Aug. 31, 1954 C. H. TRAVER 2,688,064

CONTROL APPARATUS

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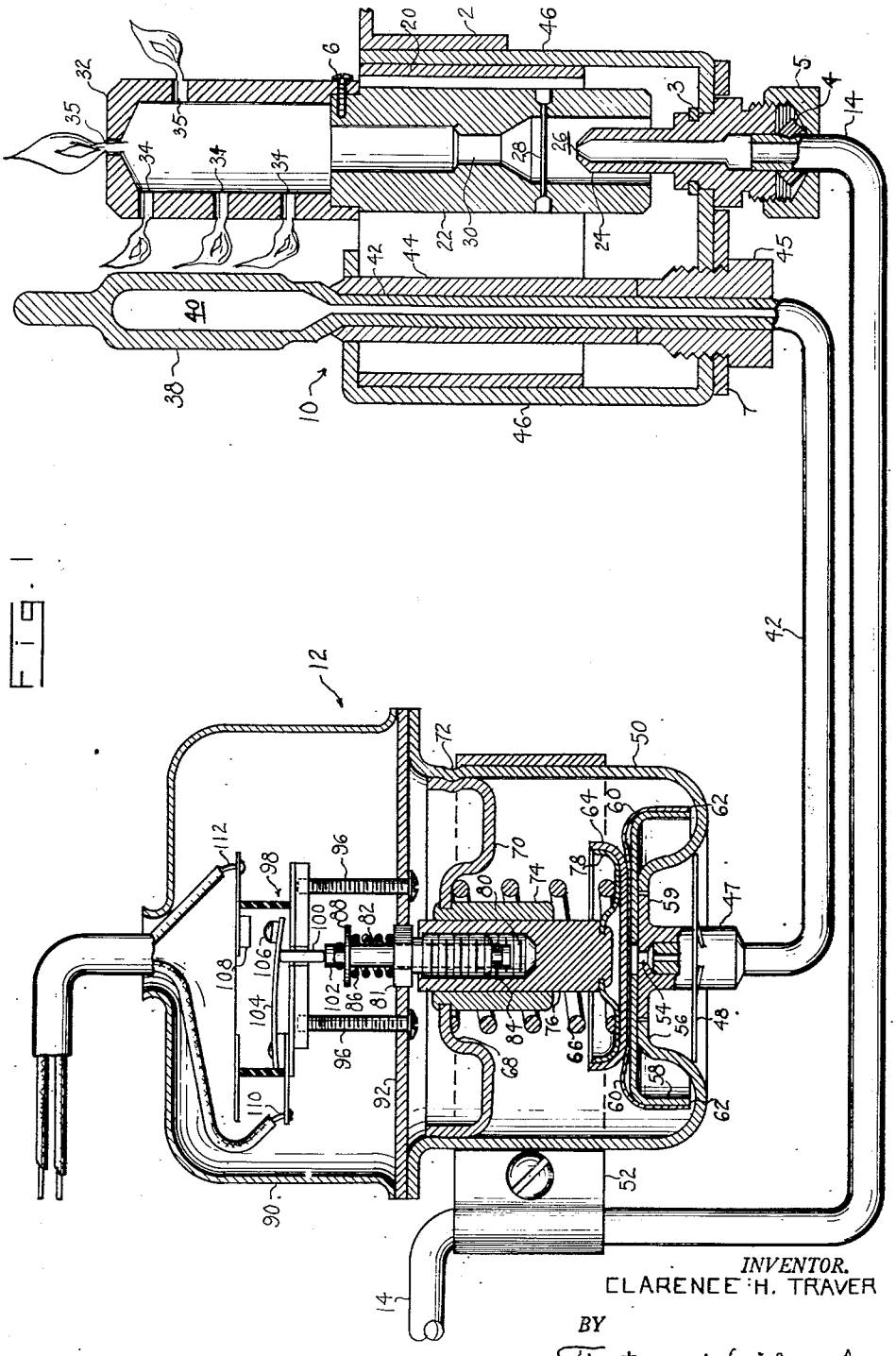


