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[56]

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2,953,198 9/1960 Hajny 431/54

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[54] **FUEL-BURNING APPARATUS**
 4 Claims, 2 Drawing Figs.

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ABSTRACT: The invention includes an auxiliary pilot valve for use in a household gas heater control. The auxiliary pilot valve flow is maintained on when the control is turned toward an irreversible safety lock position. A reduced pilot light is produced by the auxiliary flow. The reduced pilot light is small and fails to heat a thermocouple to a high temperature. A safety magnet valve connected from the thermocouple then closes off all gas entry to the control after thermocouple cools.

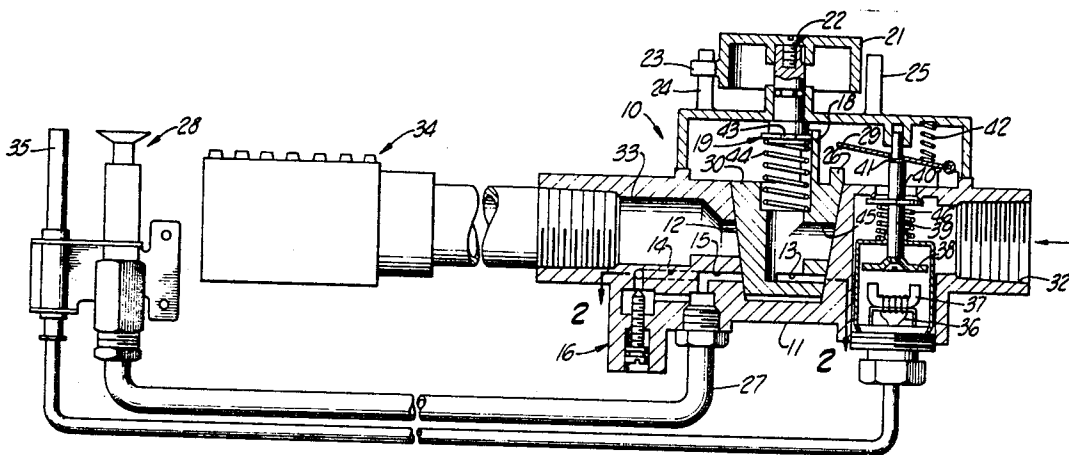


FIG. 1.

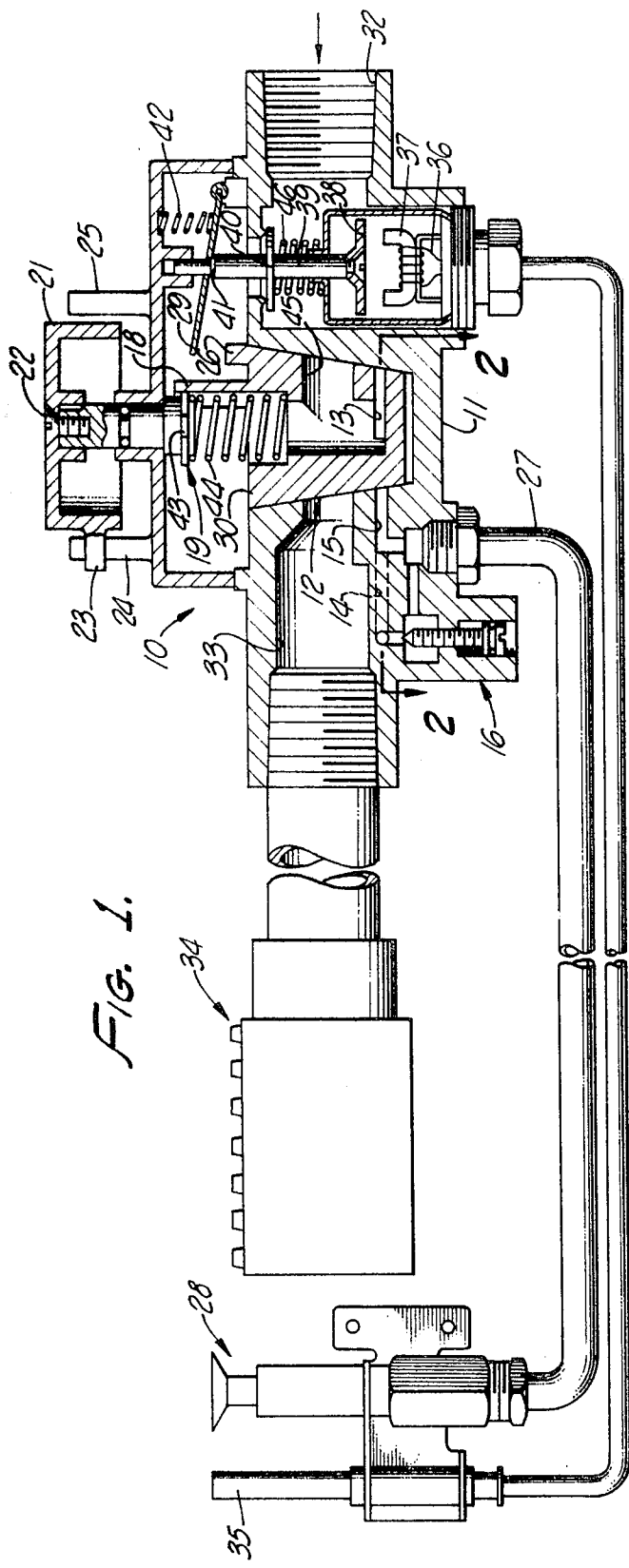
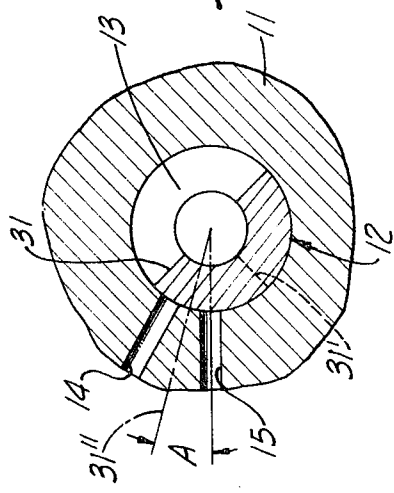


