pump, communicates with the head side chamber of the bucket tilting cylinder-piston assembly through a bypass valve connected between the actuator valve and the bucket tilting cylinder-piston assembly or an orifice connected between the bucket tilting cylinder-piston assembly and the piston pump so that the head side chambers of the piston pump and the actuator cylinder-piston assembly are at all times pressurized by the working fluid thereby preventing air from entering and deteriorating the actuation thereof while the bucket is permitted to be tilted beyond the predetermined position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic fragmentary view partly in section showing the general construction and the manner of operation of an example of the prior art device for setting the inclination of a bucket of a bulldozer;

FIG. 2 is a view similar to FIG. 1 but showing another example of the prior art device;

FIG. 3 is a view similar to FIG. 1 but showing the first embodiment of the device of the present invention in its neutral position;

FIG. 4 is a view showing the bucket lifting position of the device of FIG. 3;

FIG. 5 is a view showing the bucket dumping position of the device of FIG. 3;

FIG. 6 is a view similar to FIG. 3 but showing the second embodiment of the present invention;

FIG. 7 is a view similar to FIG. 4 but showing the device of FIG. 6; and

FIG. 8 is a view similar to FIG. 5 but showing the device of FIG. 6;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 showing an example of the prior art bucket positioning device, a bucket B is swingably supported by a pivot shaft B_1 on the distal end of an

arm A which is in turn swingably supported at its proximal end by a pivot shaft F_1 on a chasis F of a bulldozer (not shown). An actuator lever L is swingably supported at its one end on the intermediate portion of the arm A by a pivot shaft L_1 and the free end of the lever L is pivotally connected by a pivot shaft L_2 to one end of a connecting rod R the other end of which is pivotally connected to a portion of the bucket B by a pivot shaft B_2. The midportion of the lever L is pivotally connected by a pivot shaft L_2 to a piston rod **33** of a bucket tilting cylinder-piston assembly **2** the head side of which is pivotally connected to the chasis F by a pivot shaft F_2. Thus, when the cylinder-piston assembly **2** is actuated, the bucket B is swung upwards and downwards through the lever L and the connecting rod R.

A piston rod P of a cylinder-piston assembly C is pivotally connected to a portion of the arm A adjacent to the proximal end thereof and the opposite end of the assembly C is pivoted to the chasis so that the arm A can be swung upwards and downwards to any desired position by the actuation of the cylinder-piston assembly C.

The piston rod **33** has a cam member **34** mounted thereon and a piston pump **1** is supported adjacent to the cylinder-piston assembly **2** by a supporting bracket **3** secured to the assembly **2.** The piston rod **31** of the piston pump **1** is provided with a roller **32** at its outer end and the roller is positioned in the path of movement of the cam member **34** so that the piston of the piston pump **1** is urged upwards when the cam member **34** engages with the roller **32** as the cylinder-piston assembly **2** is actuated to tilt the bucket B upwards to a predetermined inclination thereby pressurizing the head side chamber of the piston pump. The bottom side chamber **6** of the piston pump **1** communicates with the atmosphere through a port **8.**

A port **12** is formed in the piston pump **1** at its head side chamber and the port **12** communicates with a port **16** formed in an actuator cylinder-piston assembly **4** at its head side chamber **14** through a line *a*.

The piston rod **24** of the piston **13** in the cylinder-piston assembly **4** is pivotally connected at **26** to the upstanding arm **25***a* of an L-shaped detent lever **25** pivoted at the corner portion thereof to the chasis by a pivot shaft **25***c*. The other arm of the lever **25** is formed with a detent **25***b* to be described later. Thus, when the piston pump **1** is actuated to pressurize the head side chamber thereof, the head side chamber **14** of the actuator cylinder-piston assembly **4** is pressurized to urge the piston **13** so that the detent lever **25** is swung in the counterclockwise direction. A spring **25***d* is connected between the free end of the arm **25***a* and the body of the actuator cylinder-piston assembly **4** so that, when the head side chamber **14** is exhausted by the disengagement of the roller **32** of the piston pump **1** from the cam member **34,** the piston **13** moves to the right by the action of the spring **25***d* thereby swinging the detent lever **25** in the clockwise direction.

