Dec. 31, 1957 R. B. GLICKMAN 2,817,973

SAFETY DEVICE

Filed Dec. 22, 1954

FIG. 1

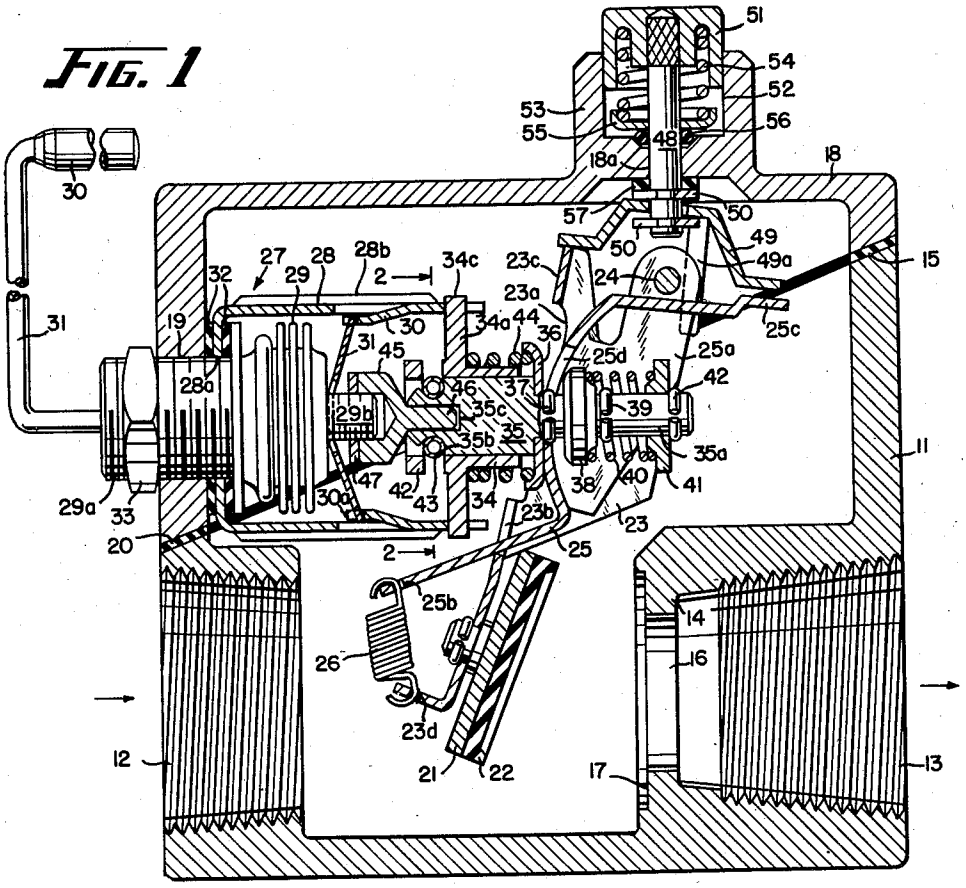


FIG. 2

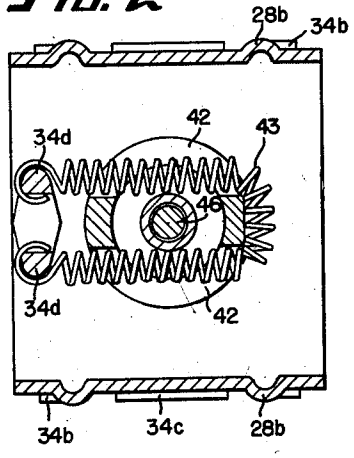
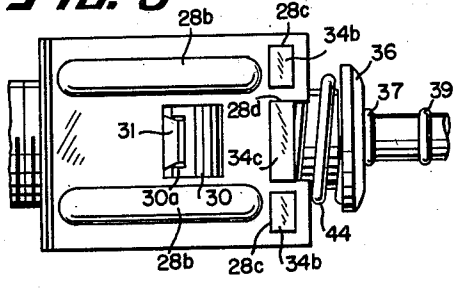


FIG. 3



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SAFETY DEVICE

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Application December 22, 1954, Serial No. 477,100

3 Claims. (Cl. 74—2)

This invention relates to limit controls and, more specifically, to limit controls which have to be manually reset after the control has moved to its "off" position in response to a predetermined condition arising.

