Dec. 30, 1941. E. G. LOOMIS 2,268,340

FLUID PRESSURE CONTROL DEVICE

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Fig. 1.

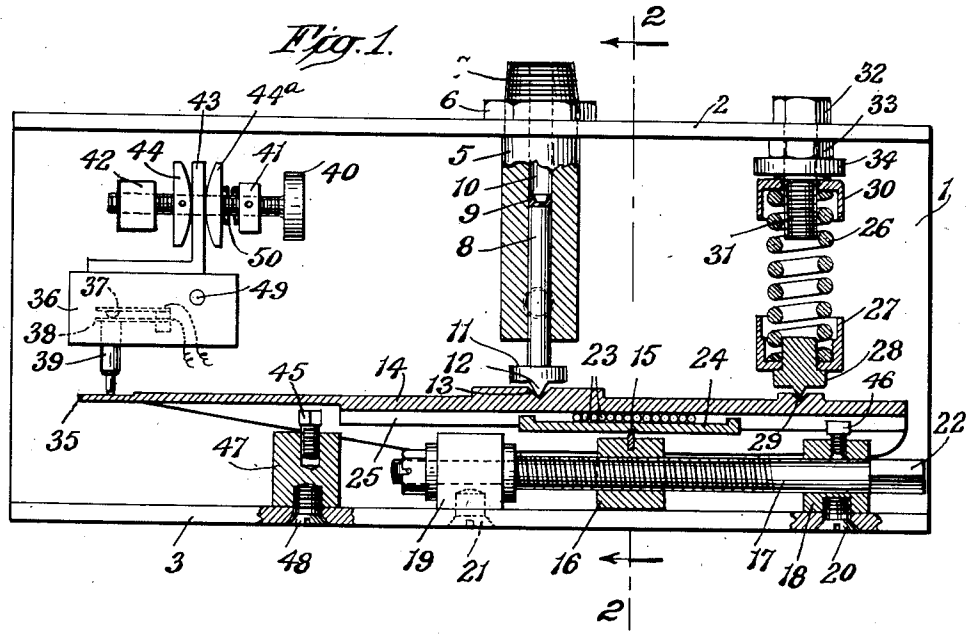
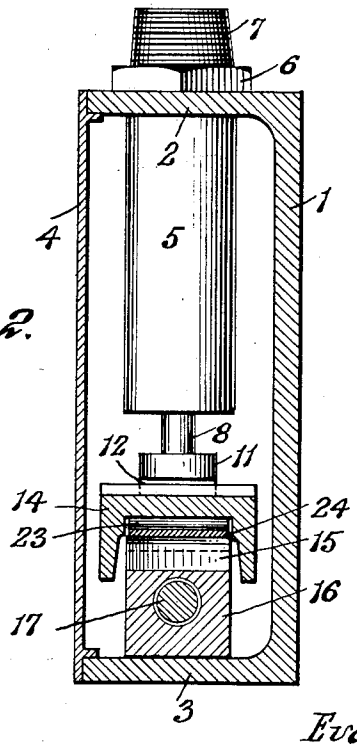


Fig. 2.



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FLUID PRESSURE CONTROL DEVICE

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6 Claims. (Cl. 200—82)

This invention relates to means for controlling the flow or application of fluid under pressure, and while the device is useful in many environments and in combination with various other mechanisms, it is herein particularly referred to and described for use in connection with hydraulically operated mechanisms, such as hydraulic rams, presses and the like.

One of the objects of the present invention is to provide a relatively simple and effective means, controlled by the pressure of a fluid, for operating a switch or actuating any other part or element of a mechanism by which actuation is desired at a predetermined time and such actuation is determined by the pressure of fluid. For example, in hydraulic presses, it is desirable to apply a predetermined pressure and to maintain the movable ram under such presure for a specified time. In such mechanisms, the desired presure of the fluid is often obtained by the employment of a hydraulic pump, the operation of which is secured by drive from an electric motor. Since it is desirable to discontinue pump operation when the fluid reaches a certain presure, the improved control device can be effectively employed to shut off current to the pump-operating motor until the fluid pressure drops whereupon the motor may be automatically set in operation to again operate the pump.

While the above use for the improved control device is a desirable one, it is only suggested as illustrative of one of the many uses for which the device is adapted, numerous other uses being apparent to those skilled in the art.

In the accompanying drawing, wherein an embodiment of the invention is shown, Fig. 1 is a vertical sectional view through a fluid-pressure control device, made in accordance with the invention, and Fig. 2 is a sectional view on the line 2—2 of Fig. 1, looking in the direction of the arrows.

