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COMBINED SAFETY PILOT AND CONTROL VALVE MECHANISM

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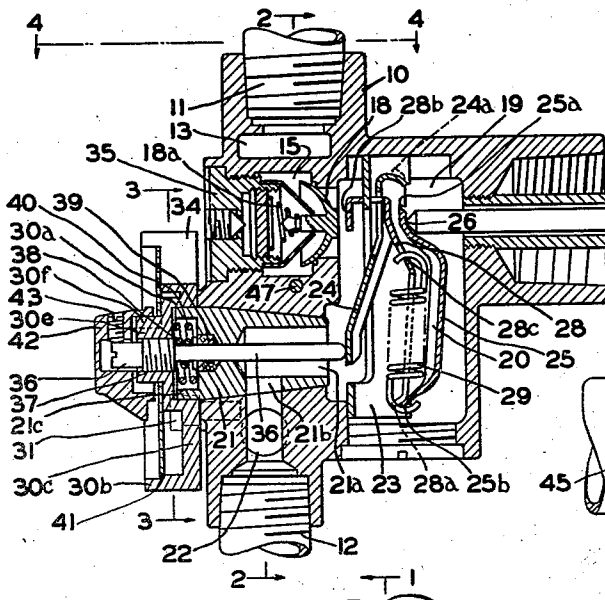

FIG.-1

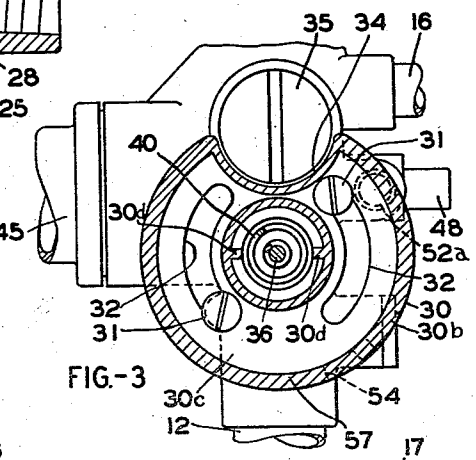

FIG.-3

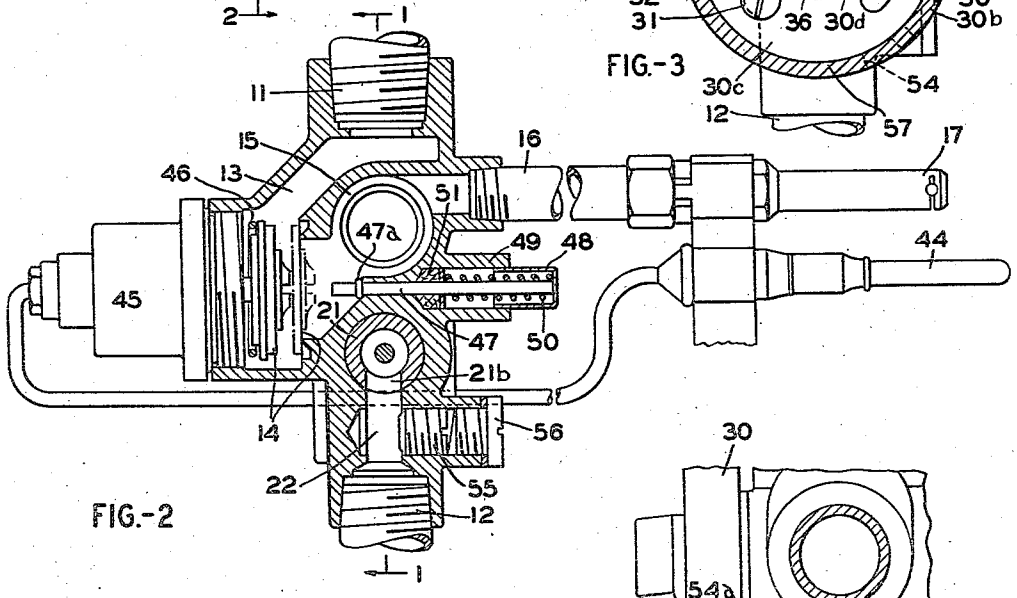

FIG.-2

FIG.-5

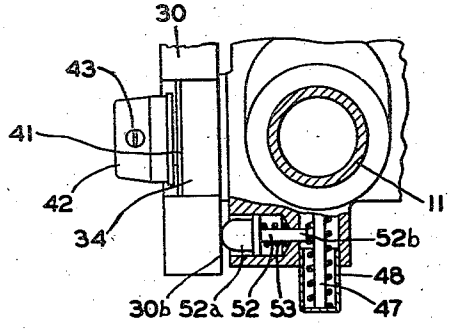

FIG.-4

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COMBINED SAFETY PILOT AND CONTROL VALVE MECHANISM

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Application May 2, 1941, Serial No. 391,474