FIG. 1

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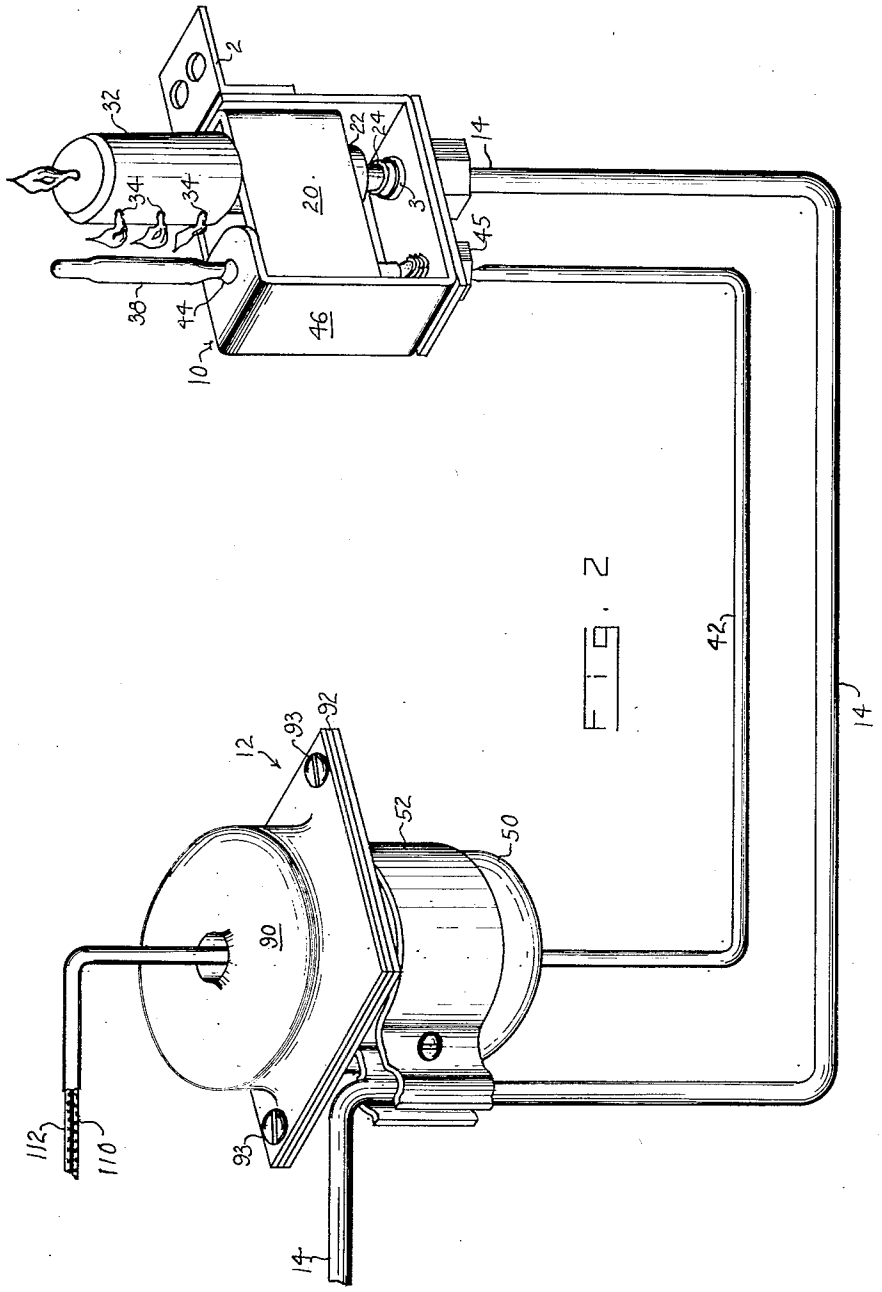


FIG. 2

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CONTROL APPARATUS

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3 Claims. (Cl. 200—140)

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This invention concerns control apparatus for a gaseous type fuel burner.

More specifically, this invention concerns a Bunsen type pilot burner provided with a mounting bracket and support for a thermosensitive element responsive to the heat of the pilot flame and operable in conjunction with control means to maintain the supply of fuel for a main burner as long as the pilot flame is burning and to shut off the supply of fuel for the main burner upon extinguishment of the pilot flame.

The thermosensitive element, consisting of a mercury filled bulb and a capillary tube, controls an actuator assembly which operates a switch in the energizing circuit of a gas valve controlling the supply of fuel to the main burner.

An object of this invention is to provide a novel actuator assembly which includes a motion transmitting means having a strain relief mechanism to relieve the force created by the mercury expansion in excess of the required actuating force.

Another object of the invention is to provide an improved method of mounting the actuator assembly and the pilot burner to effectuate ease of assembly and repair but retaining the desired functions in operation of the pilot burner and actuator assembly.

Further objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is an enlarged side sectional view of the safety pilot; and

Figure 2 is a perspective view of the safety pilot.

Referring now to the drawings, in which is shown generally a pilot burner assembly 10 and an actuator assembly 12, a mounting bracket 2, which may be secured to any suitable mounting station, has secured to it, by spot-welding or other suitable means, a rectangular bracket 46. A gas-supplying orifice member 24 is mounted in an opening in the lower face of the bracket 46 by means of a semi-circular spring clip 3 which fits into a groove in that portion of the member 24 which is just inside the bracket 46. The lower portion of member 24 is externally threaded and receives the end of the pilot-gas supply pipe 14. The pipe 14 is held in a gas-tight connection with member 24 by means of a member 4 fastened to pipe 14 by crimping, or other suitable means, and a nut 5 which is threaded on the member 24.

