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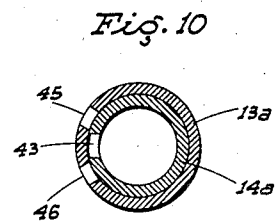
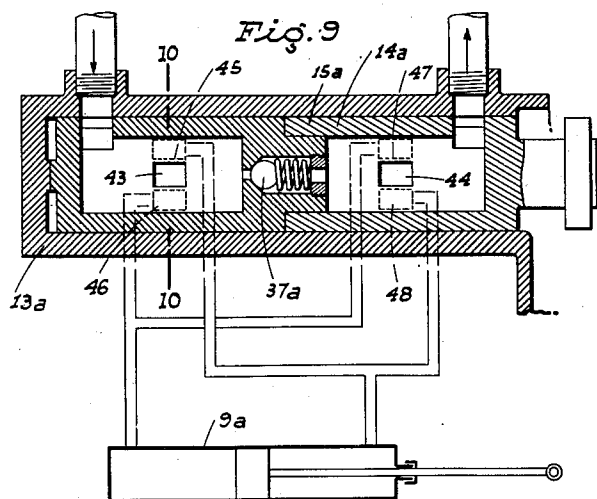
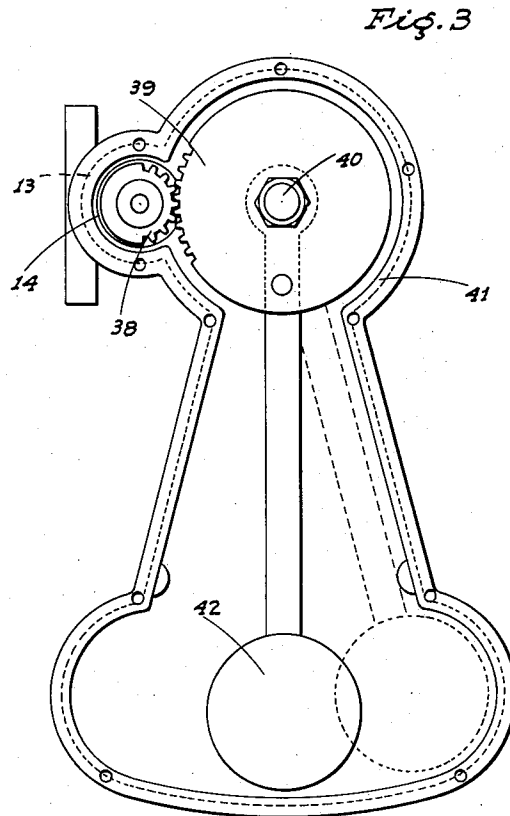
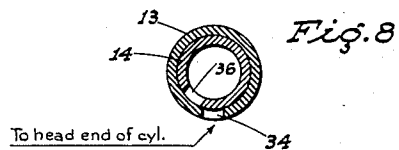
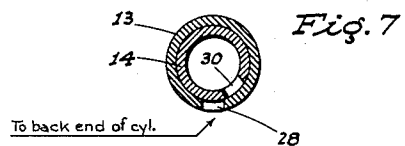
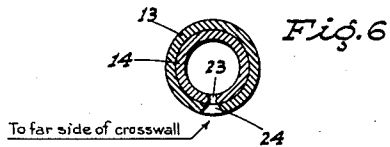
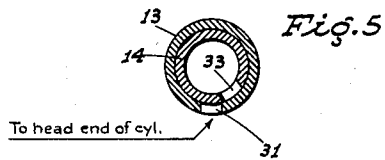
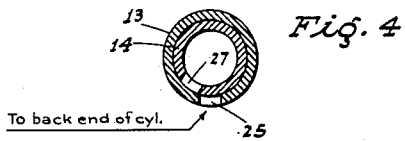
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2,520,266

HYDRAULIC LEVELING AND CONTROLLING DEVICE

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2 Sheets-Sheet 2



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HYDRAULIC LEVELING AND CONTROLLING
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2 Claims. (Cl. 37-153)

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This invention relates to leveling mechanisms for the blades of levelers to automatically maintain such blades level irrespective of the transverse level of the ground being traversed by the implement, and particularly represents a modified arrangement over what is shown in my Patent No. 2,284,550.

