

June 12, 1951

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2,556,337

RESET VALVE

Filed Jan. 12, 1946

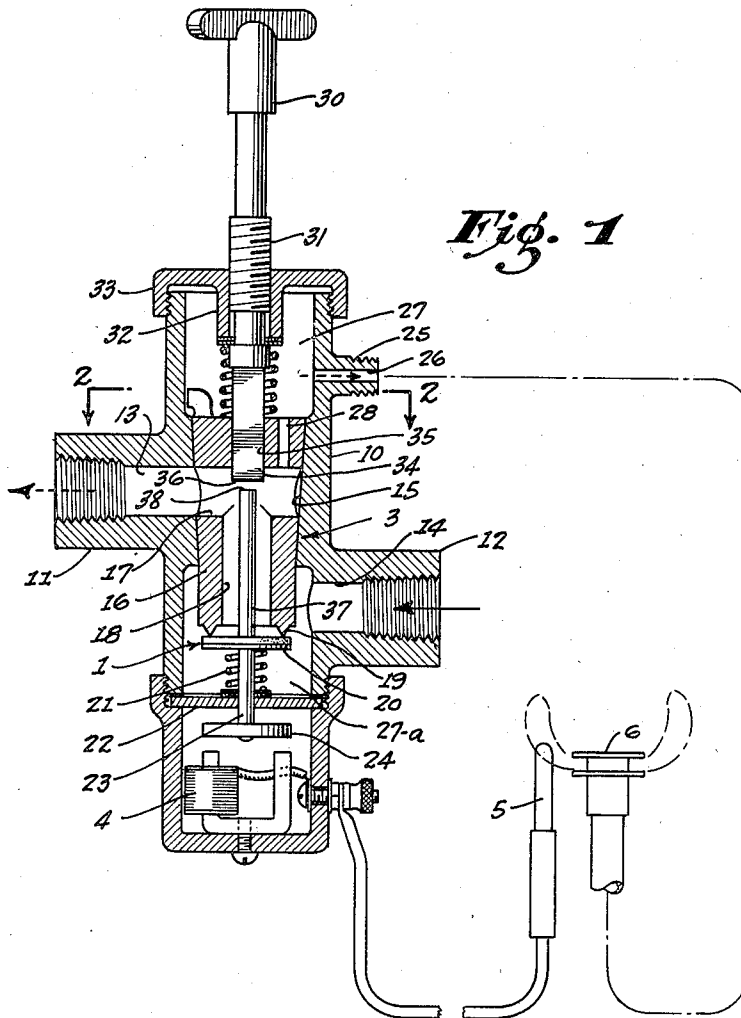
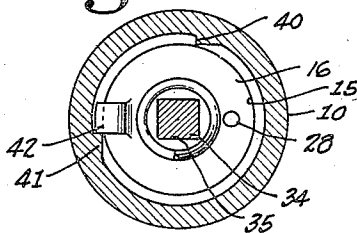


Fig. 1

Fig. 2



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2,556,337

RESET VALVE

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Application January 12, 1946, Serial No. 640,863

11 Claims. (Cl. 137-144)

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This invention relates to an electromagnetic reset valve for fluid fuels.

Such valves are used in fuel supply systems to control optionally the flow of fuel to the main burner, and to prevent such fuel flow unless a pilot flame is burning. A valve structure of this character usually comprises a pair of valves, both of which must be open to permit passage of fuel through the valve structure. One of these valves forming a safety valve is arranged to be maintained open by an electromagnet energized by a thermoelectric generator in the form of a thermocouple heated by the pilot flame. The other, or main valve is manually operable to regulate the passage of fuel to the main burner. Thus, the latter valve may be opened or closed as desired, the pilot flame serving to ignite the fuel passing through the burner whenever this valve is open.

If the pilot flame is extinguished, the safety valve closes, preventing passage of fuel through the main valve and the safety valve. To re-establish the fuel supply, the safety valve must be manually operated to open position, or reset, and held in such position until the pilot flame is lighted, after which this valve may be released, the electromagnet serving to retain it in open position. Manual resetting of this character is required because the electromagnet, when energized by the very low power output of the thermoelectric generator, is incapable of attracting the safety valve closure to open position.

