April 18, 1950 L. KIMBALL 2,504,428

ELECTRICALLY OPERATED SHUTOFF VALVE

Filed June 22, 1948

Fig. 1

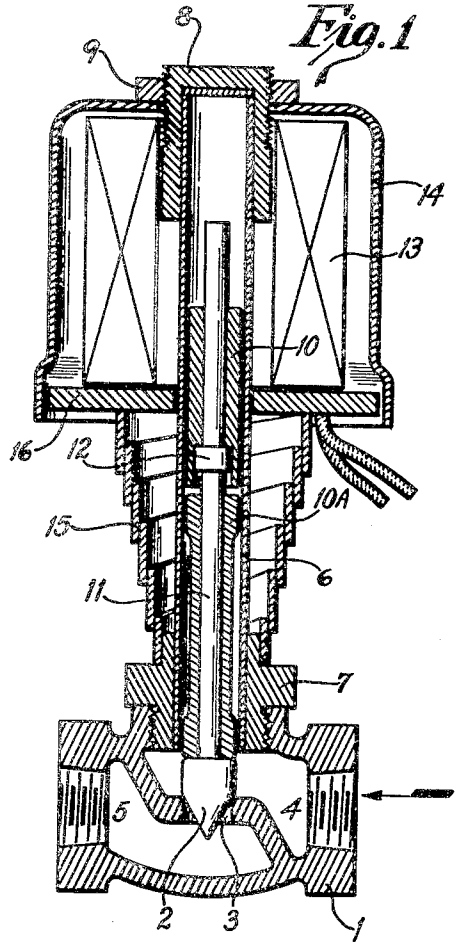
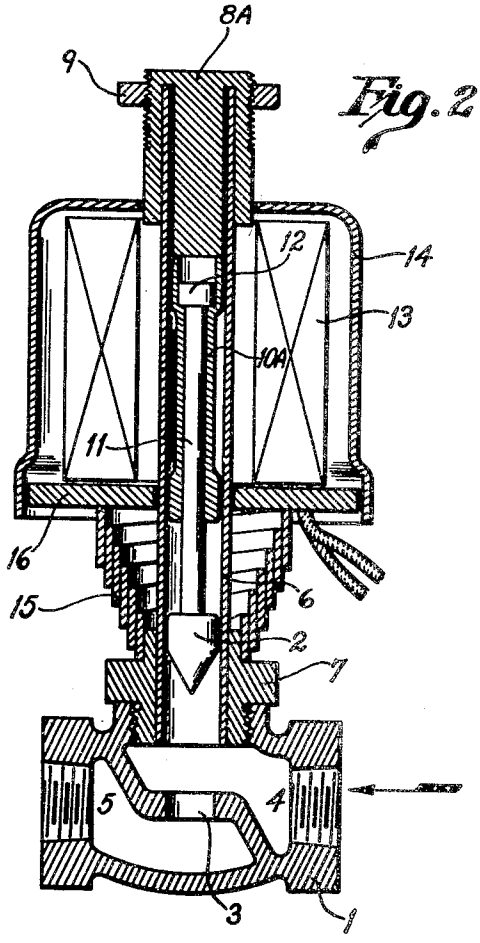


Fig. 2



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ELECTRICALLY OPERATED SHUTOFF VALVE

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4 Claims. (Cl. 137—139)

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My invention relates to electrically operated shut-off valves for oil burners and for general application where such valves are applicable. More specifically it relates to shut-off valves which will close on failure of electric current and remain closed after current has been restored until manually reset.

The object of the invention is to provide an electrically operated shut-off valve, of simple construction, which can be produced at a low cost of manufacture, which is positive in its operation.

To accomplish these objects I have devised a novel arrangement for manually re-setting the valve which consists of displacing the magnetic coil, in relation to the position of a movable magnetic core, disposed in a fluid-tight casing and operating as the valve opening and closing means.

To carry out the objects of my invention, the various elements are associated as illustrated in the accompanying drawings, in which:

Fig. 1 illustrates my invention, wherein a two-piece magnetic core is employed, the object of which will be explained later.

Fig. 2 illustrates a similar embodiment to that of Fig. 1 with the exception that the upper part of the magnetic core is stationary, the lower end extending into the magnetic field of the electric coil.

Referring to Fig. 1. Valve casing 1 has an inner valve 2, shown as closing orifice 3 which connects inlet 4 with outlet 5. A fluidtight non-magnetic tube 6, is pressed into valve cap 7 and pressure sealed at its lower end. A magnetizable pole cap 8 closes the top of tube 6 and has a threaded portion with an adjustable nut 9, the purpose of which will be explained later.

Within the non-magnetic tube 6 is a magnetizable floating core 10 and a magnetizable valve operating core 10A, both of which are mounted on valve stem 11. Valve stem 11 has a collar 12; which provides a fixed limit of movement for magnetic core, 10A, between collar 12 and valve head 2. A solenoid coil 13 is mounted on the outside of tube 6 and is enclosed in a magnetic casing 14. This coil 13 is held in place by a conical shaped spring 15 pressing on magnetic plate 16.

In the operation of my invention the magnetic coil 13 is normally elevated to such a position, that when the valve operating magnetic core 10A is de-magnetized, it drops in closing valve orifice 3, to a position which is out of the path of the magnetic pull and therefore will not be affected by the resumption of electric current. However, as the current again comes back on the coil 13, the floating core 10, which is never entirely out of the magnetic field, will be attracted to a

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floating position within the magnetic coil, thus cutting down the current through coil 13 and avoiding an excessive heat rise.

