

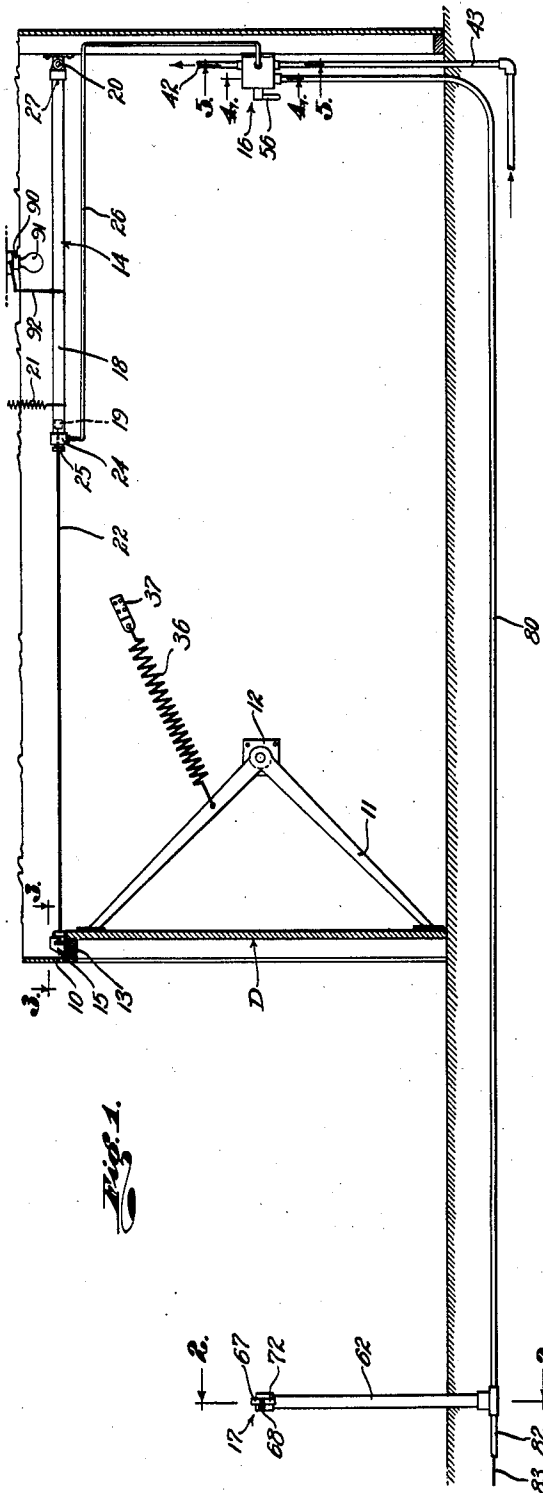
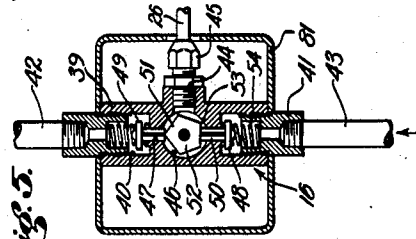
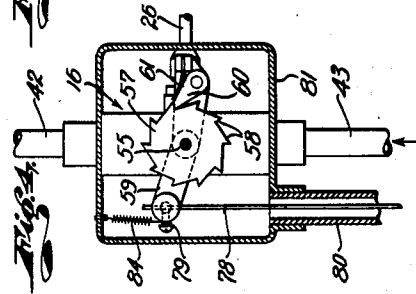
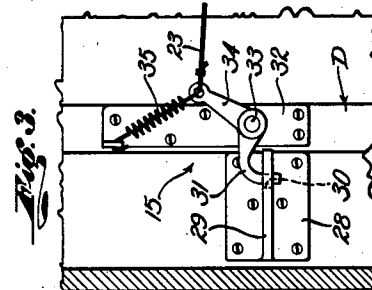
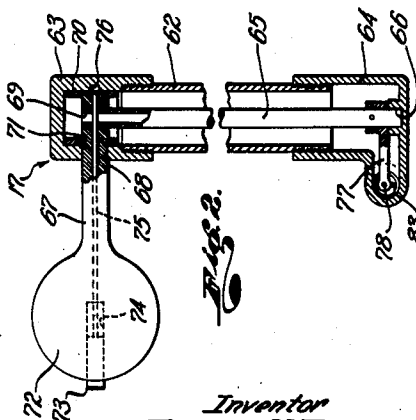
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FLUID PRESSURE ACTUATED MECHANISM AND CONTROL FOR THE SAME