A switching lever **28** is swingably supported at its intermediate portion on a portion of the chassis by a pivot shaft **28***a* and a roller **29** rotatably mounted on the upper end of the lever **28** is engageable with the detent portion **25***b* of the detent lever **25** when the lever **25** is swung in the clockwise direction.

The lower end of the lever is connected to an operating handle **27** through a connecting rod **27***a* so that the switching lever **28** is actuated by the operation of the handle **27.**

An actuator valve **5** having a movable spool **30** and supplied with working fluid from the port **19** is arranged adjacent to the switching lever **28** and the spool **30** is coupled with the switching lever **28** at its lower side so that, when the lever **28** is actuated, the spool **30** is moved axially so as to switch the passage of the working fluid as described later. As shown, the valve **5** is provided with discharge ports **20, 21** leading to a sump of working fluid and ports **22, 23,** the ports **20, 21, 22, 23** cooperating with lands of the spool **30** so as to selectively close and open these ports.

The head side chamber of the bucket tilting cylinder-piston assembly **2** communicates with the port **22** through a line b while the bottom side chamber of the cylinder-piston assembly **2** communicates with the port **23** through a line C.

Thus, when the working fluid is supplied from the port **23** to the bottom side chamber of the bucket tilting cylinderpiston assembly **2,** the piston rod **33** is retracted in the direction indicated by the arrow so that the bucket B is tilted upwards, while, when the head side chamber of the assembly **2** is supplied with the working fluid from the port **22** the piston rod **33** is urged outwardly of the assembly **2** so that the bucket B is tilted downwards.

In operation starting the condition as shown in FIG. **1** with the handle **27** set to the bucket lifting position, the switching lever **28** is swung in the clockwise direction so that the roller **29** is stopped by the detent portion **25***b* of the detent lever **25** and the spool **30** is moved in the position shown in FIG. **1.** Thus, the working fluid supplied from the port **19** is forced through the port **23** and the line C to the bottom side chamber of the bucket tilting cylinder-piston assembly **2** thereby retracting the piston rod **33** in the direction indicated by the arrow so as to tilt the bucket B upwards. When the bucket B is tilted upwards to a predetermined inclination and the cam member **34** engages with the roller **32** of the piston pump **1** and urges the piston rod **31** inwardly. The working fluid in the head side chamber thereof is pressurized so that the head side chamber **14** of the actuator cylinder-piston assembly **4** is also pressurized through the line a to urge the piston **13** to the left thereby swinging the detent lever **25** in the counterclockwise direction against the action of the spring **25***d* so that the roller **29** is released from the detent portion **25***b* of the detent lever **25** to allow the spool **30** to move to the neutral position. Thus, the actuation of the cylinder-piston assembly **2** by the actuator valve **5** is automatically stopped to hold the bucket B in the predetermined inclination.

When the handle **27** is set to the bucket lowering position indicated by broken line in FIG. **1,** the spool **30** is moved to a position for pressurizing the head side chamber of the bucket tilting cylinder-piston assembly **2** so that the piston rod **33** is moved outwardly to tilt the bucket B downwards.

In the construction of the prior art device as described above, since the head side chambers of the piston pump **1** and the actuator cylinder-piston assembly **4** constitutes a closed circuit together with the line *a*, the working fluid is liable to leak out and allow air to enter the closed circuit thereby causing the malfunctioning of the device. Also particularly in the low temperature conditions, the working fluid tends to stick to the line thereby causing delay in the actuation of the device.

FIG. 2 shows another example of a prior art device in which the leakage of the working fluid and the entrance of air in the fluid circuit are avoided. This example is substantially similar to that of FIG. 1 except that a switching valve V is provided in place of the piston pump 1. The piston 7' of the valve V is provided with a portion having a reduced diameter so as to provide a switching valve chamber 7'*a*. The port 8' of the valve V communicates with the bottom side chamber of the bucket tilting cylinder-piston assembly 2 through a line *d* while the port 9' of the valve V communicates with the port 15 opening into the head side chamber 14 of the actuator cylinder-piston assembly 4 through a line *e*, the port 16 opening into the head side chamber 14 being connected to the sump of the working fluid through a line*f*. The port 12 is connected to the sump through a line *g*.