1 Claim. (Cl. 236—21)

This invention relates to improvements in fuel control mechanism such as is found in thermostatically controlled valves and the like associated with water heaters where a main heating burner and a pilot burner are involved.

One of the objects of the present invention is to provide a safety control for fuel burning equipment wherein the fuel for the main burner cannot be turned on until the pilot has been lit and a temperature responsive device has become heated. This renders it impossible to produce an explosion when turning on the main burner fuel supply.

Another object of the present invention is to provide a very compact arrangement in a single housing of control valves for main and pilot burners, together with a safety valve preventing unsafe operation of the burners.

Another object of the present invention is to provide a safety valve for shutting off the supply of fuel to main and pilot burners combined with a manual control of this safety valve and a manual control for the main burner supply with interlocking mechanism between the two manual controls so that, in starting, it is impossible to supply fuel manually to the pilot when the manual main burner supply valve is open and, conversely, it is impossible to open the manual main burner supply valve and at the same time open the manually operable pilot burner supply valve.

Another object of the invention is to provide a novel combination between a manual control valve and a thermostat adjusting screw so as to provide a very compact arrangement of the parts.

Other objects and advantages include the specific arrangement of the parts and advantages accruing therefrom as set forth in the accompanying drawing and specification and the essential features of our invention will be summarized in the accompanying claim.

In the drawing, Fig. 1 is a sectional view taken along the line 1—1 of Fig. 2, showing one embodiment of our invention; Fig. 2 is a sectional view of the same apparatus taken along the line 2—2 of Fig. 1; Fig. 3 is a fragmental sectional view taken along the line 3—3 of Fig. 1; Fig. 4 is a view taken in the position of the line 4—4 of Fig. 1, with parts broken away to show interlocking mechanism; while Fig. 5 is a view similar to Fig. 4 showing another position of the parts.

In the drawing, a hollow valve body 10 forms a unitary housing for all of the parts. This body has an inlet connection at 11 and an outlet connection at 12 which is intended to conduct the fuel, such as gas, to the main burner (not shown) of a water heater or the like. As best seen in Fig. 2 the fuel passes from the inlet 11 laterally into a chamber 13, then through valved opening 14 into a chamber 15, one outlet from which is by way of conduit 16 to a pilot burner 17 intended to be located near the main burner supplied from the conduit connected to the outlet 12. Another outlet from chamber 15 is by way of valve 18 into chamber 19 where thermostatically controlled lever mechanism generally designated 20 is located. The outlet from this latter chamber is by way of the central passageway 21*a* in the plug valve 21 and thence through opening 21*b* in the plug valve through passageway 22 to the outlet 12.

The thermostatically controlled lever mechanism 20 comprises a frame 23 in which an adjusting lever 24 is fulcrumed at the point 24*a*. A main lever 25 is fulcrumed in lever 24 at the point 25*a*. Engaging this lever at the point 26 is the rod 27*a* of a thermostat, the other member of which is the sleeve or tube 27*b*. It will be understood by those versed in this art that the sleeve 27*b* has a high coefficient of expansion whereas the rod 27*a* has a low coefficient of expansion. It results from this that upon cooling of the sleeve 27*b* the rod 27*a* is moved toward the left in Fig. 1. The opposite movement occurs upon heating. It is assumed here that the thermostat 27*a*, 27*b* is inserted in a water heater or the like which is heated by the main burner supplied from the fuel passing through the outlet 12. A snap acting lever 28 has bifurcated legs fulcrumed at 28*a* in the frame 23. The other end of this lever at 28*b* is adapted to engage and operate valve 18. A spring 29 is held in tension between the point 28*c* on lever 28 and the free end of lever 25 at the point 25*b*. It will be understood by those versed in this art that as the thermostat rod 27*a* oscillates lever 25 so as to carry the point 25*b* to the left or right of fulcrum 28*a*, the lever 28 snaps toward the left or right as viewed in Fig. 1 so as to control the opening and closing respectively of valve 18. The spring 18*a* normally urges the valve 18 toward its seat.