The manual resetting operation, after current has been restored, is to depress the coil against the retaining spring 15, thus placing the coil in a position to magnetize valve operating core 10 and cause it to rise with the coil 13; as the same is returned to its normal position. The purpose of adjustable nut 9 is to so position the coil 13 as to place the same in the most advantageous position in relation to voltage and the pressure to be overcome in unseating inner valve 2.

The type of valve shown in Fig. 1 is best suited for A. C. current, as the magnetic cores never make metal to metal contact, but float when energized in the magnetic field and therefore avoid A. C. hum.

Referring now to Fig. 2 the illustration shows the operating coil depressed, as in its manual operation in picking up the magnetic core for opening the valve. The arrangement is quite similar to Fig. 1, with the exception that pole cap 8A extends into the coil winding when the same is in its normal position and therefore does not require the floating magnetic core 10, as shown in Fig. 1. The clearance between the upper end of core 10A of Fig. 1, Fig. 2, and collar 12 on stem 11, is to allow core 10A to move upward a short distance before contacting collar 12 and thereby gain the necessary momentum to unseat valve 2. This hammer blow action also aids in seating of valve 2, both core 10 and 10A being slidably mounted on valve stem 11.

Due to the construction of spring 15, the coil 13 can be compressed to a position where maximum pull is obtained; which permits easier opening with a lower rated coil, than would normally be required.

While I have illustrated and described my invention in relation to a shut-off valve of the type shown, I desire to have it understood that the invention is equally applicable to other types of valves or devices; for example electric switches and the like. I desire therefore, that only such limitations shall be imposed, as are indicated in the appended claims.

I claim as my invention:

1. In combination with a device to be operated, operating means mounted on said device, comprising a vertical tube of non-magnetic material, an operating stem within said tube, a collar on said stem, a core of magnetizable material freely reciprocable between said collar and the device to be operated, a second core of magnetizable material mounted on said stem above said collar and

in spaced relation to the first named core, a solenoid coil slidable on said tube, spring means supported on said tube for biasing said coil in spaced relation to said cores, means for connecting said coil to a source of electric current whereby the second named core is operated to within the magnetic field of the coil, means manually operated for depressing the coil to a position surrounding the first named core to energize the same, the arrangement being such that when the coil is returned to its former spring biased position the first named core is operated against said collar and in contact with the second named core thereby effecting operation of the device to be operated.

2. In combination, a member to be operated, a support for said member, a stem for operating said member, a collar on said stem, a core of magnetizable material mounted on said stem and freely reciprocated between said collar and said member, a second core of magnetizable material freely mounted on said stem above said collar and in spaced relation to the first named core, a tube of non-magnetic material mounted on the supporting member within which said cores operate, a solenoid coil slidable on said tube, spring means adapted to bias said coil in spaced relation to the said magnetic cores, means for connecting the solenoid coil to a source of electric current to energize the same, the arrangement being such that when the coil is energized the second named core is attracted to a position within the magnetic field of the coil, and when the coil is depressed to a position surrounding the first named core the same is energized and when the coil is returned to its former biased position the core is attracted against said collar and in contact with the second named core thereby operating said member.

3. In an electrically operated valve comprising in combination, a valve casing having an inlet and an outlet, a valve orifice intermediate the inlet and outlet, a valve seat, an inner valve adapted to engage said seat, a stem for operating said inner valve, a collar on said stem, a core of magnetizable material mounted on said stem and freely reciprocable between said collar and said inner valve, a second core magnetizable material freely mounted on said stem above said collar and in spaced relation to the first named core, a tube of non-magnetic material vertically mounted on said valve casing and closed at its upper end within which said cores operate, a solenoid coil slidable on said tube, spring means adapted to bias said coil in spaced relation to the said magnetic cores, means for connecting the solenoid coil to a source of electric current to energize the same, the arrangement being such that when the coil

is energized the second named core is attracted to a position within the magnetic field of the coil, and when the coil is depressed to a position surrounding the first named core the same is energized and when the coil is returned to its former spring biased position the said core is operated against said collar and in contact with this second named core thereby unseating said inner valve.

4. In an electrically operated valve comprising in combination, a valve casing having an inlet and an outlet, a valve orifice intermediate the inlet and outlet having a valve seat, an inner valve adapted to engage said seat, an operating stem for said inner valve, a collar on said stem, a core of magnetizable material mounted on said stem and freely reciprocable between said collar and said inner valve, a second core of magnetizable material freely mounted at the opposite end of said stem and supported on said collar in spaced relation to the first named core, a tube of non-magnetic material mounted vertically on said valve casing in axial alignment with the inner valve and its operating stem, a magnetic pole piece closing the upper end of said tube, a solenoid coil slidable on said tube, spring means adapted to bias said coil in spaced relation to the said cores, an adjustable stop on said pole piece against which coil is biased, means for connecting the coil to a source of electric current to energize the same whereby the second named core is attracted to a position within the magnetic field of the coil, and means manually operated for depressing the coil to a position surrounding the first named core to energize the same, the arrangement being such that when the coil is returned to its former spring biased position the first named core is then operated against said collar and in contact with the second named core thereby effecting operation of the inner valve.

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