The relationship between the positions of the ports 8', 9' and the position of the diameter reduced portion of the piston 7' are so determined that, when the piston 7' is in its lowered position, i.e., in the position at which the roller 32 is not actuated by the cam member 34, communication between the ports 8' and 9' is shut off while, when the piston 7' is moved upwardly by the engagement of the roller 32 with the cam member 34 at which time the bucket B has been tilted to the predetermined inclination, the port 8' communicates with the port 9' through the switching valve chamber 7'*a*.

Thus, in operation, when the piston 7' is urged upwardly by the cam member 34 engaging with the roller 32 to communicate the port 8' with the port 9' as the bucket B is tilted to the predetermined position, the pressurized fluid flows from the bottom side chamber of the bucket tilting cylinder-piston assembly 2 to the head side chamber 14 of the actuator cylinder-piston assembly 4 through the line *d*, ports 8', 9' and the line *e* so as to pressurize the head side chamber 14 so that the detent lever 25 is swung to disengage the detent portion 25*b* from the switching lever 28 thereby causing the spool 30 of the actuator valve 5 to move to its neutral position to stop the actuation of the bucket tilting cylinder-piston assembly 2.

By such a construction the high pressure fluid positively flows through the line *e* when the port 8' communicates with the port 9', therefore, the entrance of air in the line *e* is positively prevented and the sticking of the fluid to the line *e* is positively avoided even in the low temperature conditions. However, the bucket B cannot be lifted upwards beyond the predetermined position, because the working fluid is released from the bottom side chamber of the cylinder-piston assembly 2 through the line *d* thereby making it impossible to maintain a high pressure in the bottom side chamber of the assembly 2.

The present invention avoids the above-described disadvantages of the prior art device.

Preferred embodiments of the present invention will now be described with reference to FIGS. 3 – 8.

FIGS. 3 – 5 show the first embodiment of the present invention.

The general construction of the embodiment shown in FIGS. 3 – 5 is substantially similar to that of the prior art device shown in FIG. 1 except that a bypass valve 42 is provided and the piping arrangement is modified accordingly.

The bypass valve 42 is provided therein with a slidable throttle member 48 having a throttle passage 49, a switching valve chamber 48' being formed around the member 48. A spring 48*a* is located in the valve 42 to the left of the throttle member 48 so as to move the same to the right. The port 43 of the valve 42 communicates with the port 15 of the actuator cylinder-piston assembly 4 through a line 51 and the port 44 of the valve 42 communicates with a port 11 opening into the head side chamber 10 of the piston pump 1 through a line 39. The port 45 of the valve 42 communicates with the head side chamber of the bucket tilting cylinder-piston assembly 2 through a line 41 while the port 46 of the valve 42 communicates with the port 22 of the actuator valve 5 through a line 40. A port 47 communicates with the sump of the working fluid as shown.

The port 8 of the piston pump 1 communicates with the sump 36 through a line 35. The port 12 communicates with the port 16 through a line 38.

In operation, when the handle 27 is set to the tilt back position A_o (bucket lifting position) as shown in FIG. 4, the spool 30 is moved by the switching lever 28 to the position for pressurizing the bottom side chamber of the bucket tilting cylinder-piston assembly 2 through the port 23 and the line 50 to tilt the bucket B upwards and the working fluid in the head side chamber of the assembly 2 flows through the line 41 into the bypass valve 42 and, through the throttle passage 49 in the member 48, into the port 22 through the line 40 to thereby discharge the fluid into the sump through the port 20. At this time, the ports 43 and 44 are closed by the throttle member 48. Thus, when the piston 7 is actuated by the cam member 34 as the bucket B is lifted to a predetermined position, the pressurized fluid in the head side chamber 10 of the piston pump 1 is urged into the head side chamber 14 of the actuator cylinder-piston assembly 4 so as to urge the piston 13 for disengaging the detent lever 25 from the switching lever 28 thereby permitting the spool 30 to move to the neutral position to terminate the actuation of the bucket tilting cylinder-piston assembly 2 so that the bucket B is held in the predetermined inclination. At this time, the fluid in the lines 38, 39 and 51 is kept pressurized so as to prevent the entrance of air thereinto.

