

July 23, 1940.

G. HERBSTER

2,208,884

SAFETY IGNITION AND CONTROL DEVICE FOR BURNERS

Filed April 2, 1938

2 Sheets-Sheet 1

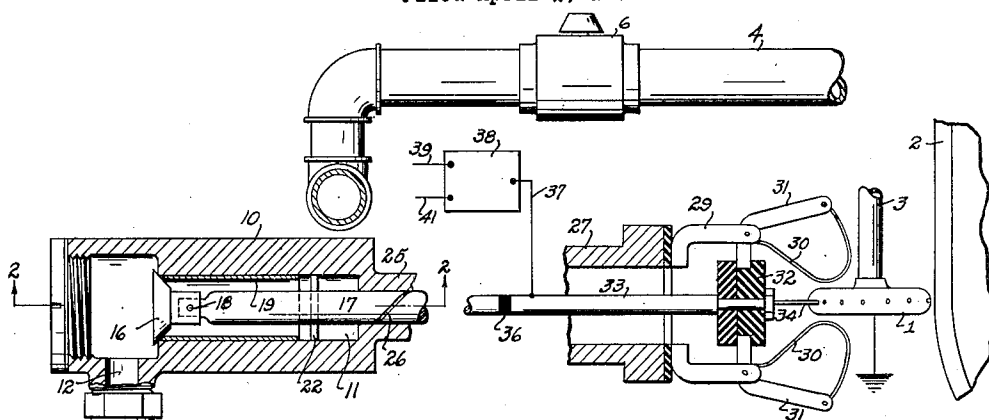


Fig. 1

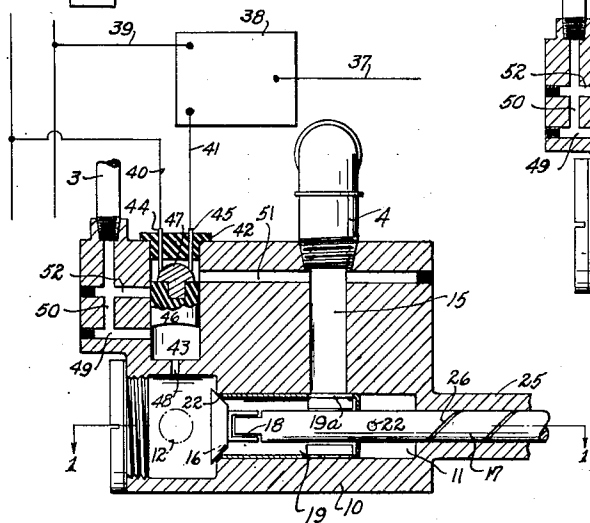


Fig. 2

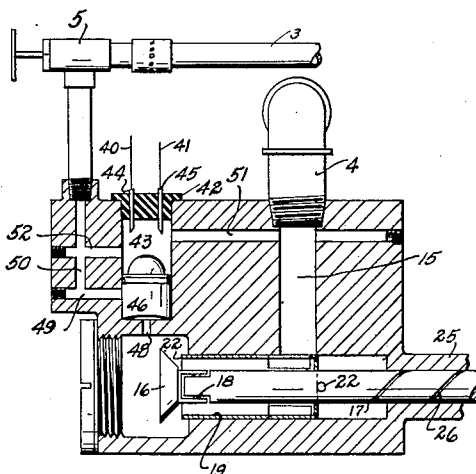


Fig. 3

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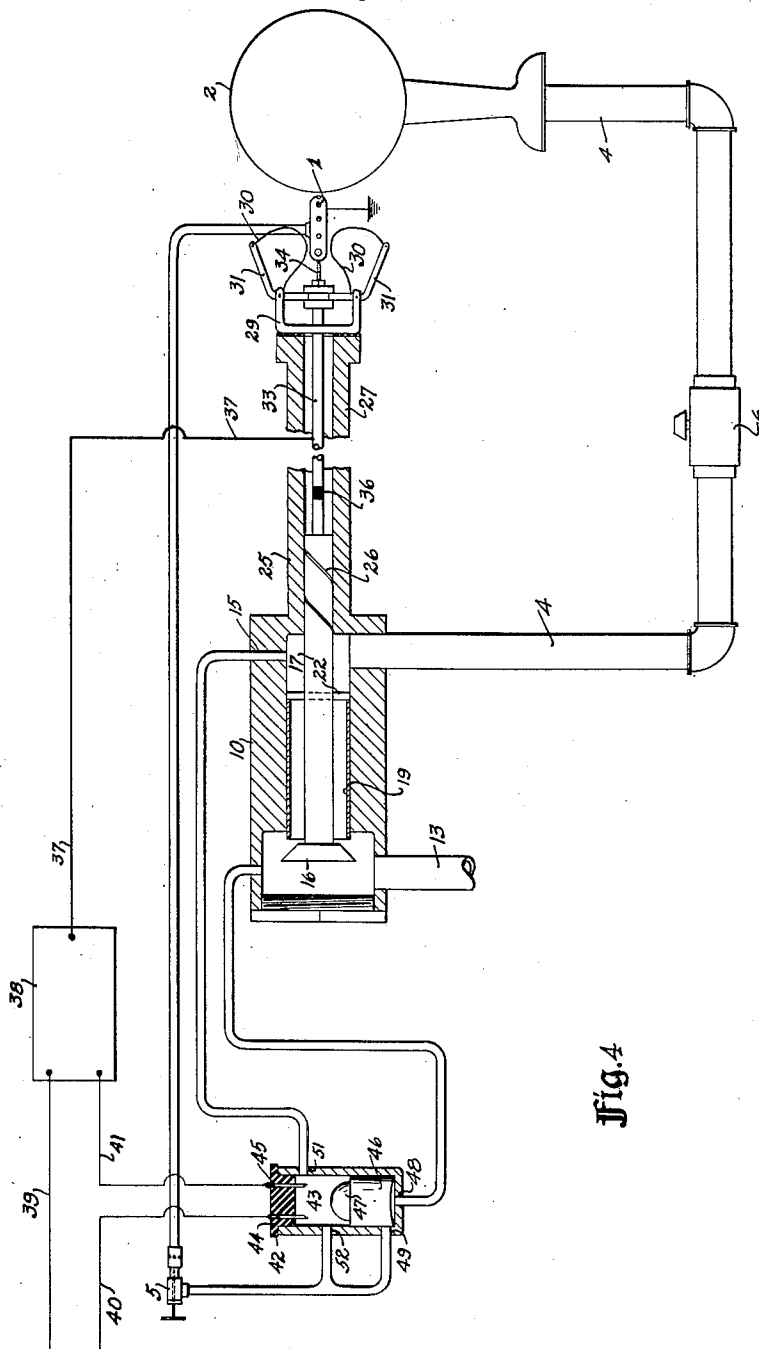
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2' Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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SAFETY IGNITION AND CONTROL DEVICE
FOR BURNERSGeorge Herbster, Cleveland, Ohio, assignor to
John H. Leonard, trustee, Cleveland, Ohio

Application April 2, 1938, Serial No. 199,661

6 Claims. (Cl. 158—117.1)

This invention is an improvement in an ignition and fuel control device for use in connection with a service burner and a pilot burner combination, and is a continuation in part of my co-pending application, Serial No. 188,330, filed February 2, 1938.

One of the principal objects of the present invention is to provide an ignition and fluid fuel control device for a pilot burner and service burner combination, whereby (a) fuel must be admitted to the pilot burner before the ignition mechanism becomes operative for igniting the pilot; (b) ignition of the pilot burner is a condition precedent to the admission of fuel to the service burner; (c) admission of fuel to the service burner renders the pilot burner ignition mechanism inoperative; and (d) extinguishment of the pilot burner stops the admission of fuel to the service burner and automatically initiates a repetition of this cycle of operation.

Another object is to provide a stop valve having a thermostatically operated closure plug and a movable seat and in which, after the valve plug is moved a predetermined amount by the thermostatic elements to an open position with respect to the seat, it remains in the same relation to the seat, even though the valve plug is moved an additional distance in the opening direction by the thermostatic elements, so that, regardless of the amount of operation of the thermostatic elements in the direction for opening the valve, the relation of the plug and seat does not exceed a predetermined maximum separated position, and the amount of movement, and consequently the time for closing the valve, remains constant regardless of the position from which the plug starts toward closing position.

