United States Patent

Randolph et al.

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[45] **Aug. 8, 1972**

[54] **LATCHING ASSEMBLY FOR A CONTROL DEVICE TO PREVENT OPERATION THEREOF PRIOR TO ELECTROMAGNET SAFETY RELEASE**

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[52] **U.S. Cl.** **137/66,** 431/54, 431/80, 431/281

[51] **Int. Cl.**.....**F23d 13/46**

[58] **Field of Search** 431/54, 80, 281; 137/66

[56] **References Cited**

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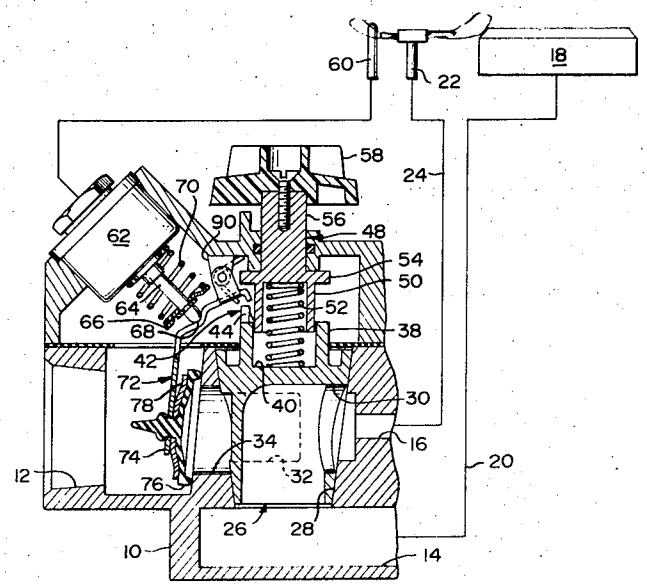
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[57] **ABSTRACT**

A latching assembly for a control device including a stop member disposed on a gas cock and a safety lever having a control leg adapted to abut the stop member to prevent rotation of the gas cock prior to release of an armature controlled by a safety electromagnet.