FIG. 2.



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FUEL-BURNING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to controls for fuel burning apparatus and, more particularly, to a gas control for an automatic household heater or the like.

In the past, it has been the practice to provide a safety lock on the knob of a gas water heater control when it is turned to its off position. This lock holds the knob in the off position until a safety magnet-operated valve closes off all gas to the control. The purpose of the safety lock is to prevent a user from unknowingly turning off both main burner and pilot light and then immediately turning the pilot or main burner back on again. In such a case, an explosion can occur when the user attempts to light the main burner.

By the use of the safety lock, the user is prevented from turning on the main burner after the pilot has gone out. Further, after the safety lock has released, the main burner cannot receive gas through the safety magnet valve until the pilot has been relighted in the conventional way.

Notwithstanding the very valuable safety features of the foregoing system (such a system is covered by U.S. Pat. No. 3,303,866), it often happens that the user does not understand why the control is temporarily locked while the pilot flame may still be burning. The user may then break the lock by the use of tools or excessive force. Alternatively, the user may unnecessarily call a repairman to service what the user thinks is a malfunctioning control. These alternatives are obviously undesirable because the control is not, in fact, malfunctioning, but is operating properly.

SUMMARY OF THE INVENTION

In accordance with the device of the present invention, the above-described and other disadvantages of the prior art are overcome by providing a reduced pilot light when the control is in a position between main pilot off and reduced pilot off positions. The reduced pilot light is made very small, i.e., it is a "bead" pilot. In accordance with one aspect of the invention, a reduced pilot needle valve is provided to adjust the pilot flame size.

Ordinarily, when the main or expanded pilot is on, it heats a thermocouple which keeps a safety magnet valve open. When the safety valve closes, all gas to the control is shut off. Thus, the reduced pilot flame is adjusted to such a small size that the thermocouple cools from the temperature created when it is heated by the larger normal main pilot flame. When the thermocouple cools, the magnet receives less electrical current; and the safety valve closes off all gas. Thus, gas to all three: the main burner valve, the expanded normal pilot valve, and the reduced flow pilot valve is shut off automatically and simultaneously.

In accordance with the present invention, the control knob may be operated to reduce the main pilot flow without the safety lock latching and then immediately to full on. Then, the normal and expanded pilot flame will ignite gas entering the main burner. However, should the manual control valve be turned into the operating zone of the safety lock and the reduced pilot be left on for a long enough period of time, the safety valve will close (as outlined in the preceding paragraph). Then, the main pilot must be relighted in the conventional way.

The above-described and other advances of the invention will be better understood when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are to be regarded as merely illustrative:

FIG. 1 is a side elevational view, partly in section, of apparatus constructed in accordance with the present invention; and

FIG. 2 is a sectional view of the apparatus taken on the line 2-2 shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings in FIG. 1, apparatus of the invention is indicated at 10 including valve body 11. Body 11 contains a gas cock 12.