It is desirable as pointed out later that the valve at the point 21 be of the non-rising stem type and for our present purposes we have selected the plug valve here disclosed. This comprises the usual tapered plug 21 which fits into a corresponding frusto-conical seat in the housing 10. The stem 21*c* of this valve is of

sleeve form interrupted by a pair of notches. This sleeve is embraced by the circular recess 30a in the handle 30. Projections 30d extending into the recess engage in the notches of the valve stem so that the handle will turn the valve. This handle is substantially circular in outline and comprises a peripheral flange 30b having a central web 30c which carries a central boss providing the recess 30a. The handle 30 is secured to the housing 10 by a pair of screws 31 each of which passes through an arcuately slotted opening 32 in the web 30c. The heads of the screws 31 hold the handle 30 firmly on the housing 10 preventing axial movement but permitting oscillatory movement about the axis of the plug valve. The screws 31 provide stops for the handle movement when they strike against the ends of the slots 32.

The handle 30 is cut away as shown at 34 so that when the parts are in the position shown in Fig. 3 the plug 35 may be removed to give access to the valve 18 and its associated parts. This recess 34 has no other function.

Means is provided for adjustment of the lever 24 and this is preferably combined with the valve 21 so as to give a very compact arrangement of the parts. As here shown an adjusting screw 36 passes axially through the plug valve 21 and its control handle and has a threaded engagement at 37 with the web of the handle 30. A spring 38 exerts a constant compressing effect against packing 39 in a suitable recess in the stem of the plug valve so as to prevent leakage along the adjusting screw 36. A spring 40 is engaged between the handle 30 and a shoulder on the plug valve so as to constantly urge the plug valve toward its seat. For this purpose of course the valve stem 21c is axially movable in the recess 30a. Thus the plug valve is always free to seal and to wear in independently. It will be understood that movement of the screw 36 changes the position of lever 24 about its fulcrum and thus changes the position of fulcrum 25a relative to the thermostat rod 27a so as to vary the range of temperature controlled by the thermostat.

Means is provided for indicating the range for which the thermostat is set. This comprises coacting indicating pointer and scale members, one of which moves with the handle 30 and the other of which moves with the screw 36. In the embodiment here shown the scale (not shown) is inscribed on a removable disk 41 which has a pressed fit within the flange 30b. An indicating pointer forms part of an adjusting knob 42 which fits over a boss 30e of the handle 30. This adjusting knob is secured by set screw 43 to the screw 36 so that the knob moves with the screw. At the same time this holds the parts assembled. A lug 30f on the boss 30e coacts with a projection on the interior of the adjusting knob to prevent rotation of the latter through more than 360°.

It will be seen that there is a distinct advantage in the combination of the non-rising valve 21, the handle 30 which cannot be moved axially of the valve and the adjusting screw 36 which has threaded engagement with the handle 30. It is a very compact arrangement of the parts and the position of the screw 36 relative to the handle 30 may be adjusted but this adjustment will not be affected by rotation of the handle 30 for manipulation of the valve. At the same time the lost motion between the valve 21 and the handle 30 permits the plug valve at all times to seat tightly.

Valve 14 is controlled by a thermocouple in the housing 44 subjected to the flame from the pilot burner 17. Electric current generated by the heating of this thermocouple is transferred to an electromagnetic unit in housing 45 and serves to hold open the valve 14 in the full line position of Fig. 2 when the thermocouple is heated. A spring 46 normally urges valve 14 toward closed position on its seat. This construction is fully described and claimed in Patent No. 2,097,838, granted November 2, 1937, to Sebastian Karrer.

Manual means is provided for opening valve 14. This comprises a setting pin 47 passing through a suitable opening in a wall of the housing 10. At its outer end this pin is provided with a cap 48 which slidably engages in the hollow boss 49. A spring 50 urges the pin to its outermost position and at the same time holds a packing 51 in position to seal the pin 47 against leakage. A stop collar 47a at the inner end of the pin limits its outer movement. It will be seen from Fig. 2 that movement of pin 47 inwardly will move valve 14 from the dot-dash position to the full line position against the action of spring 46.

