L. G. RILEY.

CONTROL APPARATUS.

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1,333,681. Patented Mar. 16, 1920.

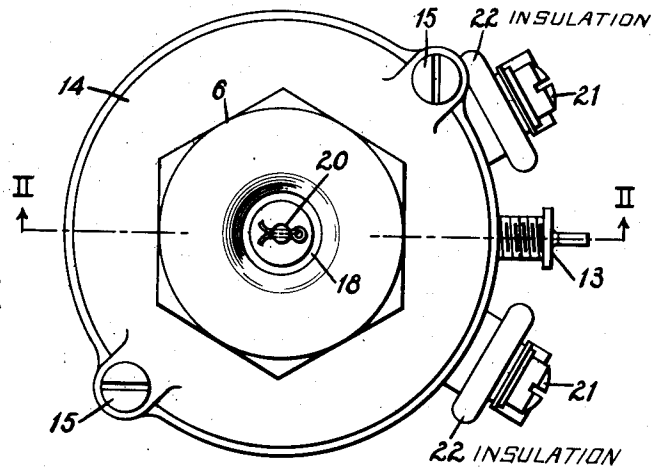


Fig. 1.

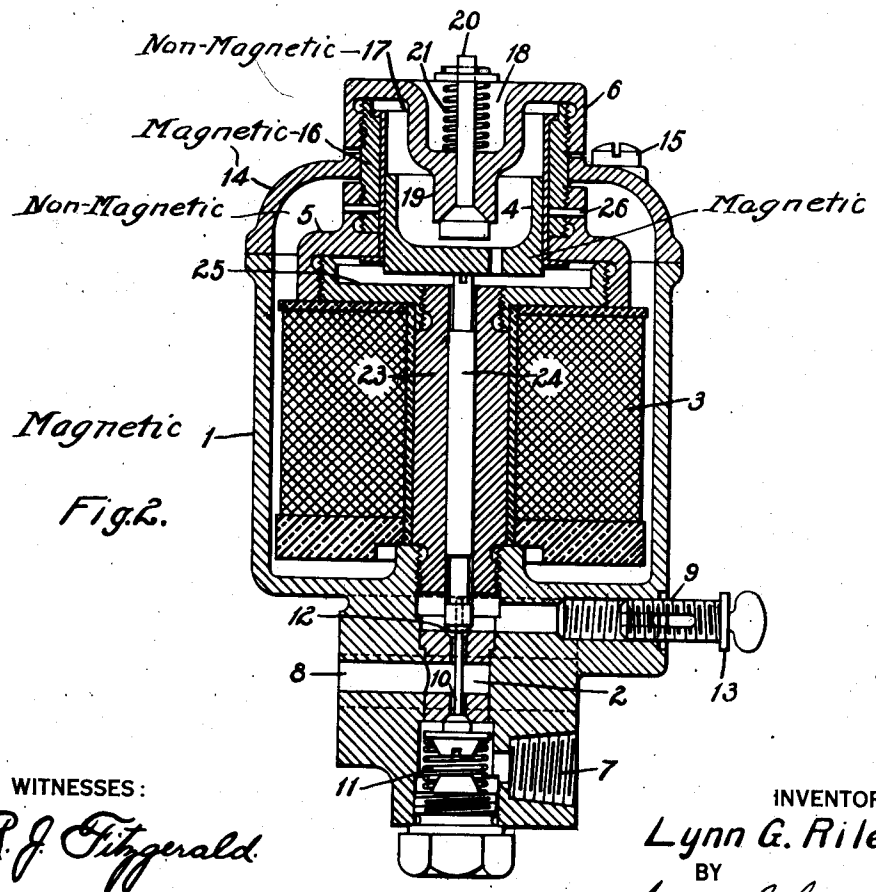


Fig. 2.

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CONTROL APPARATUS.

1,333,681. Specification of Letters Patent. Patented Mar. 16, 1920.

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To all whom it may concern:

Be it known that I, LYNN G. RILEY, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Control Apparatus, of which the following is a specification.

My invention relates to control apparatus and particularly to magnetically actuated valves for controlling fluid under pressure.

The object of my invention is to provide a valve of the above-indicated class in which the actuating mechanism is disposed in a metallic fluid-tight casing.

Another object of my invention is to provide a magnet valve of the above-specified type that may be manually actuated.