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FLUID PRESSURE ACTUATED MECHANISM
AND CONTROL FOR THE SAME

Robert H. Thompson, Inyokern, Calif.

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1 Claim. (Cl. 121—44)

This invention relates to power applying means and relates more particularly to means for opening and closing doors, gates, and the like. A general object of this invention is to provide a simplified, inexpensive, and dependable means for operating garage doors, gates and other objects requiring a controlled movement.

Another object of this invention is to provide a novel fluid pressure actuated means for operating a garage door, a gate or other object.

Another object of this invention is to provide an operating means of the character referred to that may utilize the water pressure in the city water supply system or the domestic water supply lines as the power actuating force.

Another object of this invention is to provide an operating means of the character referred to embodying a novel and very effective remote control including one or more stations located as desired for the control of the device. The operating means of the invention, when employed to operate and control a garage door, may embody a control station at the driveway to the garage and one or more similar stations in the garage and/or dwelling, each operable to actuate the door operating means and to have full control over movement of the door at all times and at all positions of the door.

Another and important object of the invention is to provide an operating means of the character mentioned that requires the employment of the fluid pressure force for moving the door or object in one direction only, movement of the object in the opposite direction being produced by gravity and/or mechanical means and controlled by the retarding action of the fluid exhaust means.

Another object of this invention is to provide an operating means of the class referred to embodying a limber or flexible piston rod. The fluid pressure operating and controlling means is required to exert a force in only one direction and therefore the piston rod may be flexible to flex in response to movement of the door or object.

A further advantage obtained by the flexible piston rod is that the object may be moved manually without injury to the mechanism and without the necessity of disconnecting any parts of the apparatus.

Another object of this invention is to provide an operating means of the character mentioned embodying a novel valve unit controlled by the remote control stations to control the flow of fluid to and from the fluid pressure actuated means.

Another object of this invention is to provide an operating system of the character mentioned

embodying latch means automatically latching the object or door when the same is closed, which means is automatically released when the fluid pressure actuated means is put into operation to move the object.

A further object of this invention is to provide a door operating means of the character referred to that is safe and dependable in use, there being no power applied during the return movement and, therefore, no chance of injury to persons or objects in the path of the door, gate or other equipment.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a side elevation of the door operating system of the present invention operatively connected with the door of a garage, or the like, showing the door and certain parts of the garage in vertical cross section. Fig. 2 is an enlarged vertical detailed sectional view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged fragmentary horizontal detailed sectional view taken as indicated by line 3—3 on Fig. 1, and Figs. 4 and 5 are enlarged fragmentary vertical detailed sectional views taken as indicated by lines 4—4 and 5—5, respectively, on Fig. 1.

The operating means of the invention may be employed to control and operate doors, gates, and other objects of various natures, and may be varied to adapt it for use in different situations. In the drawing, I have illustrated the invention employed to operate the door D of a typical garage 10. It is to be understood that the invention is not to be construed as limited or restricted to the particular form or application about to be described, but is to be taken as including any features or modifications that may fall within the scope of the claim.

The typical door D is mounted or supported to pivot about a substantially horizontal axis between the closed position where it closes the entrance to the building or garage 10 and the raised or open position. The means for supporting the door D comprises typical brackets 11 secured to the inner side of the door and pivotally mounted on the side walls of the garage 10 by bearings 12. When the door D is in the closed position its upper portion bears against a horizontal header or beam 13 above the doorway.