Gas cock 12 has a slot 13 therein which can be turned into alignment with an auxiliary pilot passage 14 and both passage 14 and main pilot passage 15. Thus, gas can enter passage 14 and pass through a needle valve 16 back to passage 15.

Gas cock 12 has a vertical projection 18 which fits in a disc 19 having a lug 43. Disc 19 is fixed to a shaft 20. A knob 21 is fixed to shaft 20 by a screw 22. Knob 21 has a projection 23. Body 11 has a projection 24 fixed thereto. Body 11 also has a projection 25 fixed thereto. Gas cock 12 has an additional projection 26.

The said patent discloses considerable structures which are disclosed herein. The structures shown in FIGS. 1 and 2 may, thus, be identical to those shown in the said patent in certain respects. In particular, all of the structures shown in FIGS. 1 and 2 may be identical to those disclosed in the said patent except projection 23, knob 21, projections 24, 25, 26, passage 14, passage 17, and needle valve 16. None of the structures shown in body 11 in FIG. 1 in the lower left-hand portion to the left of gas cock 12 is shown in the said patent except passage 15 and connection 27 therefrom to a pilot burner 28. Projections 23, 24, and 25 are not disclosed in the said patent. Projection 26 is in a different angular position around the symmetrical and vertical axis of the gas cock 12 than a similar projection 17 shown in the said patent. Except for the different locations of the two projections 25 and 17, these projections may be identical. Projection 26 is in the shape of an arcuate ramp. A lever 29 rides on this ramp. During operation, it snaps downwardly where projection 26 terminates abruptly at the level of gas cock 12 as indicated at 30. Projection 26 is positioned so that lever 29 will drop down to the elevation 30 when the position of slot surface 31 shown in FIG. 2 lies in a position between the walls of the passages, for example, at an angle A from the axis of cylindrical passage 15.

Valve body 11 has an inlet 32, a main burner outlet 33, and a pilot outlet. Outlet 33 is connected to a main burner 34. A thermocouple 35 is positioned adjacent pilot 28. Thermocouple 35 supplies electric current to magnet winding 36 which has a core 37. Core 37 holds a magnetic armature 38. A shaft is fixed to armature 38. A valve 40 is fixed to shaft 39. Shaft 39 has a shoulder 41 against which lever 29 bears. Lever 29 is biased against slot 41 by a spring 42. Disc 19 has lug 43 as explained previously. Lug 43 bears against lever 29 when knob 21 is turned to an appropriate position, and knob 21 is further pressed downwardly as viewed in FIG. 1. Downward movement of rod 20 is resisted by a spring 44 between disc 19 and gas cock 12.

In the operation of the apparatus shown in FIGS. 1 and 2, the apparatus is shown in the off position. Note that gas cock 12 has a passage 45 which will allow gas, if entering from valve 40 into gas cock 12 to pass through outlet 33 when knob 21 is turned 180° to the left as viewed from the top of knob 21. In the position shown, projection 23 engages projection 24 in the off position. In the full on position, projection 23 engages projection 25. In the full off position, both burners 34 and 28 will be cold. Thermocouple 35 will thus be cold. Valve 40 will thus be closed because insufficient current will be provided to magnet 36 to hold armature 38 to core 37. No gas can be supplied to either burners 34 and 28 before valve 40 opens. Valve 40 cannot be opened except by turning knob 21 90° to the left as viewed from the top of knob 21 and pushing knob 21 downwardly. This will cause lug 43 to engage the free end of lever 29. Movement of lever 29 downwardly will lower shaft 39 by engagement thereof with shoulder 41. Pilot 28 can thus be lit. Knob 21 must be held down a period of time sufficient after pilot 28 has been lit for thermocouple 35 to be heated so

that core 37 will hold armature 38 against the force of spring 46.

After the pilot 28 has been lit, main burner 34 may be turned on simply by rotating knob 21 to the left, as viewed from the top of knob 21, until projection 23 engages projection 25. Opening 45 will not lie in alignment with outlet 33.

It is at this point that prior art devices have been found defective. For example, if reduced pilot gas is not provided, it is desirable for the safety lock to latch when surface 31 is at angle A relative to the axis of main pilot 15. This is true because the user should be able to return knob 21 to the full on position so long as the main pilot is burning. On the other hand, when the main pilot is completely off, the safety lock should latch because an explosion may occur if knob 21 is turned to the full on position while the pilot light is out. The safety lock may latch at an angle A.