5 Claims, 9 Drawing Figures



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2 Sheets-Sheet 1

FIG. 1

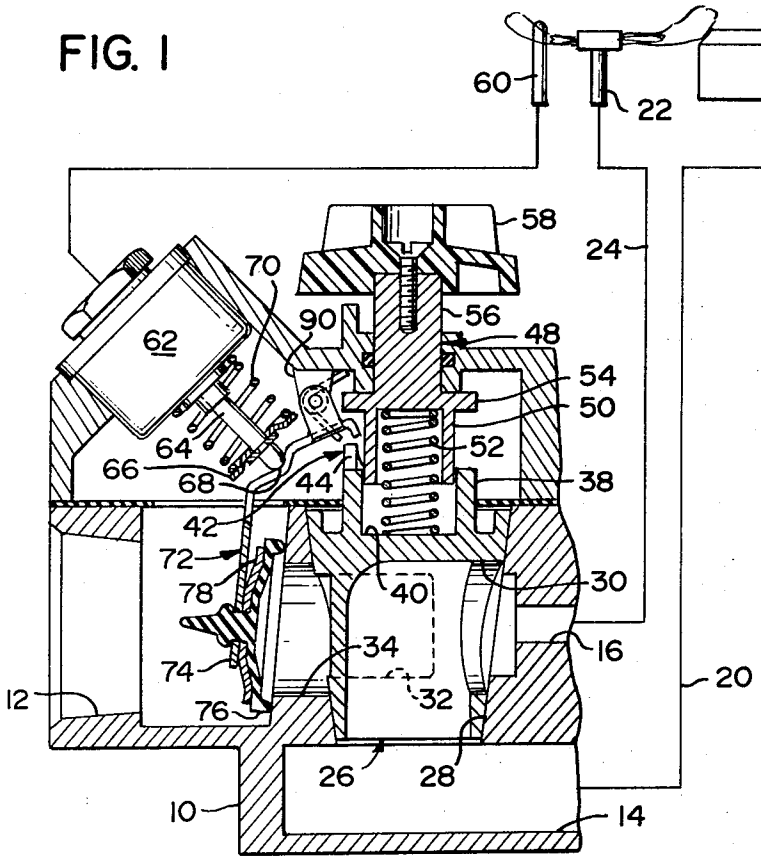


FIG. 2

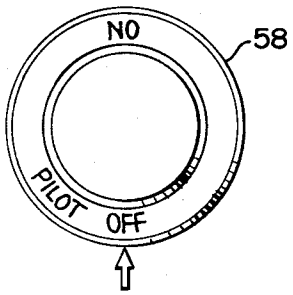


FIG. 4

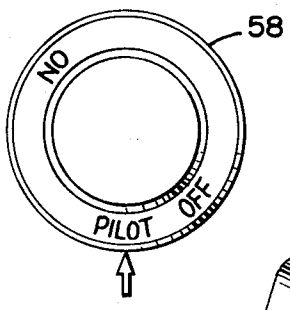


FIG. 3

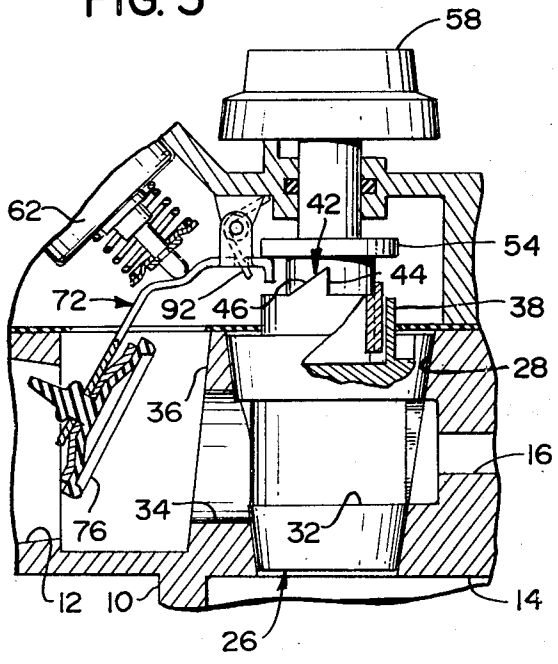
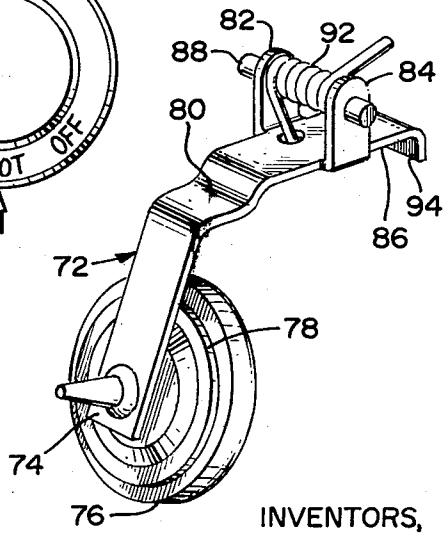