When the bucket B is to be dumped, the handle 27 is set to the dump position C_o as shown in FIG. 5. In this position, the spool 30 is moved to a position so that pressurized fluid is supplied from the port 22 through the line 40, the throttle passage 49 and the line 41 to the head side chamber of the bucket tilting cylinder-piston assembly 2 so that the bucket B is tilted downwards, the fluid in the bottom side chamber of the assembly 2 flows through the line 50 into the port 23 and, whence, to the sump through the port 21. At this time, the throttle member 48 is urged to the left by the throttling action of the fluid in the throttle passage 49 against the action of the spring 48*a* thereby permitting the port 15 of the actuator cylinder-piston assembly 4 to communicate with the sump through the port 48', the switching valve chamber 48' and the port 47 while the port 11 of the piston pump 1 is permitted to communicate with the line 40 through the port 44 as shown. Thus the pressurized fluid introduced from the line 40 into the bypass valve 42 is branched into the line 39 and introduced into the head side chamber 10 of the piston pump 1 through the port 11 and hence, through the line 38 into the head side chamber 14 and through the line 51, the ports 43 and 47 into the sump. Thus, the pressurized fluid flows through the lines 38, 39 and 51 to prevent air from entering the line. In this embodi-

ment, the bucket B can be tilted upwards beyond the predetermined position by the operation of the handle **27**, because the high pressure of the fluid in the bottom side chamber of the bucket tilting cylinder-piston assembly **2** can be continuously maintained insofar as the handle **27** is held in its tilt back position A_o.

FIGS. **6 – 8** show a second embodiment of the present invention. This embodiment is substantially similar to that shown in FIGS. **3 – 5** except that the bypass valve **42** of FIG. **3** is dispensed with and the head side chamber of the bucket tilting cylinder-piston assembly **2** directly communicates, through a line **39'** having therein a throttling orifice **42'**, with the port **11** opening into the head side chamber **10** of the switching valve **1'**. The switching valve **1'** is substituted for the piston pump **1** of FIG. **3**.

In the embodiment shown in FIGS. **6 – 8**, the port **22** directly communicates with the head side chamber of the bucket tilting cylinder-piston assembly **2** and the port **9** communicates with the port **15** through a line **37**.

The piston **7** of the switching valve **1'** has a switching valve chamber **7***a* in like manner as that shown in FIG. **2** and the port **8** communicates with the sump **36** through the line **35** and opens into the bottom side chamber **6** of the valve **1'**. The port **8** is branched so as to also communicate with the switching valve chamber **7***a* when the piston **7** is in its lowered or non-actuated position as shown in FIG. **6**.

The positions of the ports **9** and **11** with respect to the piston **7** are so determined that, when the piston **7** is in its lowered position, the port **8** communicates with the port **9** through the switching valve chamber **7***a* and the port **11** opens into the head side chamber **10** of the valve **1'** as shown in FIG. **6**. When the piston **7** is moved upwards by the engagement of the roller **32** with the cam member **34**, the communication between the ports **8** and **9** is shut off and the port **11** is shut off from the head side chamber **10** as shown in FIG. **7**.

In operation, when the handle **27** is set to the tilt back position A_o as shown in FIG. **6**, the spool **30** is moved through the switching lever **28** so that the bottom side chamber of the bucket tilting cylinder-piston assembly **2** is pressurized by the fluid from the port **23** thereby tilting the bucket B upwards in like manner as described with reference to FIG. **4**, the fluid in the head side chamber of the assembly **2** flowing through the line **40'** into the port **22** and, then, to the sump through the port **20**.

When the piston **7** is actuated by the cam member **34** as the bucket B is tilted to the predetermined position, so that the ports **9** and **11** are closed, the pressurized fluid in the head side chamber **10** of the valve **10** flows through the line **38** into the head side chamber **14** of the actuator cylinder-piston assembly **4** so as to actuate the detent lever **25** to disengage the switching lever **28** thereby causing the spool **30** to move to its neutral position so that the bucket B is held in the predetermined position. At this time, the lines **37** and **39'**, are maintained in the pressurized condition thereby preventing the entrance of air.