The prior art problems are overcome in accordance with the device of the present invention as follows. If knob 21 has been turned to the full on position with the pilot lit, gas cock 12 may be returned to the pilot position 31', i.e., surface 31 at 31'. From the pilot position, the gas cock 12 may be turned again to the full on position. From the full on position to the bottom edge of passage 15 as shown in FIG. 2, surface 31 may be moved back and forth with no difficulty. That is, gas cock 12 may be turned fully on within this range and the apparatus 10 operated to return the same from pilot to on and vice versa. Should surface 31 be turned to a position between the lower surface of passage 15 and angle A, a return to the full on position is permitted at any time. If the return is immediate, the pilot will expand to supply sufficient gas to ignite the main pilot burner and the main burner. If the return is not immediate, the pilot light may heat thermocouple 35 sufficiently to maintain the safety valve 38 open if the full and/or expanded pilot flow has not been extinguished by gas cock 12. In this case, operation at expanded pilot or full on positions is possible at any subsequent time. If the main burner 34 is cut completely off but the safety valve 40 is not latched at angle A and the condition with passage 15 cut off is allowed to persist for 2 or 3 minutes, the gas supplied through passage 14 will be insufficient to maintain thermocouple 35 at a temperature to keep safety valve 40 open. When safety valve 40 closes, all gas to the apparatus 10 will be cut off. The pilot may then be lit by conventional procedures, as described previously.

If gas cock 12 is turned to the full off position shown in FIG. 2 from any other position, the pilot light will go out completely and safety valve 40 will close in a short time. The same is true when gas cock 12 is moved to a position such that surface 31 is anywhere between full off and a position slightly past angle A where the safety lock has latched. However, if the pilot is reduced (receiving gas through passage 14 but not passage 15), safety valve 40 will not close for 2 or 3 minutes because the auxiliary pilot gas through passage 14 will sustain energization of winding 36 for a short time. If the safety lock has latched, and passage 14 is fully open, the prior art problem will still exist. That is, the safety will still be latched, and the user will still see the pilot light. However, in the prior art, this condition could persist indefinitely. In accordance with

the device of the present invention, this condition only persists 2 or 3 minutes.

As stated previously, much of the apparatus disclosed herein is clearly disclosed in the said patent. For example, the safety lock is latched when lever 29 snaps down behind the vertical surface of projection 26 from the top thereof to the level 30.

Note will be taken that the operation of the reduced pilot depends upon the relative location of pilot burner 28 and thermocouple 35 as well as the amount of gas passage 14 will pass.

Needle valve 16 may be adjusted in accordance to the spacing and location of pilot burner 28 relative to thermocouple 35.

This invention is applicable as shown with a single pilot burner 28. However, the invention may also be practiced by the use of one pilot burner for each of the passages 14 and 15.

What I claim is:

1. In a fuel-burning apparatus, the combination comprising: a main burner; a pilot burner; a thermocouple adjacent said pilot burner; a main valve to admit fuel to said main burner; a safety valve to close off said main valve; an electromagnet responsive to the output of said thermocouple for maintaining said safety valve open when said thermocouple reaches a predetermined temperature; a member to move said main valve; a main pilot valve, said main pilot valve being movable to an open position when said member is either in a pilot position or in a full on position, said main pilot valve being movable to a closed position when said member is in an intermediate position, said main pilot valve being connected with said pilot burner; an auxiliary pilot valve; and means connecting said auxiliary pilot valve with said pilot burner, said safety valve, when closed, also being adapted to close off all fuel to all of said main and pilot valves, said connecting means having an orifice therein sufficiently small in size to reduce the size of the pilot flame produced when said member is in said intermediate position, said auxiliary pilot being limited to such an extent as to sustain itself, said reduced pilot flame, however, being so small that sufficient heat is not generated to sustain energization of said electromagnet by said thermocouple, said auxiliary pilot light, thus, being sustained only for a predetermined length of time necessary for said thermocouple to cool after said member has been moved from an on position with the pilot lit and said solenoid fully energized to said intermediate position.

2. The invention as defined in claim 1, wherein said connection means includes a flow restriction for adjusting the amount of fuel which can pass through said orifice.

3. The invention as defined in claim 1, wherein said member has stops to limit its movement between its full on position and its full off position.

4. The invention as defined in claim 1, wherein said apparatus has a safety lock to prevent movement of said member to its full on position until said safety valve closes, said lock being adapted to latch between positions where the main pilot flame is completely off and the reduced pilot flame is completely on.

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