FIG. 1a



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FIG. 5

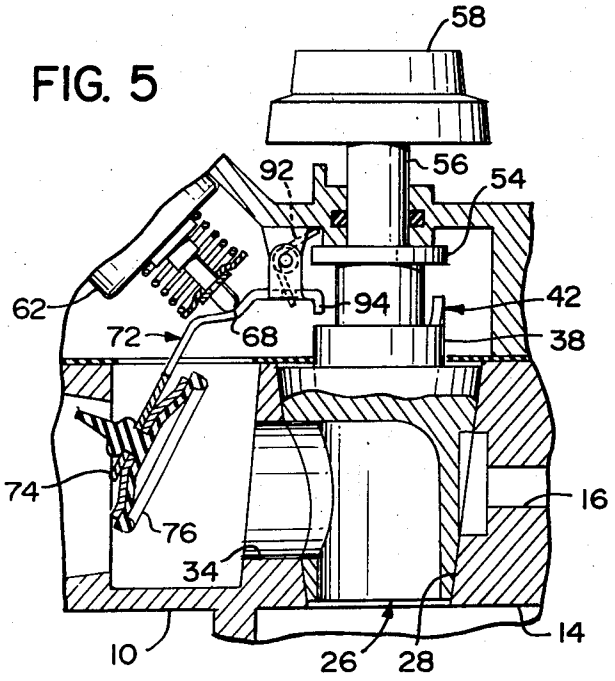


FIG. 6

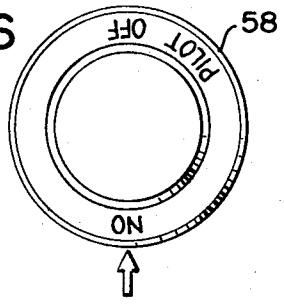


FIG. 7

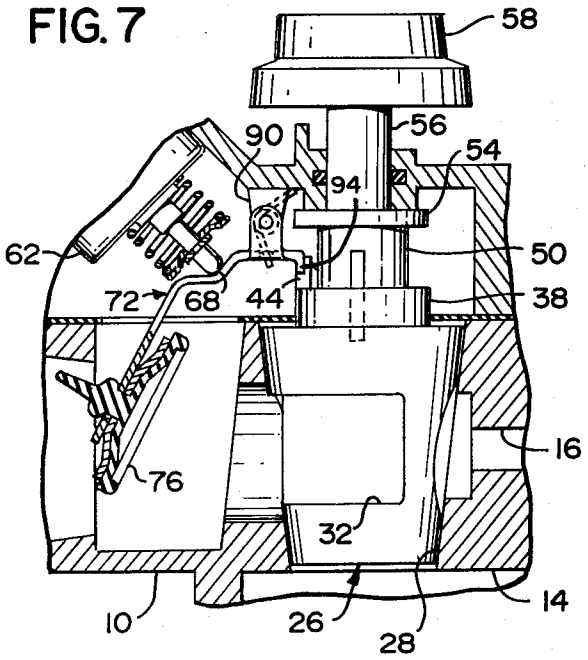
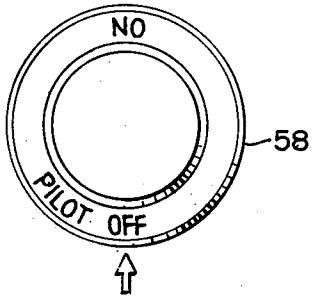


FIG. 8



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LATCHING ASSEMBLY FOR A CONTROL DEVICE TO PREVENT OPERATION THEREOF PRIOR TO ELECTROMAGNET SAFETY RELEASE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to control devices for supplying fuel to a main burner and, more particularly, to latching assemblies to prevent such control devices from being placed in an on condition prior to electromagnetic release.

2. Discussion of the Prior Art

Conventional control devices for supplying fuel to a main burner include a safety valve to prevent fuel from being supplied to the main burner upon outage of the flame at a pilot burner. The safety valve is normally controlled by a thermocouple which is operable in response to a flame at the pilot burner to supply electricity to energize an electromagnet. When the electromagnet is energized the safety valve is open to permit fuel to flow through the control device; however, if the pilot burner flame is extinguished for any reason the electricity from the thermocouple ceases and the electromagnet is deenergized to close the safety valve.

When such a control device is turned from an on condition to an off condition, the flow of fuel to the pilot burner is stopped; and, accordingly, the pilot burner flame is extinguished. The thermocouple, therefore, ceases to generate electricity; however, the electromagnet does not immediately drop out in that there is a time delay during which the field established by the electromagnet decays sufficiently to drop out the armature. Thus, if such a control device is placed in its off condition and then immediately returned to its on condition, as is liable to be the case when the control device is accidentally turned off, hazardous conditions will exist in that gas will be permitted to flow to the main burner without the establishment of a flame at the pilot burner.

While there have been many attempts to provide latching assemblies to overcome the above described problem, such attempts have required additional components, such as auxilliary levers, to be included in existing control devices. Thus, relatively extensive modification of existing control devices is necessary in order to incorporate prior art latching assemblies therein, and such modification has the disadvantages of being expensive and not fully utilizing existing components.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to construct a latching assembly for a control device to prevent the control device from being placed in an on condition prior to release by a safety electromagnet without requiring major modification of the control device.

The present invention is summarized in a latching assembly for a control device including a stop disposed on a cylindrical wall of a gas cock controlling communication between an inlet and main and pilot outlets in a casing, and a safety lever pivotally supported in the casing and having an operating end secured to a safety valve, a control leg extending above the cylindrical wall and an offset portion connecting the operating end with the control leg to define a concave surface receiving the rounded end of an armature controlled by an electromagnet, the safety lever having a position wherein the operating end opens the safety valve and the control leg is positioned between an edge of the stop and an end of the cylindrical wall of the gas cock whereby rotation of the gas cock is restricted in one direction due to abutment with the stop.