In this patent means are provided to control the level of the blade by mechanical or electrical devices, and my principal object now is to provide a hydraulic control mechanism for the purpose.

Though initially designed for leveler use, the mechanism is also suitable for use to keep any movable part level, or at a constant angle from level, when such part is mounted on a base subject to tilting or variation from a vertical or horizontal plane.

I have also provided an improved form of fluid control valve as an important feature of the mechanism.

A further object of the invention is to produce a simple and inexpensive device, and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a rear end outline of a leveler equipped with my improved hydraulic leveling mechanism.

Figure 2 is an enlarged sectional elevation of the hydraulic control mechanism, partly diagrammatic, and showing the preferred form of control valve unit.

Figure 3 is an end elevation of the control unit with the cover plate removed.

Figures 4 to 8 are diagrammatic cross sections of the control valves on lines 4-4, 5-5, 6-6, 7-7, and 8-8, respectively, of Fig. 2.

Figure 9 is a sectional elevation of a modified form of valve unit and control system generally.

Figure 10 is a cross section of the valve on line 10-10 of Fig. 1.

Referring now more particularly to the characters of reference on the drawings, and at present to the structure shown in Figs. 1 to 8, the level to which my improved hydraulic control mechanism is applied comprises essentially a wheel mounted main frame 1 from the rear end of which a transverse leveler blade 2 is suspended on a longitudinally extending central pivot 3. Links 4 extend upwardly from the blade on opposite sides of the pivot and are connected at

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their upper ends to a cross beam 5 centrally pivoted on an auxiliary frame 6. As here shown, an arm 7 depends from the beam 5 and is connected to the piston rod 8 of a double acting hydraulic cylinder 9 extending transversely of and suitably mounted on the frame 1. This cylinder has liquid passage pipes 10 and 11 leading to the ends of the cylinder on opposite sides of the piston 12.

It will of course be evident that when the piston is moved in one direction or the other by fluid in the cylinder the cross beam and blade 2 will be correspondingly swung in a transverse vertical plane and this movement is controlled by a change of transverse level of the frame 1 and the implement as a whole, by the following structure:

Fixed in connection with the arm 7 or other part which swings or tilts with the blade is a valve unit which comprises a casing 13 having a rotor 14 therein whose axis extends lengthwise of the implement. The rotor is hollow and is closed at both ends with a cross wall centrally of its ends and thus forming separate internal chambers 15 and 17 in the valve rotor.

An arcuate port 18 in the valve adjacent one end provides constant communication between the chamber 15 and a pressure pipe 19 connected to the valve casing and leading from a conventional pressure pump 20. Similarly an arcuate port 21 in the valve adjacent its opposite end provides constant communication between the chamber 17 and a return pipe 22 connected to the valve casing and leading back to the pump. Ports 23 in the valve on opposite sides of the wall 15 communicate with a bypass 24 in the valve casing only when the valve is in its normal position, or when the blade is horizontal. The area of the ports 23 is sufficiently large to take the full flow of the pipe 19 but are made relatively narrow, arcuately, as shown in Fig. 6, so that they will close with only a slight rotary movement of the valve from its normal position.

A normally closed port 25 in the casing 13 is connected by a pipe 26 with the pipe 10; a port 27 in the valve chamber 16 being disposed to one side of the plane of the ports 23 and adapted to register with the port 25 when the valve is rotated in one direction from its normal position. Another normally closed port 28 in the casing 13 is connected by a pipe 29 with the pipe 10; a port 30 in the chamber 17 being disposed on the opposite side of the plane of the ports 23 and adapted to register with the port 28 when the valve is rotated in the other direction from its normal position.

Similarly another normally closed port 31 in the valve casing is connected to the pipe 11 by a

pipe 32; a port 33 in the chamber 16 and disposed on said opposite side of the plane of the ports 23 being adapted to register with the port 31 when the valve is rotated in said other direction. Another closed port 34 in the valve casing is connected by a pipe 35 with the pipe 11; a port 36 in the chamber 17 being disposed on said one side of the ports 23 and adapted to register with the port 34 when the valve is rotated in said one direction.