One of the objects of this invention is to provide a simple, compact, inexpensive, and thoroughly reliable limit control which can be set or reset into and be retained in its "on" position only if a predetermined condition does not exist.

Another object of the invention is to produce a limit-control power unit which is sufficiently small as to be able to replace a thermocouple power unit in conventional safety pilots.

Still other objects of the invention will become apparent upon reading the following detailed description of the invention in conjunction with the accompanying drawings wherein:

Figure 1 is a vertical sectional view of the invention;

Figure 2 is a cross sectional view of the invention taken along line 2—2 of Figure 1, and

Figure 3 is a plan view of the motor portion of the condition responsive unit.

While it is to be understood that the invention could embody a switch as well as a valve or any other control means, it is illustrated in the form of a valve which is substantially identical to that disclosed in a copending application of James M. Cunnien and Melvin G. Sogge filed May 20, 1953, Serial No. 356,202.

The valve consists of a lower casting **11** having an inlet **12** and an outlet **13** with a dividing wall **14** therebetween. The lower casting **11** is open at its top and has a peripheral edge **15** that lies in a flat plane inclined at an angle to the longitudinal axis of the inlet and outlet of the valve body. The partition wall **14** has an opening **16** therein which is substantially coaxial with the inlet and outlet and has a valve seat **17** machined in the inlet side of the partition around the opening **16**.

The valve body also includes an upper casting **18** that is open at its lower edge and has an aperture **19** in one side wall thereof for mounting a power unit therein, to be presently described. The lower peripheral edge of the upper casting lies in a flat plane that is inclined to the axis of the inlet **12** and outlet **13** at the same angle as the upper edge of the casting **11**. The upper casting **18** is secured to the lower casting **11** with a sealing gasket **20** therebetween by means of bolts (not shown) extending freely through bores (not shown) in the upper casting and threaded into aligned bores (not shown) in the lower casting. The two castings, when so bolted together, form a generally rectangular shaped hollow housing or valve body that encloses the operating mechanism for the valve head now to be described.

The valve head **21**, having a soft facing **22** made of rubber or other suitable material, is supported at the

lower end of a bell crank lever **23** in a conventional manner, with an annular rib on the soft facing **22** adapted to engage with the valve seat **17** when the valve is in its "off" position. The upper portion of the lever **23** is of channel shape, which has a wide aperture **23***a* therein. The aperture **23***a* joins with a centrally disposed aperture **23***b* at the lower end of the aperture **23***a*, with the width of the aperture **23***b* being less than half the width of the channel portion. The upper end of the aperture **23***a* is spaced a short distance from the upper end of the channel portion and forms a cross bar arm **23***c* as the other arm of the bell crank lever **23**. The lever is pivoted on a pivot **24** supported in grooves **25** (not shown) in the upper casting **18**, with the pivot being held in said grooves by means of projections (not shown) on the lower casting **11**.

Another bell crank lever **25** has an intermediate channel shaped portion **25***a* and is pivoted at its upper end to the casting **18** on the same pivot **24** as is the lever **23**. One arm of the bell crank lever **25** extends downwardly and transversely from the channel shaped portion **25***a*, through the aperture **23***b* in lever **23**, to a point spaced from but substantially in axial alignment with the center of the valve **21**. A coil tension spring **26** has one end thereof hooked through an aperture **25***b* in the lower end of the lever **25** and the other end thereof hooked through an opening **23***d* in a transversely bent portion of the lower end of the lever **23**. This spring normally holds the lower end of the slot **23***b* in the lever **23** against the lever **25** but will stretch to permit separation of the lever **25** from the lever **23** for a purpose to be hereinafter described. The other end or arm of the bell crank lever **25** extends laterally from the pivot **24**, on the opposite side of the pivot **24** from the arm **23***c* on lever **23**, and has an offset portion **25***c* which is, normally, substantially in alignment with the arm **23***c* and the pivot **24**.