Another object of the present invention is to construct a lever for a control device to have a concave portion adapted to receive an armature of a safety electromagnet controlling pivotal motion of the safety lever.

A further object of the present invention is to dispose a stop above a cylindrical wall on a gas cock to abut the operating leg of a safety lever when a control device is being moved from an on condition to an off condition to an on condition in rapid succession.

Some of the advantages of the present invention over the prior art are that the latching assembly is simply and inexpensively produced and may be incorporated into conventional control devices with little modification.

Further objects and advantages of the present invention will become apparent from the description of the preferred embodiment as shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation, partially in section, of a control device according to the present invention in an off condition.

FIG. **1***a* is a perspective view of the safety lever in the control device of FIG. **1**.

FIG. **2** is a top plan view of the selector knob in FIG. **1**.

FIG. **3** is a side elevation, partially in section, of the control device of FIG. **1** in a pilot condition.

FIG. **4** is a top plan view of the selector knob in FIG. **3**.

FIG. **5** is a side elevation, partially in section, of the control device of FIG. **1** in an on condition.

FIG. **6** is a top plan view of the selector knob in FIG. **5**.

FIG. **7** is a side elevation, partially in section, on the control device of FIG. **1** in the off position prior to electromagnetic release.

FIG. **8** is a top plan view of the selector knob in FIG. **7**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A control device according to the present invention is illustrated in FIG. **1** and includes a casing **10** having a inlet **12**, a main outlet **14** and a pilot outlet **16**. Inlet **12** is adapted to receive fuel, such as gas, from any suitable source, not shown, and main outlet **14** supplies the fuel to a main burner **18** through a conduit **20**. A pilot burner **22** is disposed in igniting proximity to main burner **18** and receives fuel from pilot outlet **16** through a conduit **24**.

A gas cock **26** is seated in a conical cavity **28** in casing **10** and has a port **30** in a side wall thereof and a pilot groove **32** extending more than 180° around the side wall between a pair of stops. Port **30** and groove **32** are aligned with an aperture **34** in a wall in casing **10**,

and aperture 34 is aligned with inlet 12 and has an outer surface 36 forming a valve seat. Gas cock 26 is open at its lower end to communicate with main outlet 14, and the upper end of gas cock 26 has a cylindrical wall 38 extending therefrom defining a recess 40. A stop member 42 is disposed on the upper end of wall 38 and has an upstanding face 44 with a slanted cam surface 46 extending from the edge of face 44 to the upper end of wall 38.

A stem 48 is coupled with gas cock 26 by any conventional means such as a keying arrangement as illustrated in U.S. Pat. No. 3,235,180 or No. 2,746,472; the stem 48 has a cylindrical wall 50 which is movable within recess 40, and a bias spring 52 has one end seated in a recess defined by wall 50 and the other end seated in recess 40. An annular projecting ledge 54 is disposed around stem 48, and an upper portion 56 of stem 48 extends through casing 10 and is secured to a selector knob 58 which has "ON," "OFF" and "-PILOT" indicia thereon.

A thermocouple 60 is disposed in heat sensing proximity to pilot burner 22 and is connected in circuit with a safety electromagnet 62 supported in casing 10. An armature 64 is operated by electromagnet 62 and carries a plate 66 near a rounded end 68, and a coiled bias spring 70 is mounted in compression between plate 66 and the housing for the electromagnet 62. A safety lever 72 has an operating end 74 with an aperture therein receiving a projection of a resilient valve facing 76 which is supported by a disc 78. Valve facing 76 cooperates with valve seat surface 36 to control flow from inlet 12 to aperture 34.

Safety lever 72 is offset to define a concave portion 80 engaging the rounded end 68 of armature 64, as shown in FIG. 1 and 1*a*. A pair of apertured ears 82 and 84 extend transversely from a control leg 86 of lever 72, and a pivot pin 88 extends through the apertures in ears 82 and 84 and through apertures in supports 90 depending from casing 10. A torsion spring 92 is coiled around pivot pin 88 and has one end abutting casing 10 and the other end extending through a hole in control leg 86 of lever 72 to bias lever 72 clockwise about pin 88. Leg 86 terminates in a transversely extending edge 94 that is suspended above wall 38 of gas cock 26 and below ledge 54 of stem 48.