When the bucket B is to be lowered, the handle **27** is set to the dump position C_o as shown in FIG. **8**. The fluid flows through the line **40'** into the head side chamber of the bucket tilting cylinder-piston assembly **2** to dump the bucket B, the fluid in the bottom side chamber of the assembly **2** flowing to the sump through the line **50**, the ports **23** and **21**.

A portion of the pressurized fluid in the head side chamber of the assembly **2** flows through the line **39'** and the orifice **42'** into the head side chamber **10** of the valve **1'** and, then, through the line **38** into the head side chamber **14** of the actuator **4** and, then, through the line **37**, the port **9**, the switching valve chamber **7***a* and the line **35** into the sump. Thus, the fluid flows in the lines also during the dumping of the bucket B thereby preventing air from entering the line.

In the embodiment of FIG. **6**, the bucket B can also be tilted upwards beyond the predetermined position in like manner as described in connection with the embodiment shown in FIG. **3**.

I claim:

1. Device for setting the inclination of a bucket of a bulldozer comprising a tiltable bucket, a bucket tilting cylinder piston assembly having a bottom side chamber and a head side chamber and connected to said bucket for tilting the same upwards when said bottom side chamber is pressurized by working fluid while said bucket is tilted downwards when said head side chamber is pressurized, a piston pump operatively coupled with said bucket tilting cylinder-piston assembly such that the head side chamber of said piston pump is pressurized when said bucket tilting cylinder-piston assembly moves to a position to tilt said bucket upwards to a predetermined position, the bottom side chamber thereof communicating with a sump of working fluid, an actuator cylinder-piston assembly with its head side chamber communicating with the head side chamber of said piston pump, wherein the head side chamber of said actuator cylinder-piston is pressurized when the head side chamber of said piston pump is pressurized, a detent lever connected to said actuator cylinder-piston assembly said detent lever being moved by the movement of the piston of said actuator cylinder-piston assembly, an actuator valve having a movable spool therein and connected to a source of working fluid said actuator valve communicating with said head side chamber and said bottom side chamber of said bucket tilting cylinder-piston assembly for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards and downwards by the actuation of said spool, a switching lever connected to said spool of said actuator valve said switching lever being engageable with said detent lever, an operating handle connected to said switching lever for actuating said switching lever such that, when said handle is operated to move said spool in a position for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards, said detent lever is engaged with said switching lever for maintaining said spool in said position for tilting said bucket upwards, while, when said piston pump is actuated by said bucket tilting cylinderpiston assembly, said piston pump actuates said actuator cylinder-piston assembly such that said detent lever is disengaged from said switching lever thereby permitting said spool to move to the neutral position thereof for terminating the actuation of said bucket tilting cylinder-piston assembly to automatically set the inclination of said bucket, and a bypass valve having a movable throttle member therein, said bypass valve being connected between said head side chamber of said bucket tilting cylinder-piston assembly and said actuator valve, said bypass valve communicating with said head side chamber of said piston pump and said head side chamber of said actuator cylinder-piston assembly, said movable throttle member being adapted to be

moved to a first position to shut off the communication of said head side chambers of said piston pump and said actuator cylinder-piston assembly with said bypass valve when said bottom side chamber of said bucket tilting cylinder-piston assembly is pressurized to tilt said bucket upwards thereby maintaining said head side chambers of said piston pump and said actuator cylinder-piston assembly in pressurized condition and said movable throttle member being adapted to move to a second position to establish the communication of said head side chambers of said piston pump and said actuator cylinder-piston assembly with said bypass valve thereby communicating said head side chamber of said piston pump with said head side chamber of said bucket tilting cylinder-piston assembly and communicating said head side chamber of said actuator cylinder-piston assembly with said sump of working fluid through said bypass valve, when the head side chamber of said bucket tilting cylinder-piston assembly is pressurized, whereby said head side chambers of said piston pump and said actuator cylinder-piston assembly are at all times in a pressurized condition.