A bracket 20 is mounted within the bracket 46 and secured thereto by any suitable means such as spot-welding. Rigidly held within the bracket

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20 is a pilot-burner body 22 having a central, axial opening therethrough providing a mixing chamber 26 and a Venturi passage 30. The orifice end of member 24 extends into the body 22 and the annular space between them provides an air passage for the admission of primary air into the burner. A rod 28 extends across the mixing chamber 26 for creating turbulence in the gas-air mixture as it passes through the mixing chamber.

Mounted on the reduced upper end of the body 22 is a burner tip 32 which may be located and held thereon by means of the drive-screw 6. A series of flame ports 34 are located on one side of the tip 32 and a second series of ports 35 may be located at the opposite side and top of the tip 32. The flame issuing from ports 34 heats an enclosed thermal responsive fluid to be subsequently described. The ports 35 provide a flame for igniting a main burner (not shown) adjacent to which the pilot burner assembly 10 is mounted.

A bulb 38 and capillary tube 42 are mounted on the bracket 46 adjacent the pilot burner. The tube 42 is crimped slightly to support a spud 45 which is threaded into an opening in the lower portion of the bracket 46 and a plate 7, underlying the bracket 46. The bulb 38 is rigidly supported in position adjacent the ports 34 by means of a spacer 44, which rests on the spud 45 and has a beveled portion extending through an opening in the upper portion of bracket 46. The inner, beveled edge of spacer 44 serves to rigidly support bulb 38 and resists bending of the bulb either toward or away from the pilot burner flame.

The tube 42 has fastened to its end remote from the pilot burner assembly 10 a spud 47 which has a flanged portion 59 to which is attached, by welding or other suitable means a rigid cup-shaped member 58. A flexible diaphragm 60, having the same general configuration as the member 58, overlies the member 58 and is secured thereto by a fluid-tight seal adjacent the junction of their peripheries 62. A central opening 54 in the spud 47 and in the member 58 form a passage into the fluid tight space between the members 58 and 60. The bulb 38, capillary tube 42 and the space between elements 58 and 60 thus form a sealed system which is filled with a temperature responsive fluid such as mercury. Under such conditions, with the pilot flame at ports 34 burning, the bulb 38 will be heated to a temperature well above the boiling point of mercury. A portion of the mercury in bulb 38 will be volatilized under these conditions forcing the

remaining liquid mercury into the space between the members 58 and 60. This will result in upward movement of member 60. Should the pilot flame go out the bulb 38 will again be filled with liquid mercury and the volume of the space between members 58 and 60 will be reduced and member 60 will move downwardly. The volatilization and liquefication of the mercury occurs rather sharply as the critical temperatures are reached and the movement of member 60 is therefore rapid and definite.

The member 58 is supported within a cup-shaped member 50 by the flanges 56 formed adjacent an opening in the bottom of member 50 through which the spud 47 extends. A disc clip 48 closes the indentation formed at the flanges 56 and securely holds the diaphragm assembly against the cup 50. Resting on the diaphragm 60 but not secured thereto is a cup-shaped member 64. The member 64 is biased downwardly against the diaphragm 60 by a return spring 66, acting against the expanding force of diaphragm 60. The upper portion of spring 66 is retained in a depression 68 formed in an annular support 70. The support 70 is securely fastened to the lower cup-like cover 52 by crimping 72 or other suitable means. The support 70 provides a retaining means for a bushing 74 securely mounted therein. The bushing 74 has an axial opening therethrough for the reciprocal movement of a stud 76 contained therein. The lower end of stud 76 is securely fastened to a member 78 which is contained within the member 64. This arrangement permits reciprocable movement of stud 76 as a result of movement of diaphragm 60. The stud 76 is provided with a threaded opening 80 which receives a threaded sleeve 81. A thrust pin 82 is reciprocably movably retained within the sleeve 81 by means of a retaining washer 84 and a strain relief spring 86. The upper end of the spring 86 abuts a collar 88 on the thrust pin 82.

An upper cup-shaped cover 90 has a closure plate 92 fastened to the member 90 by any suitable means, and the assembly thus formed is fastened to the flange of the lower cup-shaped member 50 by means of screws 93 (Fig. 2). A central opening in plate 92 permits the pin 82 to extend freely therethrough. The plate 92 provides a support for screws 96 which support and space a switch assembly 98. Switch 98 may be any convenient type of small snap acting switch actuated by a thrust pin 100. In the form of switch illustrated, the pin 100 must be retained in the depressed position to close the contacts and when released opens the contacts. In this invention the pin 100 is shown biased downwardly against the top 102 of thrust pin 82, by means of a spring contact lever 104. The lever 104 carries the movable contact 106 which co-acts with a fixed contact 108. Flexible leads 110 and 112 connect the contacts 106 and 108 respectively with a circuit providing a source of power for a solenoid gas valve, for example, to control the supply of fuel to the main burner adjacent to which the pilot burner 10 is mounted.