Sequential operation of the control device will now be described with reference to FIGS. 1–8 which illustrate the control device in various operational conditions.

The control device is illustrated in an off condition in FIG. 1. That is, with selector knob 58 turned to OFF gas cock 26 is rotated such that fuel entering casing 10 at inlet 12 cannot be communicated to main outlet 14 since port 30 is not in communication with aperture 34 and cannot be communicated to pilot outlet 16 since the stops in groove 32 engage the surface of cavity 28. Thus, no fuel is supplied to main burner 18 or pilot burner 22; and, since thermocouple 60 does not sense a flame at pilot burner 22, electromagnet 62 is deenergized thereby permitting spring 70 to place armature 64 in an extended position. The force from spring 70 is greater than the force from spring 92; and, accordingly, safety lever 72 is pivoted counterclockwise about pin 88 such that valve facing 76 engages valve seat surface 36 to further assure that no fuel is supplied to either main outlet 14 or pilot outlet 16.

With the control device in the off condition illustrated in FIG. 1, lever 72 is in a closed position such that edge 94 is disposed between the edge of face 44 of stop members 42 and ledge 54 thereby permitting rotation of selector knob 58 and gas cock 26.

If it is desired to fire up main burner 18, selector knob 58 is turned to the PILOT position, as illustrated in FIG. 4, to rotate gas cock 26 such that groove 32 communicates with pilot outlet 16 and aperture 34. Selector knob 58 is now depressed to move stem 48 toward gas cock 26 against the force of spring 52, and ledge 54 engages control leg 86 of safety lever 72 to pivot lever 72 clockwise, as illustrated in FIG. 3, to an open position in which edge 94 is disposed between the edge of face 44 of stop member 42 and the end of wall 38. The clockwise pivotal movement of lever 72 moves armature 64 to a withdrawn position against the force of spring 70 and moves valve facing 76 away from surface 36 to permit communication between inlet 12 and aperture 34. Thus, it may be seen that fuel flows from inlet 12 through aperture 34, groove 32 in gas cock 26, pilot outlet 16 and conduit 24 to pilot burner 22 where it may be ignited in any suitable manner, such as by a match.

Once the pilot burner 22 is ignited, the flame thereat is sensed by thermocouple 60 which generates sufficient electricity to energize electromagnet 62 to maintain armature 64 in the withdrawn position. Accordingly, selector knob 58 may be released after pilot burner 22 is ignited without valve facing 76 moving back against surface 36.

Selector knob 58 is now turned to the ON position, as illustrated in FIG. 6, such that port 30 in gas cock 26 is aligned with aperture 34 to permit fuel to flow from inlet 12 through aperture 34, port 30, gas cock 26, main outlet 14 and conduit 20 to main burner 18. Fuel supply to pilot burner 22 is maintained when the control device is in the on condition in the same manner as previously described with respect to operation of the control device in the pilot condition.

Operation in the on condition is monitored by thermocouple 60; and, if the flame at pilot burner 22 is extinguished for any reason, thermocouple 60 will cease to generate electricity thereby deenergizing electromagnet 62 and permitting armature 64 to return to the extended position to move safety lever 72 such that valve facing 76 contacts valve seat surface 36 to prevent fuel flow through casing 10. Thus, fuel is prevented from escaping if the pilot flame ceases.

In order to place the control device in the off condition from the on condition, selector knob 58 is turned clockwise to the OFF position, as illustrated in FIG. 8. Safety lever 72 will be in the open position at this time, and edge 94 will ride up over cam surface 46 which leads face 44 of stop member 42 to permit full turning of selector knob 58 back to the OFF position. It will be appreciated that various means may be utilized to prevent accidental turning of selector knob 58 to the OFF position.

Once the control device is placed in the off condition, the flow of fuel to main burner 18 and pilot burner 22 will be stopped, and the flame at the pilot burner will be extinguished. Thus, thermocouple 60 will no longer supply electricity to electromagnet 62; however, armature 64 will not drop immediately in that there is a finite time required for the field created by electromag-

net 62 to decay. If the control device could be returned to the on condition during this time, fuel would escape without being ignited since the pilot burner flame is out and extremely hazardous conditions would exist.