A further object of my invention is to provide a normally fluid-tight valve cap having actuating means extending therethrough.

Heretofore, in magnet valves, and particularly in valves having a throttled exhaust, it has been proposed to provide a fluid-tight seal composed of fibrous material for inclosing the moving parts of the valve. My invention provides a metallic fluid-tight seal for magnet valves of the type specified and a means for manually actuating the valve.

Figure 1 of the accompanying drawing is a top plan view of a magnet valve embodying my invention, and Fig. 2 is a sectional side view on the line II—II of Fig. 1.

A preferred form of magnet valve shown in the drawing comprises a case 1, which is preferably of magnetizable material, having a bottom portion that is provided with a valve mechanism 2 and an upper portion which incloses a coil 3, a magnetizable armature 4 that is adapted to be actuated by the coil 3, and an improved form of fluid-tight seal 5 for inclosing the movable parts of the structure. The magnet valve also embodies an improved form of cap 6 for the case 1.

The bottom portion of the case is provided with a supply port 7 through which fluid, under pressure, is admitted, a delivery port 8 through which the fluid flows to a device to be actuated thereby, and an exhaust port 9 through which fluid from the device to be actuated is released into the atmosphere. The flow of fluid from the supply port 7 to the delivery port 8 is by way of a valve 10 which is normally biased to a closed position by a spring 11 and is actuated in a manner to be hereinafter set forth. The flow of fluid from the delivery port 8 to the exhaust port 9 is by way of a valve 12 which is normally biased to an open position by the spring 11 and is operatively connected to the valve 10 so that when one valve is opened, the other valve is closed. The exhaust port 9 is provided with a fluid-throttling device 13 which adjustably regulates the rate of escape of fluid through the exhaust port 9.

The upper portion of the case 1 comprises a main recessed body portion and a top portion 14 that is secured to the body portion by screws 15. A cylindrical armature-guide 16 is preferably composed of magnetizable material and may be considered as a portion of the top 14. A portion at each end of the guide 16 is threaded to engage the sealing member 5 and the cap member 6. A non-magnetizable shell 17, which is disposed within the guide 16, insures a suitable bearing surface for the armature 4 and prevents the sticking thereof caused by residual magnetism in the flux path. The cap member 6 comprises a hexagonal portion that is internally threaded to engage the guide member 16, a disk portion, a recessed portion 18 and a projecting portion 19. A pin 20 having a valve on the lower end thereof is positioned in a perforation in the projecting portion 19 of the cap and is normally biased to a closed position by a spring 21. The lowermost portion of the valve on the pin 20 is adapted to engage the armature 4, when depressed, and to thereby actuate the valves 10 and 11, in a manner to be hereinafter described. The spring 21 is positioned within the recess 18 and is secured to the pin 20 by a suitable washer and cotter pin.

The coil 3, which is inclosed in the upper portion of the case 1, is of a familiar type that is adapted to be energized from terminal members 21, each of which is insulated from the case 1 by an insulator 22. A hollow core member 23 is disposed within the coil 3 and has the lower end thereof secured to the bottom portion of the case 1. A rod member 24, the lower end of which constitutes a portion of the valve 12 and the upper end of which extends above the core 23,

is movably positioned within the hollow core 23 and is adapted to be actuated by the armature 4. A threaded disk 25 is secured to the upper end of the core 23 and is adapted to engage the sealing member 5. The magnetizable armature 4 is mounted within the guide 16 and is adapted to bear upon the upper end of the rod 24. The sealing member 5, which is of non-magnetizable material, insures a fluid-tight incasement around the armature 4 and thereby prevents the escapement of fluid, under pressure, from the valve 12 through the hollow core 23 to the atmosphere. The sealing member 5 comprises two concentric cylindrical portions that are disposed on opposite sides of a recessed disk portion. The cylindrical portion having the larger diameter is internally threaded to engage the disk 25, and the smaller cylindrical portion is internally threaded to receive the guide member 16, which is secured thereto by suitable pins 26.