It is an object of this invention to provide such a valve which ensures that the fuel supply to the main burner is shut off upon flame failure and cannot be re-established during the resetting operation.

It is another object of this invention to provide a reset valve having an improved means for performing the resetting operation.

It is still another object of this invention to provide a reset valve having an angularly movable operating member for actuating one of the valves, and arranged to move axially in response to such angular movement for actuating the other valve, whereby a continuation of the movement closing the main valve serves to perform the resetting operation.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. The form will now be

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described in detail illustrating the general principals of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

In the drawing:

Figure 1 is an axial section through a valve structure incorporating the features of the invention; and

Fig. 2 is a cross section on an enlarged scale, taken as indicated by line 2-2 of Fig. 1.

This valve is of the type for controlling the fuel fluid supply to a burner which is operated at irregular intervals, a constantly burning pilot flame being provided for igniting the main burner after periods of inactivity.

The valve structure comprises a main valve 3, manually operable for optionally controlling the fuel supply to a main burner (not shown) and a safety valve 1 for automatically controlling fuel flow through the valve structure in response to the existence of a pilot flame. For this purpose the safety valve closure 20 is adapted to be retained in open position by an electromagnet 4 energized by electricity generated by a thermocouple 5 in response to the heat of the flame of the pilot burner 6.

The valve structure comprises a generally cylindrical body 10 with oppositely directed axially spaced bosses 11 and 12 having openings 13 and 14 respectively communicating with the interior of the body 10 and forming the outlet and inlet ports. The interior of the body 10 has a tapered surface 15 for accommodating a correspondingly tapered plug 16 having a radial port 17 and a communicating axially extending passageway 18 opening at the lower end of the plug.

A safety valve seat 19 is provided about the open end of passageway 18 for cooperating with the safety valve closure 20, which is movable toward and away from the seat 19 to control fuel flow through the passageway 18. A light compression spring 21, interposed between the closure 20 and a wall 22 extending across the lower end of the body 10, urges the closure 20 to seat. The closure 20 has a downwardly projecting stem 23 carrying an armature 24 adapted to cooperate with the electromagnet 4 to maintain the closure 20 unseated. It is to be understood that the armature 24 is attached to stem 23 by a suitable swivel so that the armature can seat properly on magnet 4; and, furthermore, appropriate strain release springs may be provided to prevent excessive seating pressure.

The body 10 is provided with an additional boss 25 having a port 26 leading from the body space 27 above the plug 16 to the pilot burner 6. A small port 28 in the plug 16 extends upwardly from the transverse port 17 to the body space 27 for supplying fuel to the pilot burner. This space 27 is separated from the lower body space 27-a, into which the inlet port 14 opens, by the plug 16.

With the safety closure 20 seated as shown, no fuel can pass to either the pilot burner through port 26 or to the main burner through port 13. However, when closure 20 is unseated, fuel flows continuously to the pilot burner 6, and to the main burner via port 13 in accordance with the position of plug 16.

A common operating member 30 is provided for actuating the plug 16 to control the main burner, as well as to reset the safety closure 20 after a flame failure. The operating member 30 has an enlarged threaded portion 31 engaging a correspondingly threaded boss 32 in a cap 33 closing the top of the body 10. Below the threaded portion 31, member 30 has a non-circular portion 34 slidably engaging a correspondingly shaped aperture 35 in the plug 16 (see Fig. 2). In this way the plug 16 is splined on the member 30 to rotate therewith.

Furthermore, the lower end surface 36 of member 30 is arranged to unseat the safety closure 20. For this purpose, the closure 20 may have an upward extension or stem 37 to provide a cooperating surface 38 appropriately spaced from the surface 36.