A condition responsive unit **27**, consists of a bracket member **28** of channel shape, a bellows unit **29**, a temperature responsive bulb **30** and a capillary tube **31** extending between the bulb and the bellows.

A bracket **28** has an aperture **28***a* therein, for mounting purposes, outwardly struck ribs **28***b* in the sidewalls thereof, for strengthening purposes, and inwardly struck arms **30** with notches **30***a* therein to support a leaf spring **31** in engagement with the free end of the bellows **29**.

The condition responsive unit **27** is held in its assembled relationship in the valve body by means of a threaded shank **29***a* on the bellows **29** extending through sealing washers **32**, the opening **28***a* in the bracket and the opening **19** in the valve body **18**, and tightly clamped to the wall of the valve body by means of a nut **33** threaded on the threaded stem **29***a* externally of the valve body. The capillary tube between the bulb and bellows is filled with a suitable expansible fluid, such as xylene, so that upon a predetermined temperature occurring at the bulb **30**, the bellows **29** will be expanded sufficiently to cause the valve to close.

The mechanism for normally holding the valve in its open position but which will permit the bellows to cause the valve to close at a predetermined temperature, consists of a guide sleeve **34** having a flange **34***a* thereon which is anchored to the inner ends of the bracket **28** by means of projections **34***b* extending through apertures **28***c* in the bracket and staked or riveted to the bracket. A wider projection **34***c* merely rests in a wider notch **28***d* in the bracket. Slidable in the sleeve **34**, is a plunger **35** having a reduced diameter portion **35***a* at one end thereof and an annular groove **35***b* at the other end thereof,

The reduced diameter portion extends through the opening 23*a* in lever 23 and the opening 25*d* in the lever 25. A spring thrust collar 36 is secured on the portion 35*a* against the main portion of the stem 35 by means of a split ring 37 engaged in an annular groove in the portion 35*a*. An abutment collar 38 is slidably supported on the portion 35*a* and is retained thereon by means of a split ring 39 engaging in an annular groove in the portion 35*a* and is resiliently urged against the lever 25 by means of a coil compression spring 40 extending between the collar 38 and another abutment collar 41, which, in turn, is retained on the extreme outer end of the stem portion 35*a* by means of another split ring 42 engaging in an annular groove in the portion 35*a*. The spring 40 is sufficiently strong as to hold the lever 25 against the spring cup 36 at all times.

Extending through two diametrically opposed slots 42 in the sleeve 34, is a coil spring 43, generally known as a garter spring, which has its ends anchored to two spaced lugs 34*d* formed on the flange 34*a*. This spring is of sufficient strength as to hold the plunger 35 in engagement therewith against the bias of spring 44 extending between the flange 34*a* and the spring retainer cup 36 for normally biasing valve 21 to its closed position. However, the spring 43 is not sufficiently strong as to hold the plunger 35 against the combined forces of the spring 44 and the force exerted by the bellows 29 against the plunger 35. For calibrating purposes, a nut 45, having a projection 46 thereon for engagement with the bottom of a bore 35*c* in the plunger 35, is screw threaded on a threaded boss 29*b* formed on the free end of the bellows 29. The nut 45 is locked in its adjusted or calibrated position by means of a jam nut 47.

The manual means for actuating the valve to its open position, with the plunger 35 in latching relationship with respect to the spring 43, is the same as that in the above mentioned Cunnien et al. patent application. It consists of a plunger 48 extending through a bore 18*a* and carrying at its inner end a floating lever 49 arranged to engage at one end with the arm 23*c* and its other end with the arm 25*c*. The lever 49 is retained on the plunger 48 by means of two split rings 50 engaging in annular grooves in the stem 48 on opposite sides of the lever 49. Mounted on the outer end of the stem 48 is a pushbutton 51 slidable in a bore 52 formed in a boss 53 extending upwardly from the top of the valve body casting 18. A coil spring 54 extends between the pushbutton 51 and a spring retainer cup 55 and a gas sealing O-ring 56 located between the spring retainer cup 55 and the outer surface of the wall 18. A sealing washer 57 is also positioned between the upper split ring 50 and inner surface of the valve body 18. The spring 54 will normally hold the pushbutton in its arised or outermost position but is yieldable to permit manual movement of the plunger 48 and the lever 49 into engagement with the levers 23 and 25. Downwardly projecting arms 49*a* on the lever 49 extend along the side of the pivot 24 to prevent rotation of the lever 49 out of alignment with the portions 23*c* and 25*c*.