It will therefore be seen that the liquid as pumped may normally flow unobstructed through the valve, but as soon as said valve is turned somewhat in one direction or the other the liquid is forced into the cylinder 9 from the chamber 16 either from the pipes 26 or 32 on one side or the other of the piston 12, while liquid is discharged from the cylinder on the opposite side of the piston and into the chamber 17 and thence to the return pipe 22 either from the pipe 29 or the pipe 35. If desired a suitable check pressure relief valve 37, resisting normal pump pressure and opening toward the chamber 17, may be mounted in the wall 15.

The above described movement of the valve, which obviously controls the tilting of the blade 2 is controlled or actuated by the following means:

The valve at one end is provided with a pinion 38 meshing with a relatively large gear 39 which is mounted on a stub shaft 40 fixed in a lateral extension 41 of the housing 13. A pendulum 32 depends from and is fixed with said gear, the extension 41 enclosing and protecting the pendulum, as shown, and also serving to limit its throw beyond points which will fully open the valve. By reason of the relative sizes of the gear and pinion, a slight swinging only of the pendulum will impart a relatively large amount of rotation to the valve, or so that the different ports will be quickly brought into register with each other. It will be noted that in the above description it is assumed that the pendulum swings. Actually of course the pendulum remains stationary while the implement and the valve case secured thereon rotate about the axis of the pendulum.

The housing extension 41 is preferably oil-tight, so that the pendulum may be immersed in oil, to provide uniform and steady movement thereof.

With the above described valve arrangement the pump is only under load when the cylinder is to be actuated. In the valve structure shown in Fig. 9 on the other hand the only normal flow through the valve 14a is past a pressure relief valve 37a disposed in the central wall 15a. This valve has only two normally closed ports 43 and 44 on opposite sides of the wall 15a. The port 43 is adapted to alternately register with ports 45 and 46 in the valve casing 13a which are connected to the opposite ends of the cylinder 9a, while the port 44 is adapted to alternately register with ports 47 and 48 in the valve casing which are connected to opposite ends of the cylinder in the reverse order to the connection of the ports 45 and 46 therewith, as shown. This valve of course is pendulum controlled in the same manner as the first described type.

While the valve units above described have been initially designed for the purpose recited in this specification, it will be obvious that their utility is not confined to this particular field, and they may be of value in controlling the actuation of any double acting hydraulic or fluid mechanism, and whether gravity-actuated control is employed or not.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful and upon which Letters Patent is desired:

1. In a leveler having a frame and a transverse leveling blade mounted on the frame for relative swinging movement in a transverse vertical plane, hydraulic means to swing the blade, including a double-acting hydraulic cylinder having a piston rod projecting therefrom and connected to the blade mounting, a liquid pressure circulating system connected to the ends of the cylinder, a movable valve interposed in the system to control the liquid flow to and from opposite ends of the cylinder in alternating order, a pendulum mounted on the blade mounting for swinging movement in a transverse plane, and connecting means between the pendulum and valve to move the latter upon a relative swing of the pendulum from a normal position, and an oil tight case in which the pendulum is mounted whereby the pendulum may swing in a bath of oil.

2. A land leveler including a ground supported main frame, a leveling blade pivoted substantially midway of its length to the main frame and transversely of the latter, an auxiliary frame supported on and projecting upwardly from the main frame, a cross beam pivoted substantially midway of its length to the upper end of the auxiliary frame, a link pivoted to each end of the cross beam and to the blade, a depending arm fixed to the cross beam substantially midway of its length, a fluid pressure motor comprising a cylinder, a piston therein and a piston rod on the piston, the cylinder being pivotally connected to the main frame and the piston rod being pivotally connected to the arm, a fluid pressure circulating system connected to the ends of the cylinder, a rotary valve in said system operative to alternately admit fluid pressure to opposite ends of the cylinder, said valve being fixed to the arm and being swingable therewith, a pendulum, means pivotally suspending the pendulum from the arm for swinging movement relative to said arm and transversely of the direction of travel of the leveler, and connecting means between the rotor of the valve and the pendulum and effective to operate the valve upon relative swinging movement of the arm and pendulum.

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