A magnet valve of the form herein described is electrically actuated by energizing the coil 3 which produces magnetic flux in a path extending from the upper end of the core 23 through the armature 4, the guide member 16, the case top 14 and the case 1 to the lower end of the core 23. The energization of the armature 4 causes the same to be attracted toward the core 23 and, since the armature bears upon the rod 24, the movement of the armature opens the valve 10 and closes the valve 12, thus admitting fluid to the device to be actuated. The deënergization of the coil 3 causes the armature 4 to be immediately released, by reason of the interposed non-magnetic sleeve 17, and the valve 10 to be closed by the spring 11. This action establishes a connection from the delivery port 8 to the exhaust port 9 and, since the fluid cannot escape through the hollow core 23 to the atmosphere by reason of the sealing member 5, the rate of exhaust may be regulated by properly adjusting the throttle 13 whereby any desired lag in the operation of the device to be actuated may be secured. To manually actuate the valves 10 and 12, the pin member 20 is depressed which opens the valve 10 and closes the valve 12 in the same manner as when the coil 3 is energized. As soon as the pin 20 is released, the spring 21 biases the valve on the pin 20 to a closed position and thereby prevents the subsequent escape of fluid.

The inclosing member 5 is made of non-magnetizable material in order that it may not provide a low-reluctance path for the flux from the core 23 to the guide member 16.

Although I have described my invention in a simple and preferred form, it is not necessarily so limited, and I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. The combination with a coil, a hollow core for the coil, a rod disposed within the hollow core, an armature adapted to be energized by the coil and bearing upon the said rod, a guide for the armature, a fluid-controlling valve actuated by the rod, and a case for the coil, armature and valve, of a cap for the case having a perforated recessed portion, a valve within the perforation, resilient means disposed within the recess for normally biasing the last named valve to a fluid-tight position, and metallic means joining the said core and guide for preventing the escape of fluid.

2. The combination with a coil, a magnetizable core for the coil, a fluid-controlling valve, a movable armature for actuating the valve, a magnetizable case for inclosing the said elements and constituting a return path for the flux from the coil, and guiding means for the armature associated with the case, of means for joining said core and said guiding means comprising non-magnetizable metallic means located beyond one end of said coil to prevent the escape of fluid from that end.

3. The combination with a coil, a magnetizable core for the coil, a fluid-controlling valve, a movable armature for actuating the valve and guiding means for the armature, of single metallic means detachably joining the guiding means and the core for preventing the escape of fluid from the said valve, and a casing for the various elements.

4. The combination with a coil, a magnetizable core for the coil, a fluid-controlling valve, a movable armature for actuating the valve, a case for the said elements and guiding means for the armature associated with the case, of metallic means detachably joining the guiding means and core within the case for preventing the escape of fluid.

5. The combination with a coil, a core for the coil, a movable armature actuated by the coil, a fluid-controlling valve actuated by the armature, a case for the said coil, core, armature and valve, and guiding means for the armature associated with the case, of a cap for the case surrounding said guiding means and having means normally biased to a fluid-tight position for manually actuating the valve.

6. The combination with a coil, a core for the coil, a movable armature actuated by the coil, a fluid-controlling valve actuated by the armature, a case for the coil, core, armature and valve, and guiding means for the armature associated with the case, of a cap for said case surrounding said guiding means and having means normally biased to a fluid-tight position for manually actuating

the armature, and metallic means associated with the core and guiding means for preventing the escape of fluid.

7. The combination with a coil, a magnetizable core therefor, a fluid-controlling valve located near one end of said core, a movable armature for actuating the valve and located near the other end of the core and a magnetizable case having a bottom portion and a top portion for inclosing the coil, core, valve and armature, of guiding means for said armature contained within said top portion, a disk member secured to said core, and a non-magnetizable member rigidly surrounding said guiding means and said disk member.

8. The combination with a case and a cap therefor, of a coil and an armature therefor contained within said case, a valve located within said case and controlled by said armature guiding means for the armature, and non-magnetizable means separating said armature from said case, said non-magnetizable means and said cap forming a seal for preventing the escape of fluid from said case.

9. In a valve mechanism, a magnetizable case, a coil and an armature therefor contained within said case, a valve controlled by said armature, a non-magnetizable member within said case and having a fluid-tight connection to said coil, a non-magnetizable shell secured to said member and lying within said case, said shell serving as a guide for said armature and a magnetizable cap having a fluid-tight connection to said case.

In testimony whereof, I have hereunto subscribed my name this 25th day of March 1916.

LYNN G. RILEY.