Accordingly, changing of conditions of the control device is prevented until the time has elapsed since gas cock 26 cannot be rotated in a counterclockwise direction due to the abutting of face 44 which leads cam surface 46 of stop member 42 against edge 94 of safety lever 72 in the open position. Once the field of the electromagnet has decayed sufficiently, spring 70 will move armature 64 to the extended position to move safety lever 72 to the closed position, such that valve facing 76 engages valve seat surface 36 and edge 94 of safety lever 72 is moved above stop member 42 to permit rotation of the gas cock 26. The control device is now returned to the off condition illustrated in FIG. 1 and is ready for further operation.

Thus, the latching assembly made up of safety lever 72 and stop member 42 prevents rapid cycling of the control device from the on condition to the off condition and back to the on condition prior to release of safety electromagnet 62 to thereby prevent escape of unignited fuel. It will be appreciated that the assembly requires little modification of a control device in that stop member 42 need only be mounted on the top of gas cock 26 or formed integrally therewith and safety lever 72 need only be configured to have open and closed positions wherein the control leg 86 interferes with or permits rotation of the gas cock, respectively. The transverse edge 94 provides a greater stop surface to engage stop member 42 and permits more accurate and reliable operation, and the concave surface 80 of safety lever 72 maintains proper alignment of armature 64 and safety lever 72.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A latching assembly for a control device of the type including a casing having an inlet, a main outlet and a pilot outlet, a rotatable gas cock disposed in the casing and having a cylindrical wall extending from one end thereof, a stem having a ledge projecting therefrom and an end engaging the gas cock to control communication between the inlet and the main and pilot outlets, safety valve means disposed in the casing to control communication between the inlet and the gas cock, and an electromagnet operating an armature to control the operation of the safety valve means such that the safety valve means is open when a flame is sensed at a pilot burner and the safety valve means is closed when no flame is sensed at the pilot burner, said latching assembly comprising

a stop member disposed on the cylindrical wall of the gas cock and having a face with an edge spaced from an end of the cylindrical wall and a cam surface sloping from the end of the cylindrical wall to said edge of said face; and

a safety lever pivotally supported in the casing and having an operating end controlling the safety valve means, a control leg extending toward the gas cock and the stem to a position between the ledge on the stem and the end of the cylindrical wall, and an offset portion connecting the operating end with the control leg to define a concave surface receiving the armature,

said safety lever having a closed position in response to the armature wherein said operating end closes the safety valve means and said control leg is positioned between said edge of said face of said stop member and the ledge on the stem to permit rotation of the gas cock and an open position in response to the armature wherein said operating end opens the safety valve means and said control leg is positioned between said edge of said face of said stop member and the end of the cylindrical wall whereby rotation of the gas cock is restricted in one direction due to abutment of said control leg with said face of said stop member when said safety lever is in said second position.

2. The invention as recited in claim 1 wherein said control leg of said safety lever has a transverse edge extending toward the end of the cylindrical wall.

3. The invention as recited in claim 1 wherein a compression spring biases the armature against said concave surface of said safety lever, said safety lever is mounted on a pin supported in the casing, and a torsion spring is coiled around said pin and has a stationary end abutting the casing and a movable end engaging said control leg to bias said safety lever toward said open position, the force from the compression spring being greater than the force from said torsion spring.

4. The invention as recited in claim 1 wherein the gas cock has on and off positions and is rotatable in said one direction from the off position to the on position and in a second direction opposite to said first direction from the on position to the off position, and said stop member is disposed on the cylindrical wall of the gas cock such that said face leads said cam surface when the gas cock is rotated in said one direction and said cam surface leads said face when the gas cock is rotated in said second direction whereby said control leg rides on said cam surface when said safety lever is in said open position and the gas cock is rotated in said second direction from the on position to the off position and said control leg abuts said face of said stop member when said safety lever is in said open position to prevent rotation of the gas cock in said one direction from the off position to the on position.

5. The invention as recited in claim 4 wherein said control leg of said safety lever has a transverse edge extending toward the end of the cylindrical wall.

* * * * *