The arrangement is such that, when the member 30 is turned 90° from the position shown in a clockwise direction (Fig. 2) communication between the ports 17 and 13 is first interrupted; and then closure 20 is unseated, bringing the armature 23 into engagement with the magnet 4. This allows fuel to flow to the pilot burner 6 which is lighted. The heat of the pilot flame activates the thermocouple 5 which energizes the magnet 4. Thus, when the operating member 30 is turned counter-clockwise to open the main valve 3 by aligning ports 17 and 13, the safety closure 20 is retained in open position by the magnet. If the pilot flame fails to ignite, the safety closure 20 seats in response to release by return movement of the member 30 before the plug 16 reaches open position, thus preventing fuel flow through the valve. With the pilot flame burning, the flow of fuel to the main burner may be controlled and interrupted as desired by appropriate manipulation of the member 30. Should the pilot flame fail at any time, the magnet 4 is at once deenergized, allowing the safety closure 20 to close and prevent all fuel flow to the main burner, as well as to the pilot burner 6. Interengaging stop means such as 40, 41, and 42 may be provided on the body 10 and the plug 16 to limit angular movement of the plug to about 90° and to definitely determine its open and closed position.

It will be understood that the spacing of the surfaces 36 and 38 is such, with respect to the pitch of the screw threads on member 30, that the plug 16 must be positioned to prevent all passages of fuel through the valve before these surfaces contact. Further, the space between armature 24 and the face of the electro-magnet 4 when the safety closure 20 is seated is such that the axial movement of the member 30 caused by the final closing movement of the plug, after engagement of surfaces 36, and 38 will be sufficient

to bring the armature 24 into contact with the face of the magnet 4.

The inventor claims:

1. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body and each capable independently to interrupt flow between the inlet and outlet passages; said body providing a valve seat with which the first of said closures cooperates, said first closure being rotatable to position the closure to open or closed positions; the second valve closure being linearly movable to open and closed positions; an operator for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement; and means connected to the second closure and in the path of axial movement of the operator when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position when the first closure member is in closed position.

2. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body; said body providing a valve seat for the first of said closures; said first closure being rotatable about an axis and having a radial port communicating with an axially extending passageway in said first closure, said radial port being positionable selectively to communicate with said outlet passage, said first closure providing a seat for said second closure around said axial passageway; means releasably holding said second valve closure in open position according to external conditions; said second closure being linearly movable; an operator for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement; and means connected to the second closure and in the path of axial movement of the operator when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position when the first closure member is in closed position.

3. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body and each capable independently to interrupt flow between the inlet and outlet passages; said body providing a valve seat with which the first of said closures cooperates, said first closure being rotatable to position the closure to open or closed positions; the second valve closure being linearly movable to open and closed positions; an operator for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement, including threaded means on said valve body and cooperating threaded means on said operator; and means connected to the second closure and in the path of axial movement of the operator when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position when the first closure member is in closed position.

4. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body and each capable independently to interrupt flow between the inlet and outlet passages; said body providing a valve seat with which the first of said closures cooperates, said first closure being rotatable to position the closure to open or closed positions; the second valve closure being linearly movable to open and closed positions; an operator having an extension forming a splined connection with said first closure for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement; and means connected to the second closure and in the path of axial movement of the operator extension when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position when the first closure member is in closed position.

5. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body; said body providing a valve seat for the first of said closures; said first closure being rotatable about an axis and having a radial port communicating with an axially extending passageway in said first closure, said radial port being positionable selectively to communicate with said outlet passage, said first closure providing a seat for said second closure around said axial passageway; an auxiliary passageway in constant communication with said port; means releasably holding said second valve closure in open position according to external conditions; said second closure being linearly movable; an operator for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement; and means connected to the second closure and in the path of axial movement of the operator when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position when the first closure member is in closed position.

6. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body and each capable independently to interrupt flow between the inlet and outlet passages; said body providing a valve seat with which the first of said closures cooperates, said first closure being rotatable to position the closure to open or closed positions; the second valve closure being linearly movable to open and closed positions; an operator having an extension forming a splined connection with said first closure for angularly moving the first closure about an axis; means responsive to angular movement of the operator for moving the operator linearly in a direction corresponding to the axis of the angular movement, including threaded means on said valve body, and cooperating with threaded means on said operator; and means connected to the second closure and in the path of axial movement of the operator extension when the second closure is in closed position, said operator in the course of its axial movement urging said means connected to the second closure to move the second closure to open position

when the first closure member is in closed position.