The operating system of the present invention may be said to comprise, generally, a fluid pres-

sure operated means 14 for controlling the door D, lock means 15 for locking the door D in its closed position operated or controlled by the means 14, valve means 16 for controlling the passage of fluid pressure to and from the means 14, and remote control means 17 for the valve means 16.

The operating means 14 is adapted to be actuated by fluid under pressure and, in accordance with the invention, may be actuated by the water pressure in the domestic water lines or the city water lines to raise the door D to its open position and to control the lowering of the door. The fluid pressure actuated means 14 includes a cylinder 18 and a piston 19 operable in the cylinder. The cylinder 18 may be arranged in any convenient or selected location, it being a feature of the invention that the connection between the door D and the operating means 14 allows any preferred or required position of the means 14. In the particular case illustrated the cylinder 18 is arranged in the garage 10 to normally occupy a plane adjacent the plane of the beam 13. The cylinder 18 is positioned some distance at the rear of the door D so that it does not interfere with the free opening of the door. The rear end of the cylinder 18 may be open and the cylinder is supported by a pivot means or swivel 20 to pivot about an axis transverse of the direction of movement of the piston 19. A spring hanger 21 supports the forward portion of the cylinder 18 and allows pivoting of the cylinder. A rod 22 is connected to the piston 19 and extends forwardly from the cylinder 18. In accordance with the invention the piston rod 22 is limber or flexible and serves to transmit force to the door D in only one direction. A head 24 closes the forward end of the cylinder 18 and carries a gland 25 which seals about the rod 22. The rod 22 being small in diameter is easily and dependably packed. A pipe 26 enters the head 24 to communicate with the forward end of the cylinder 18 and is adapted to conduct fluid pressure to and from the cylinder.

The lock means 15 is optional, that is, it is not essential in every case. Furthermore, the means 15 may be varied greatly in construction. The lock means 15 normally locks the door D against movement when in the closed position and is released by the means 14 to allow free opening of the door D by the said means. The lock means 15 is such that it automatically locks the door D when the door returns to its closed position and is such that it may be manually released or opened by a person within the garage 10. In the form of the invention illustrated the lock means 15 includes a catch 28 secured to the beam 13 and provided with an upstanding part 29. The catch part 29 has a downwardly facing shoulder or notch 30 at its rear or inner side. The lock means 15 further includes a pivoted bolt or latch 31 for cooperating with the catch 29. A plate 32 is secured to the top of the door D and carries a substantially vertical pivot pin 33. The latch 31 is pivotally supported on the pin 33. The latch 31 is formed and positioned to engage in the notch 30 of the catch 28 to prevent upward swinging movement of the door D.

Spring means is provided for urging the latch 31 to its active position. An arm 34 projects rearwardly from the latch 31 and a spring 35 is connected between the arm 34 and a part on the plate 32 to urge the latch 31 to its active position where it cooperates with the notch 30. The forward end of the flexible portion 23 of the piston

rod 22 is connected to the latch arm 34. Rearward movement of the piston 19 and the rod 22 first pivots the latch 31 to a released position clear of the catch part 29 and then moves or swings the upper portion of the door D rearwardly so that the door is raised or opened. When the door D is lowered or closed the spring 35 brings the latch 31 to a position where it automatically cooperates with the notch 30 to latch or lock the door in the closed position.

The door D is of the counter-balanced type which has been slightly underbalanced to return or close by gravity. An extensible coiled spring 36 is anchored to the building or garage wall at 37 and has its forward end connected with the adjacent bracket 11. The spring 36 is under tension when the door D is in the closed position. The spring 36 is of the type commonly employed to counter-balance doors and its anchor point is shifted to lessen the tension, making the door slightly underbalanced. The parts are preferably related so that the door D is stopped against the beam or any other suitable part to be in a slightly inclined position when fully opened so that it tends to close by gravity. The spring 36 is completely untensioned when the door D is fully opened and does not retard the initial downward movement of the door. Accordingly, the door D may move closed by gravity and the weight of the door acting through the piston rod 22 moves the piston 19 forwardly in the cylinder 18, assuming that the pipe 26 is open to permit the discharge of fluid from in front of the piston. While I have shown only one spring 36 it is to be understood that a spring 36 is connected with both supporting brackets of the door.