2. Device for setting the inclination of a bucket of a bulldozer comprising a tiltable bucket, a bucket tilting cylinder-piston assembly having a bottom side chamber and a head side chamber and connected to said bucket for tilting the same upwards when said bottom side chamber is pressurized by working fluid while said bucket is tilted downwards when said head side chamber is pressurized, a piston pump having a switching valve chamber said piston pump being operatively coupled with said bucket tilting cylinder-piston assembly such that the head side chamber of said piston pump is pressurized when said bucket tilting cylinder-piston assembly moves to a position to tilt said bucket upwards to a predetermined position, the bottom side chamber thereof and said switching valve chamber communicating with a sump of working fluid, an actuator cylinder-piston assembly with its head side chamber communicating with the head side chamber of said piston pump wherein the head side chamber of said actuator cylinder-piston is pressurized when the head side chamber of said piston pump is pressurized, a detent lever connected to said actuator cylinder-piston assembly said detent lever being moved by the movement of the piston of said actuator cylinder-piston assembly, an actuator valve having a movable spool therein and connected to a source of working fluid, said actuator valve communicating with said head side chamber and said bottom side chamber of said bucket tilting cylinder-piston assembly for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards and downwards by the actuation of said spool, a switching lever connected to said spool of said actuator valve, said switching lever being engageable with said detent lever, an operating handle connected to said switching lever for actuating said switching lever such that, when said handle is operated to move said spool in a position for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards, said detent lever is engaged with said switching lever for maintaining said spool in said position for tilting said bucket upwards, while, when said piston pump is actuated by said bucket tilting cylinder-piston assembly, said piston pump actuates said actuator cylinder piston assembly such that said detent lever is disengaged from said switching lever thereby permitting said spool to move to the neutral position thereof for terminating the actuation of said bucket tilting cylinder-piston assembly to automatically set the inclination of said bucket, said head side chamber of said piston pump communicating with said head side chamber of said bucket tilting cylinder-piston assembly and said head side chamber of said bucket tilting cylinder-piston assembly, said switching valve chamber of said piston pump communicating with said head side chamber of said actuator cylinder piston assembly, wherein said piston pump, when actuated, shuts off the communication between said head side chamber of said bucket tilting cylinder-piston assembly as well as the communication between said switching valve chamber and said head side chamber of said actuator cylinder-piston assembly, whereby said head side chambers of said piston pump and said actuator cylinder-piston assembly are maintained at all times in a pressurized condition.

3. Device for setting the inclination of a bucket of a bulldozer comprising a tiltable bucket, a bucket tilting cylinder-piston assembly having a bottom side chamber and a head side chamber and connected to said bucket for tilting the same upwards when said bottom side chamber is pressurized by working fluid while said bucket is tilted downwards when said head side chamber is pressurized, a piston pump operatively coupled with said bucket tilting cylinder-piston assembly such that the head side chamber of said piston pump is pressurized when said bucket tilting cylinder piston assembly moves to a position to tilt said bucket upwards to a predetermined position, the bottom side chamber thereof communicating with a sump of working fluid, an actuator cylinder-piston assembly with its head side chamber communicating with the head side chamber of said piston pump wherein the head side chamber of said actuator cylinder-piston is pressurized when the head side chamber of said piston pump is pressurized, a detent lever connected to said actuator cylinder-piston assembly said detent lever being moved by the movement of the piston of said actuator cylinder-piston assembly, an actuator valve having a movable spool therein and connected to a source of working fluid said actuator valve communicating with said head side chamber and said bottom side chamber of said bucket tilting cylinder-piston assembly for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards and downwards by the actuation of said spool, a switching lever connected to said spool of said actuator valve said switching lever being engageable with said detent lever, an operating handle connected to said switching lever for actuating said switching lever such that, when said handle is operated to move said spool in a position for actuating said bucket tilting cylinder-piston assembly to tilt said bucket upwards, said detent lever is engaged with said switching lever for maintaining said spool in said position for tilting said bucket upwards, while, when said piston pump is actuated by said bucket tilting cylinder-piston assembly, said piston pump actuates said actuator cylinder piston assembly such that said detent lever is disengaged from said switching lever thereby permitting said spool to move to the neutral position thereof for terminating the actuation of said bucket tilting cylinder-piston assembly to automatically set the inclination of said bucket, and means coupled to said piston pump and said actuator cylinder-piston assembly for maintaining pressurization in the head side chambers of said piston pump and said actuator cylinder-piston assembly at all times.

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