7. In a valve: a valve body having an inlet and an outlet passageway; means forming a chamber in constant communication with the inlet; a main valve closure member comprising a rotatable plug having an axial passageway and a radial port connected thereto; said radial port being angularly positionable for selectively connecting said outlet passageway with said axial passageway, said plug passageway adapted to communicate with said chamber irrespective of angular position of said plug; a safety closure member movable axially of the plug in response to external conditions for interrupting or maintaining communication of said plug passageway with said chamber; an operating stem for angularly positioning said plug; means forming a splined connection between said stem and said plug to permit relative axial movement therebetween; means mounting said stem to cause axial movement thereof in response to angular movement thereof; and means connected to the safety closure and in the path of axial movement of said stem when the safety closure is in closed position, said stem in the course of its axial movement urging said means connected to the safety closure to move the safety closure to open position when the plug is in closed position.

8. In a valve: a valve body having an inlet and an outlet passageway; means forming a chamber in constant communication with the inlet; a main valve closure member comprising a rotatable plug having an axial passageway and a radial port connected thereto; said plug providing a valve seat around said passageway; said radial port being angularly positionable for selectively connecting said outlet passageway with said axial passageway, said plug passageway adapted to communicate with said chamber irrespective of angular position of said chamber irrespective of angular position of said plug; a safety closure member cooperating with said valve seat and movable axially of the plug in response to external conditions for interrupting or maintaining communication of said plug passageway with said chamber; and operating stem for angularly positioning said plug; means forming a splined connection between said stem and said plug to permit relative axial movement therebetween; means mounting said stem to cause axial movement thereof in response to angular movement thereof; and means connected to the safety closure and in the path of axial movement of said stem when the safety closure is in closed position, and engaged by said stem to move said safety closure to open position only after a predetermined angular movement of said stem.

9. In a valve structure: a valve body having an inlet passage and an outlet passage; a pair of movable valve closures within the body and each capable independently to interrupt flow between the inlet and the outlet passages; said body providing a valve seat with which the first of said closures cooperates, said first closure being rotatable to position the closure to open or closed position; an operating stem for said first closure having a threaded portion; means engaging said threaded portion for effecting axial movement of said stem in response to rotation thereof; a splined connection between said stem and said first closure member to enable said first closure to move angularly therewith to open or close said valve structure without moving axially with

said stem; means forming a lost motion connection between said stem and the second of said valve closures for transmitting axial motion of said stem to open said second valve closure; and electromagnetic means releasably holding said second valve closure in open position in response to external conditions after said second valve closure has been moved to open position by said stem.

10. In a valve having an inlet and an outlet; a main valve structure and a safety valve structure each capable independently to interrupt flow between the inlet and the outlet; a closure for the main valve structure comprising a rotatable plug; a closure for the safety valve structure movable axially of the plug in response to external conditions for closing or maintaining open said safety valve structure; an operating stem for rotating said plug to open and close said main valve structure; means forming a splined connection between said stem and said plug to permit relative axial movement therebetween; threaded means mounting said stem to cause its axial movement in response to its rotation; and means forming a lost motion connection between said safety valve closure and said stem for resetting said safety valve closure, said threaded means having such a pitch and said lost motion connection being such as to reset said safety valve only after said main valve is closed.

11. In a valve having an inlet and an outlet; a main valve structure including a rotary closure member having an axially extending passageway adapted to communicate with said inlet and angularly positionable for selectively communicating said passageway with said outlet,

said plug being provided with a safety valve seat adjacent the inlet; a safety closure movable axially of said member in response to external conditions for interrupting or maintaining communication of said passageway with said inlet; an operating member splined to said rotary closure member for angularly positioning said rotary closure member and axially movable with respect thereto; and threaded means for causing said operating member to move axially in response to its angular movement, said operating member and said safety closure member having normally spaced surfaces which are engageable upon predetermined angular and axial movement of said operating member, said threaded means having such a pitch as to cause engagement of said surfaces only after said rotary closure member is in closed position.

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