Operation

The device is illustrated in its "on" position. That is, the bulb 30 is below the temperature at which the bellows 29 will expand sufficiently to engage the plunger 35 and force it out of engagement with spring 43. Should the temperature of the bulb increase to a predetermined amount, as for example 200 degrees, the temperature at which it would be dangerous to further heat a hot water tank, the bulb 30, which is in positioned to sense the temperature of the water in the tank, will expand the fluid in the bulb and consequently expand the bellows 29 sufficiently to force the plunger out of engagement with the spring 43. As soon as the plunger is free of the spring 43, the spring 44 will cause the lever 25 to move counterclockwise about the pivot 24 and force the lever 23 and the valve carried thereby into their off positions with the valve 21 seated against the valve seat 17. This will shut off the flow of gas through the valve to the burner for heating the water in the tank.

To reset the valve after the water in the tank has cooled below the control point, it is necessary to manually move the plunger 51 inwardly. The inward movement of the plunger will cause the floating lever 49 to bear against the lever 23 and the lever 25 and, as the lever 23 cannot move counterclockwise due to the fact that the valve is resting against the valve seat, only the lever 25 will be pivoted about the pivot 24. This will cause stretching of the spring 26 and movement of the piston 35 by the lever 25 to its latched open position with the spring 43 in engagement with the angular groove 35*b*. As long as the plunger 51 is held inwardly, no gas will flow to the burner. Only upon release of the button 51 will the spring 26 be able to pull the lever 23 and the valve carried thereby in a clockwise direction around the pivot 24 to their open positions. It is thus seen that it is impossible to move the valve to its open position unless the bulb 30 has cooled down sufficiently to permit the fluid in the bulb and bellows to contract and free the plunger 35 for movement to its latched open psoition.

While I have described the preferred embodiment of the invention, it is deemed to be apparent that various modifications may be made in the preferred embodiment of the invention without parting from the spirit thereof. Therefore, the scope of the claims should be determined solely from the appended claims.

I claim:

1. A control device comprising a generally U-shaped bracket having an opening in the base thereof, a bellows positioned within said bracket and having a shank portion thereof extending through said opening for securing said bracket to the control device, said bellows being connected to a condition sensing bulb, a flanged sleeve secured to the ends of the bracket with its axis coaxial with said bellows, said sleeve having parallel and diametrically opposed slots therein, control means having a stem slidable in said sleeve and having an annular groove therein, a garter spring extending substantially around said sleeve and lying in said slots for engagement in said annular groove to hold said member in its "on" position, and manually operable means for actuating said control to its "on" position.

2. A safety device comprising a bracket, condition responsive means positioned within said bracket and having a shank portion thereof extending through an opening in said bracket for securing said bracket to the safety device, a flanged sleeve secured to the ends of the bracket, said sleeve having substantially parallel and diametrically opposed slots therein, a garter spring extending substantially around said sleeve and lying in said slots, a control member, actuating means for said member including a stem having a groove therein, said spring being registerable with said groove to hold said member in its "on" position, and manually operable means operably connected to said actuating means and movable in one direction to move said stem into registration with said groove while holding said control member in its "off" position and movable in the opposite direction to permit said control to be moved to its "on" position by said manually operated means.

3. A control device comprising a control member having a groove therein, condition responsive actuating means for operating said control member, a bracket having an opening in the base thereof, a bellows in said actuating means positioned within said bracket and having a shank portion thereof extending through said opening for securing said bracket to the control device, said bellows being connected to a condition responsive bulb of said actuating means, spring means on said bracket engaging a free end of said bellows and tending to compress said bellows,

a flanged sleeve secured to the ends of the bracket and having its axis substantially coaxial with said bellows, said sleeve having substantially parallel and diametrically opposed slots therein, resilient means extending substantially around said sleeve and in said slots for engagement in said groove in said control member to hold said member in its "on" position, and manually operable means for moving said control member to its "on" position.

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