The valve means 16 is operable to put the cylinder pipe 26 in communication with a source of fluid under pressure to operate the means 14 so that the door D is opened, is operable to maintain this communication so that the door is held open, and is operable to open the cylinder pipe 26 for fluid discharge so that the door D may close in a controlled manner. The valve means 16 includes a body 39 provided at its opposite ends with sockets 40 (see Fig. 5). Adapters or tubular fittings 41 are threaded in the sockets 40. A waste pipe or discharge pipe 42 has an end threaded in one fitting 41 to communicate with one of the sockets 40 and a pipe 43 connected with a source of fluid under pressure is threaded in the other fitting 41 to communicate with the other socket 40. It may be considered that the pipe 43 is connected with a water supply system, for example, the city water supply system or the domestic water supply system. A lateral opening 44 is provided in the body 39 and a nipple or fitting 45 connects the cylinder pipe 26 with the valve body 39 to communicate with the opening 44. A central transverse opening 46 is formed in the valve body 39 and has communication with the inner end of the lateral opening 44. Reduced ports 47 connect the sockets 40 with the central opening 46.

The valve means 16 further includes closures or valves 48 and 49 controlling the ports 47 to govern communication of the pipes 43 and 42 respectively, with the central valve opening 46. Stems 50 are provided on the valves 48 and 49 and extend inwardly through the ports 47 to project into the central opening 46. The valve stems 50 are fluted or otherwise formed to permit the flow of fluid through the ports 47 when their respective valves 48 and 49 are open.

A novel turnable operating member 51 is pro-

vided in the opening 46 to cooperate with the inner ends of the valve stems 50. The member 51 is polygonal having a plurality of flat surfaces or sides 52 joining at corners 53. In accordance with the invention the member 51 has an uneven number of sides 52, for example, it may have three sides, five sides, seven sides, and so on. In the case illustrated the member 51 is pentagonal having five sides 52. Where the member 51 has five sides 52, one side 52 directly opposes or is in flat engagement with the end of one valve stem 50 when a corner 53 is in cooperation with the end of the other valve stem 50. Thus, as illustrated in Fig. 5 of the drawings, one side 52 directly opposes the end of the stem on the valve 48 so that the said valve is closed when a corner 53 is in cooperation with the stem 50 on the valve 49 to hold the last named valve open. The relationship between the valves 48 and 49 is reversed by merely turning the member 51 a distance equal to one half the width of a side 52. Thus, where the member 51 has five sides, the member may be turned one tenth of a revolution to allow one valve 48 or 49 to close and to open the other valve 48 or 49. Springs 54 are arranged under compression between the fittings 41 and the valves 48 and 49 to normally urge the valves to their closed positions. The valve operating member 51 is fixed to a rotatable stem 55. The stem 55 projects from the side of the valve body 39 and a manual lever 56 is secured to the projecting end of the shaft 55. The lever 56 may be manipulated by a person in the garage to reverse the valves 48 and 49.

The remote control means 17 is operable from one or more stations remote from the valve means 16 to operate or reverse the valve means and thus control the fluid pressure actuated means 14. The remote control means 17 includes a ratchet mechanism at the valve means 16 operable at each actuation to advance the valve member 51 a distance equal to one half the width of its sides 52 and thus cause reversal of the valves 48 and 49. The ratchet mechanism includes a ratchet 57 fixed to the valve shaft 55 and provided with a plurality of ratchet teeth 58. The number of teeth 58 is twice the number of sides 52 on the member 51. Thus where the member 51 has five sides the ratchet has ten teeth 58. The ratchet means further includes a lever 59 pivoted on the valve shaft 55 and carrying a pivoted pawl 60. A spring 61 yieldingly urges the pawl 60 into cooperation with the ratchet teeth 58.