In the embodiment of the invention disclosed in the drawing, the operating parts are preferably enclosed in a metal case or housing consisting of a back plate 1, integrally formed top 2 and bottom 3. The front of the case or housing is closed in any suitable way, such as by a removable cover plate 4 which when removed, permits access to the parts for replacement or adjustment. The ends of the casing may be closed in any suitable way, such enclosures being omitted from the structure shown in the drawing. At 5 is shown a cylinder extending downwardly into the casing and supported in the top plate 2 of the same by means of the nut 6. Said cylinder 5 is provided with a threaded nipple 7 by which it may be attached to a feed pipe through which the fluid under pressure may enter into the passage 10 extending through the cylinder. The fluid under pressure may be water, oil, gas or any other fluid medium dependent upon the nature of the device to which the control mechanism is connected.

Mounted for vertical movement within the cylinder 5 is a piston member 8 carrying at its upper end a gasket or packing 9. This piston member 8 is adapted to be moved downwardly, as hereinafter explained, by pressure of the fluid entering into the passage 10. The lower end of the piston 8 is formed with a head 11 terminating at the bottom in an angular ridge or rib 12 fitting in a transverse groove 13 formed in the top of a lever 14. The lever 14 is adapted to be rocked upon a fulcrum consisting of a blade 15 secured in and rising out of a block 16 that is longitudinally adjustable with respect to the lever 14 by means of a threaded adjusting screw 17. The adjusting screw 17 is mounted for rotation in bearing blocks 18 and 19, secured in spaced relationship, to the bottom plate 3 of the casing by means of the respective screws 20 and 21.

At one end of the casing the adjusting screw 17 is provided with a squared end 22 for engagement by a wrench or other suitable tool to permit the adjusting screw to be rotated and to thus cause the fulcrum block 16, carrying the fulcrum blade 15, to be shifted to the left or right according to the direction of rotation of adjusting screw 17.

In order to permit frictionless adjustment of the fulcrum 15 with respect to the lever 14, a plurality of rollers 23 is provided, these rollers being confined in a cradle 24 resting on top of the fulcrum blade 15 and held between said blade and the under-side of the lever 14. As will be noted in Fig. 2, the under-side of the lever 14 is channelled as indicated at 25 so that the rollers 23 are confined in the channel, and prevented from shifting laterally with respect to the lever 14.

Near one end and to one side of the fulcrum, the lever is under the pressure of the coil spring 26 which has its lower end seated in a cup 27, held on the plug 28 provided with the rib 29 resting in a complementary groove in the top of the lever, as clearly seen in Fig. 1. The upper end of the spring fits in a cap 30 surrounding a threaded stud 31 provided with the head 32 and lock nut 33 and adjustment nut 34 respectively. Through the arrangement described, it will be

clear that the tension of the spring may, by adjustment of the nut 34 on the stud 31, be readily obtained.

The opposite end 35 of the lever 14 is adapted to cause the opening or closing of a switch 36 or other suitable mechanism, the nature of this switch or other mechanism being dependent upon the use to which the control device is put. In the embodiment shown, a simple type of switch is disclosed, the same having the contacts 37 and 38 adapted to be normally held in closed relationship as long as the end 35 of the lever 14 is held in engagement with the operating element 39 secured or otherwise connected to the contact member 38. The switch may be hinged as shown on stud 49 within the casing to permit and adjust the engagement of the operating element 39 with the end of the lever 14 as may be desired. For this purpose, the adjusting screw 40 is shown as being adjustable through threaded guide 42, projecting from the wall 1 of the casing. The switch carries a lever arm 43 disposed between adjusting members 44 and 44*a*, mounted on the adjusting screw 40. The member 44 is pinned to screw 40 as is also a collar 41. Member 44*a* is loose on the screw but is held in contact with lever arm 43 by means of a spring 50 as shown, for safety in case the lever end 35 overtravels.

From the foregoing, the operation of the device will be readily understood. In Fig. 1 of the drawing, the device is shown in its normal position, at which time the spring 26 is exerting sufficient downward pressure upon the right hand end of the lever 14, to maintain the opposite end 35 of the lever elevated sufficiently to exert pressure upon the operating member 39 of the switch 36 and hold the contacts 37 and 38 of said switch in closed position. Assuming that the switch controls the operation of an electric motor that drives a hydraulic pump or operates other mechanism, the circuit to said electric motor being closed by means of the switch, the motor is maintained in operation and the pump is working to build up pressure in the fluid entering through cylinder 5 and exerting its pressure against the piston 8 therein. When the pump builds up sufficient fluid pressure against the piston 8 to overcome pressure of the spring 26, lever 14 will be rocked on its fulcrum 15 by such fluid pressure to cause the end 35 of the lever to descend and permit the contacts 37 and 38 on switch 36 to open so that the electric circuit will then be broken. As long as the pressure of the fluid against piston 8 is sufficient to overcome the pressure of the spring 26, the end 35 of the lever 14 will remain in lowered position and switch 36 will remain open. As soon as the pressure of the fluid operative against the piston 8 is decreased to such an extent as to permit spring 26 to raise the end 35 of the lever sufficiently to cause it to move the switch operating element 39 upwardly, the contacts 37 and 38 will then be closed and the motor controlled thereby will be at once set in operation and will continue in operation until the fluid pressure is raised sufficiently to again overcome the pressure of spring 26 and swing the end 35 of lever 14 away from member 39.