Interlocking means is provided between pin 47 and valve handle 30. This comprises a pin 52 extending at right angles to pin 47 and housed in a suitable recess in the housing 10. This pin has a head 52a which engages against the flange 30b of the handle 30 as shown in Fig. 4 in all open positions of valve 21. It will be noted in Fig. 4 that the end 52b of pin 52 lies in the path of movement of the cap 48 by which the pin 47 is manipulated. Thus it is impossible to push pin 47 inwardly sufficient to open valve 14 when valve 21 is open. Spring 53 urges pin 52 toward the left as viewed in Figs. 4 and 5.

In Fig. 5 the handle 30 has been rotated to carry the nearer face of flange 30b upwardly from the position of Fig. 4. This is the same as counterclockwise movement of the parts as viewed in Fig. 3. In this position of the parts (Fig. 5) valve 21 is completely closed. This brings a recess 54 in the face of flange 30b in registration with the head 52a of pin 52. Spring 53 then moves pin 52 out of the path of cap 48 and it is then possible to move pin 47 inwardly so as to open valve 14.

When the parts are in the position of Fig. 4, if it is desired to open valve 21 handle 30 may be turned to carry the nearer face of flange 30b downwardly as viewed in Fig. 5, whereupon the sloping surface 54a of the recess 54 will cam pin 52 back to the position of Fig. 4 without interfering with the operation of handle 30. However if when the parts are in the position of Fig. 5 the cap 48 is moved inwardly to carry pin 47 to the position where it opens valve 14, then cap 48 lies in the path of movement of pin 52 and in such a position of the parts it is impossible to move the handle 30 to open valve 21 because the head 52a of pin 52 cannot move out of the recess 54 and therefore it locks handle 30 in place.

If necessary or desirable a throttling screw 55, best seen in Fig. 2, may be provided for limiting flow through the passageway 22 and access to this screw is sealed by a plug 56.

The operation of the device is as follows: Assuming that the thermostat 27a, 27b is cold, then the snap lever 26 will oscillate in a counterclockwise direction from the position shown in Fig. 1 so as to hold open valve 18. If the pilot 17 is extinguished and thermocouple 44 is cold, then valve 14 will be closed and no fuel can get

beyond chamber 13 to the pilot burner 17 or through open valve 18, chamber 19, to pass through valve 21 and outlet 12 to the main gas burner. In other words all gas is shut off. Therefore even though valve 21 is opened no gas will be supplied to the main burner or to the pilot burner and no useful purpose is served. It is therefore necessary to move pin 47 manually so as to open valve 14. This is impossible unless valve 21 has been closed so as to place the parts in the position of Fig. 5. It is then possible to press on the cap 48 so as to open valve 14 after which pilot burner 17 may be lit. If at this time while still holding valve 14 open by this manual operation it is attempted to open valve 21, this will be found impossible because as previously explained the cap 48 will hold the head of pin 52 in the recess 54 of handle 30. However after thermocouple 44 has been warmed up by the pilot burner 17 so that valve 14 remains opened, then the cap may be released so that the parts return to the position of Fig. 5 and it is then possible to turn handle 30 to open valve 21 to supply gas to the main burner which will be ignited by the pilot burner. It is thus impossible to coincidentally open valve 21 and to manually open valve 14 and it makes no difference whether one attempts to manually open valve 14 before or after attempting to open valve 21.

It will be understood by those skilled in this art that so long as valve 14 is held open by thermocouple 44, with valve 21 in its open position, then the main burner will be turned on and off responsive to movement of valve 18 under control of the thermostat 27*a*, 27*b*.

What we claim is:

Valve mechanism of the character described comprising a hollow valve body providing a chamber, a multiplying leverage system in said chamber, a thermostat coacting with said system, there being two valved openings through one of the side walls of said chamber and communicating therewith, a thermostatically controlled valve coacting with said system and controlling one of said openings, a shut-off valve controlling the other of said openings, said valves having parallel axes, there being a valved opening lying to one side of and partially opposite each of said valves, there being a short passageway in said body providing direct communication between said last named valved opening and said thermostatically controlled valved opening, an emergency valve controlling said last named opening and having an axis at right angles to the axes of said two first named valves, a resetting pin coaxial with said emergency valve passing through said valve body between said two first named valves to the exterior of said body for control of said emergency valve, there being fluid inlet and outlet openings in said valve body, there being a passageway through said body between said inlet opening and said emergency valve, and there being a passageway through said body between said shut-off valve and said outlet opening.

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