A mounting clip 52 extends around the member 50 and can be secured to the pilot-gas supply pipe 14, for example, to rigidly mount the assembly 12. It will be understood that the capillary tube 42 may be of various lengths in order to locate the assembly 12 remote from the pilot burner 10.

Operation

As shown in Fig. 1, the pilot flame has just been lighted and the switch 98 is open. As the bulb 38 is heated to a temperature above the volatilization temperature of mercury, the mercury forced between members 58 and 60 will cause the pin 82 to move upwardly closing switch 98. Further expansion of the mercury and consequent additional movement of member 60 will move the sleeve 81 along the pin 82 compressing the strain relief spring 86. This provision for allowing additional movement of the flexible member 60 after the pin 100 has reached its limit of inward motion prevents damage to the switch and rupture of the assembly formed by members 58 and 60.

In the event that the pilot flame at burner 10 should be extinguished, the cooling of bulb 38 and the resultant downward movement of member 60 will move pin 82 back to the position shown in Fig. 1, permitting switch 98 to open and thereby breaking the circuit to the control valve for the gas supply to the main burner.

It may be noted that by removing the screws 93, the lower actuator assembly and the upper switch assembly may be readily separated as units thus facilitating replacement of either assembly. The burner orifice member 24 and the burner tip 32 are also integrated into the pilot burner assembly so as to be easily removable and interchangeable with tips and orifices for the various types of gas, such as natural and manufactured.

There has been illustrated a preferred embodiment of the invention, but its scope is to be limited only by the appended claims.

What is claimed is:

1. A control apparatus comprising: a first cup-shaped member, a second cup-shaped member, means detachably joining said members at the peripheries of thejr open ends, an expansible-collapsible element mounted adjacent the base of said second cup-shaped member, control means mounted within said first cup-shaped member, a portion of said control means being capable of limited movement, and means for transmitting movement of said expansible-collapsible element to said control means comprising a support mounted on the sidewall of said second cup-shaped member adjacent the open face thereof, a bushing carried by said support, a stud reciprocable in said bushing and having an internally threaded central opening, resilient means urging said stud into contact with said expansible-collapsible member, a sleeve threaded into said central opening and a thrust pin capable of limited reciprocatory motion within said sleeve, a strain-relief spring urging said pin to its outer limit of movement within said sleeve, said pin engaging said movable portion of said control means upon expansion of said expansible-collapsible element, said strain-relief spring being flexed and said pin being moved within said sleeve upon expansion of said expansible-collapsible element beyond the limit of movement of said moveable portion of the control means.

2. A control apparatus comprising: a first cup-shaped member, a second cup-shaped member, means detachably joining said members at the peripheries of this open ends, an expansible-collapsible element mounted adjacent the base of said second cup-shaped member, control means mounted within said first cup-shaped member, a portion of said control means being capable of limited movement, and means for transmitting movement of said expansible-collapsible element to said control means comprising a support

mounted on the sidewall of said second cup-shaped member adjacent the open face thereof, a bushing carried by said support, a stud reciprocable in said bushing and having a longitudinal opening therein, said stud being moveable by said expansible-collapsible element, a thrust pin capable of limited reciprocatory motion within said longitudinal opening in the stud, a strain-relief spring urging said pin to its outer limit of movement, said pin engaging the moveable portion of said control means upon expansion of the expansible-collapsible element, said strain-relief spring being flexed and said pin being moved relative to said stud upon expansion of said expansible-collapsible element beyond the limit of movement of said moveable portion of the control means.

3. Control apparatus comprising: a first cup-shaped member, a second cup-shaped member, means detachably joining said members at the peripheries of their open ends, an expansible-collapsible diaphragm mounted adjacent the base of said second member, a switch mounted within said first member, said switch having an actuator capable of limited movement, and means for transmitting movement of said diaphragm to said switch comprising a support extending across said second member adjacent the open face thereof, a bushing carried by said support, a stud reciprocable in said bushing and having an internally threaded central opening, spring means bottomed on said support urging said stud into engagement with the diaphragm, a sleeve threaded into said central opening and a thrust pin carried by said sleeve and capable of limited reciprocatory motion relative thereto, a strain-relief spring between said sleeve and said pin urging the pin to its outer limit of movement relative to said sleeve, said pin engaging said actuator upon expansion of said diaphragm, said strain-relief spring being compressed and said pin being moved relative to said sleeve upon expansion of said diaphragm beyond the limit of movement of said actuator.

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