The remote control means 17 further includes one or more remote manual operating stations. These stations may be located at convenient points, for example, one station may be provided in front of the garage 10 and one or more stations may be provided in the residence or dwelling. The remote manual operating station illustrated in the drawing includes a tubular standard 62 closed at its upper end by a cap 63 and provided at its lower end with a fitting 64. The fitting 64 is preferably, though not necessarily, below the ground level, as illustrated in Fig. 1. A shaft 65 extends longitudinally in the standard 62 and its lower end is rotatably supported in a socket 66 in the fitting 64. An operating lever 67 extends through an arcuate horizontal slot 68 in the wall of the cap 63 and its inner part has an opening 69 receiving the upper portion of the shaft 65. A tubular bearing 70 is rotatable in the cap 63 and the lever 67 is received in aligned transverse openings 71 in the bearing so that the bearing carries the lever and assists in rotatably sup-

porting the shaft 65 in the standard 62. The projecting portion of the lever 67 may have a flat enlargement 72 to be conveniently engaged and operated by the driver of a vehicle approaching or leaving the garage 10.

It is preferred to provide means for locking the manual lever 67 against operation so that the door operating means cannot be operated by unauthorized persons. A suitable tumbler lock 73 is shiftable in an opening 74 in the lever enlargement 72 and controls a bolt 75. The bolt 75 passes inwardly through the opening 74 and a transverse opening in the shaft 65 to have its inner end cooperate with a notch 76 in the interior of the cap 63. When the lock 73 is depressed and latched in the opening 74 the bolt 75 cooperates with the notch 76 to prevent turning of the lever 67 and the shaft 65. When the lock 73 is conditioned by a key the bolt 75 moves out of the notch 76 freeing the lever 67 and the shaft 65 for operation.

The remote control means 17 further includes an operating connection between the shaft 65 of the remote manual operating station and the ratchet lever 59. This operating connection includes a lever 77 fixed to the lower part of the shaft 65 and a flexible element 78 in the form of a wire or the like attached to the lever 77. The flexible element 78 extends from the lever 77 to the ratchet lever 59. Suitable clamp means or securing means 79 secures the flexible element 78 in the lever 59. A conduit or tubing 80 may be provided to enclose a guide the flexible connecting member 78. The tubing 80 may extend below the ground surface, as illustrated in Fig. 1. It is preferred to enclose the valve body 39 and the ratchet means in a housing 81 and the tubing 80 may extend from the fitting 64 to the housing 81.

Where there are several remote manual operating stations there may be a separate connecting element 78 extending from each station to the ratchet lever 59 or a common connecting element 78 may be employed, if desired. In the drawings I have shown a tubing 82 continuing from the fitting 64 to house and guide a second connecting member 83 which may extend to a remote manual operating station. The second flexible element 83 may be connected with the ratchet lever 59 by the means 79, and operation of either element 78 or 83 causes operation of the ratchet means. A spring 84 is suitably connected with the ratchet lever 59 to return the lever and ratchet pawl 60 and the flexible elements 78 and 83 following each operation. The pawl 60 merely ratchets past the teeth 58 when returned by the spring 84 and this operation does not produce turning of the ratchet wheel 57 or the member 51. The operating lever 67 of the remote manual operating station is limited in its movement to provide for the operation of the ratchet lever 59 a distance just sufficient to turn the member 51 one tenth of a revolution. In practice the ends of the slot 68 may limit the movement of the lever 67 to provide for the correct operation.

The invention may include an automatic means for illuminating the interior of the building or garage. This means comprises a suitably located electric lamp socket 90 provided with the usual lamp 91. The switch means of the lamp socket 90 is controlled by a pull cord 92. The pull cord 92 is connected with the cylinder 18 so that the switch means of the lamp socket 90 is operated when the cylinder 18 moves or pivots in response

to movement of the door D. The lamp socket 90 may be of the well known pull cord type. When the door D is opened the piston rod 22 is flexed and the strain on the rod causes upward and then downward pivoting of the cylinder 18. This pulls on the cord 92 and closes the switch means of the socket 90 so that the lamp 91 is lit. The lamp remains lit as long as the door remains open. When the door D is closed the cylinder 18 again is caused to move upward and downward so that the lamp 91 is extinguished.