By rotation of the adjusting screw 17, the fulcrum 15 may be moved toward the left or the right, as viewed in Fig. 1, to any required extent and maintained in any selected position so that by shifting of the fulcrum in this way, the lever may be caused to move to permit opening of the switch 36 at any predetermined fluid pressure. The mounting of the lever 14 upon anti-friction bearings such as the rollers 23 permits this adjustment to be made in a smooth, easy manner while under working conditions to secure the finest adjustment.

The rocking movements of the lever 14 are limited by means of the adjustable stops 45 and 46, that shown at 45 being threaded into a block 47 secured by screws 48 to the bottom plate 3 of the casing. The stop indicated at 46 is threaded into the bearing 18.

While I have shown my improved fluid control device as adapted for use in a particular environment, it will be obvious that it may be used in almost any mechanism or combination of mechanisms wherein an actuating member is adapted to be controlled or moved by means of fluid pressure and it will also be obvious that various modifications may be made in the structure without departing from the spirit of the invention.

What I claim is:

1. A fluid pressure control device comprising, a lever, a fulcrum upon which the lever rocks, spring means for exerting pressure adjacent one end of the lever to one side of the fulcrum, means for communicating fluid pressure to the lever at the opposite side of the fulcrum, means for adjusting the position of the fulcrum relative to the lever, said means including an anti-friction bearing interposed between the fulcrum and the lever and carried by the fulcrum.

2. A fluid pressure control device comprising, a lever, a fulcrum upon which the lever rocks, spring means for exerting pressure upon the lever to one side of the fulcrum and adjacent to one end of the lever, switch-operating means mounted for engagement by the opposite end of the lever, means for communicating variable fluid pressure to the lever at a point between the switch-operating end thereof and the fulcrum, and means for adjusting the position of the fulcrum relative to the point of fluid-pressure application.

3. A fluid pressure control device comprising, a lever, a fulcrum upon which the lever rocks, spring means for exerting pressure upon the lever to one side of the fulcrum and adjacent to one end of the lever, switch-operating means mounted for engagement by the opposite end of the lever, means for communicating variable fluid pressure to the lever at a point between the switch-operating end thereof and the fulcrum and at a side of the fulcrum opposite to that where the spring-pressure means is located, and means for adjusting the position of the fulcrum relative to the point of fluid-pressure application, said means including a threaded screw upon which the fulcrum is shifted and an anti-friction bearing interposed between the fulcrum and the lever.

4. A fluid-pressure control device comprising, a casing, a passage for fluid under pressure leading into said casing, a piston mounted for movement in said passage, a lever in the casing against which the piston exerts pressure, a fulcrum upon which the lever is supported, a spring for exerting pressure on the lever and tending to rock the lever to resist the pressure exerted by the piston, and means for adjusting the position of the fulcrum relative to the points of pressure by the spring and piston, said fulcrum-adjusting means including an anti-friction bearing interposed between the fulcrum and the lever.

5. In a fluid pressure control device, a threaded shaft, a fulcrum mounted thereon for movement longitudinally of the shaft, a cradle mounted to rock on said fulcrum, a plurality of rollers movably supported in said cradle and projecting above the same, a rocking lever resting upon said rollers and adapted to rock in company with the cradle, means for communicating fluid pressure to said lever at a point to one side of the fulcrum, and means for imposing an opposing pressure on the lever at a point located at the opposite side of the fulcrum.

6. In a fluid pressure control device, a pivoted lever, an adjustable fulcrum upon which the lever is supported, means for conveying fluid pressure to said lever at a point to one side of the fulcrum, means for applying an opposing force at the opposite side of the fulcrum, a pivoted switch for operation by said lever, an adjusting screw upon which the switch is positioned and a spring-pressed adjusting element threaded on said screw and operative upon the switch to adjustably position said switch relative to the lever and to resiliently resist abnormal pressure of the lever upon the switch.

EVARTS G. LOOMIS.