In the use or operation of the device of the invention it will first be assumed that the door D is closed and locked by the means 15 and that the valve means 16 is in the condition illustrated in Fig. 5 of the drawing where the pressure supply pipe 43 is closed. In this connection it will be observed that the means 14 is normally relieved of fluid pressure and, therefore, is less liable to leak. When it is desired to open the door D the lock 73 is conditioned by a key, or the like, to release the bolt 75 from the notch 76 and the lever 67 is turned. Similar operations may, of course, be performed at any other remote manual operating station. Upon operation of the lever 67 the flexible element 78 is moved to pivot the pawl lever 59 and the pawl 68 cooperates with the ratchet 57 to turn the valve shaft 55. The valve shaft 55 is turned approximately one tenth of a revolution, bringing a corner 53 into camming engagement with the stem 50 of the valve 48 and bringing a flat side 52 opposite the end of the stem on the valve 49. Thus the valves 48 and 49 are reversed and fluid pressure from the pipe 43 is admitted to the pipe 26 which conducts it to the forward end of the cylinder 18. Fluid pressure in the cylinder acts on the piston 19 to move the rod 22 rearwardly. At the beginning of the rearward movement of the rod 22 the latch 31 is pivoted out of engagement with the catch part 29 and following the release of the latch 31 the rearward movement of the piston rod is transmitted to the door D and the door is swung upwardly to its open position. The travel of the piston 19 is sufficient to bring the lower portion of the door against the beam 13. The piston rod 22 bends or flexes and the cylinder 18 pivots when the door D is opened. The movement of the cylinder 18 lights the lamp 91. With the door D open the automobile or vehicle may be driven into the garage 10. The fluid pressure in the cylinder 18 acting on the piston 19 holds the door D in its open position until the valve means 15 is again reversed.

To cause closing of the door D the lever 67 or the operating part of another manual operating

station is operated to cause operation of the flexible element 78 or the element 83, with the resultant pivoting of the lever 59. Pivoting of the lever 59 results in turning of the ratchet 57 and the member 51 for about one tenth of a revolution. This reverses the valves 48 and 49, the valve 48 closing under the action of its spring 54 and the valve 49 being opened by a corner 53. With the valve 48 closed and the valve 49 opened the fluid under pressure in the cylinder 18 may discharge through the pipes 26 and 42. As described above, the door D is mounted to normally close by gravity and the door automatically swings downwardly pulling the piston rod 22 forwardly. The closing movement of the door D is controlled or retarded by the dashpot action of the piston 19 in the cylinder 18 and the door may close without shock or jar. It is to be observed that the means 14 does not apply power to close the door D, the door closing by gravity under the control of the means 14 and the springs 36. This conserves the fluid pressure and eliminates accidents that may result when power is applied to close the door. When the door D reaches or approaches its closed position the spring urged latch 31 automatically comes into locking engagement with the notch to lock the door D against opening and the lamp 91 is extinguished.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claim.

Having described my invention, I claim:

Mechanism of the character described including a cylinder and piston means, a pipe leading from the cylinder of said means, a source of fluid under pressure, a discharge, valves controlling communication of said source and discharge with the pipe, means tending to close the valves, opposing stems on the valves, a turnable polygonal member between the stems formed to have one of its corners in valve opening engagement with one of the stems when one of its sides is at the other stem where the valve of the last named stem is closed, ratchet means operable to turn the member a distance substantially equal to one-half the width of its sides at each operation to reverse the positions of the valves, a turnable manual operating member remote from the ratchet means, and a flexible element connecting the ratchet means with the manual operating member to be operated thereby.

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