Other objects and advantages will become apparent from the following specification, wherein reference is made to the drawings, in which:

Figure 1 is a top plan view of a device embodying the principles of the present invention;

Figure 2 is a fragmentary sectional view taken on a plane indicated by the line 2—2 of Figure 1;

Figure 3 is a fragmentary, sectional view, similar to Figure 2, showing the parts in different operating relation with respect to each other; and

Figure 4 is a diagrammatic illustration of the device showing the broad cooperative relation of the parts thereof.

For purposes of illustration, the present invention is described herein in connection with a gas service burner and gas pilot burner for use in ovens of domestic gas cooking ranges, its use

in connection with other fluid fuels and apparatus being readily apparent from the exemplary disclosure.

In the form illustrated, the device is shown in connection with a pilot burner 1 which is in firing relation to gas service oven burner 2, fuel being admitted to the pilot burner through a suitable conduit 3 and to the service burner through a suitable conduit 4. A needle valve 5, Fig. 3, is provided for regulating the amount of gas admitted to the pilot burner and the usual temperature regulator 6 is connected in the gas supply line 4 of the service burner so as to regulate the admission of fuel to the service burner.

The device of the present invention may comprise a valve body 10 having an axial bore 11 therein and an inlet passage 12 through which gas is supplied from a suitable gas line 13 which is connected to a gas main through the usual rotatable stop cock 14. The valve body 10 has a main outlet passage 15 which admits gas to the service burner 2 through the pipe line 4 heretofore described. Within the body 10 is a valve plug 16, the plug being mounted on a stem 17 which is movable axially of the bore 11. The plug 16 is connected to the inner end of the stem 17 by a pivot 18 which is disposed vertically for purposes later to be described.

Mounted within the bore 11 is a sleeve 19 which is coaxial with the stem 17 and is of greater internal diameter than the external diameter of the stem. The outer circumferential wall of the sleeve 19 is in sealed relation with the wall of the bore 11 but the sleeve is so mounted that it may be moved axially of the bore. The sleeve 19 is open at the end adjacent the plug 16 so as to afford a passage for gas from the inlet passage 12 into the sleeve. The sleeve has openings 19a for permitting gas to flow from the sleeve into the outlet passage 15. The inner end of the sleeve 19 is in the form of a seat 20 on which the valve plug 16 may seat for blocking the passage of gas through the sleeve from the inlet passage 12 to outlet passage 15.

The opposite end of the sleeve 19 is closed by an end wall, as shown, and the bore 11 is slightly longer than the sleeve 19. The bore 11 is dead-ended so that gas entrapped between the closed end of the sleeve 19 and the dead end of the bore 11 assists in yieldably resisting movement of the sleeve 19 toward the dead end of the bore, thus assisting in effecting proper seating of the plug 16 against the open end of the sleeve 19.

A "follow-up" or lost motion connection between the sleeve and valve plug is provided. This

connection may comprise a pin 22 which is connected to the stem 17 and is spaced from the seat 20 of the sleeve 19 a distance greater than the length of the sleeve so that, when the valve stem 17 is moved in a direction to open the valve, the pin 22 engages the sleeve after the valve plug 16 is moved to a predetermined open position with respect to the seat. Thereafter, upon continued movement of the stem 17 in the direction for opening the valve, the sleeve 19 is moved by the pin 22 along with the valve plug 16 and maintains a constant opening between the plug 16 and seat 20 of the sleeve regardless of the movement of the stem 17 in the opening direction. Upon movement of the stem in the opposite direction, the plug needs to move only a distance equal to the distance between the pin 22 and the adjacent end of the sleeve 19 to close the valve. Consequently if the stem is operated by a thermostatic lever, regardless of the amount of movement of the stem by the lever in the opening direction beyond a predetermined amount, the time required to close the valve remains constant, thus affording a much more rapid shut-off. The valve, therefore, is provided with a follow-up seat and a lost motion operative connection between the plug and the follow-up seat.

As heretofore described, the valve plug 16 is connected to the stem 17 by an upright pivot 18. Because of the pivotal connection between the plug 16 and the stem 17, the plug can adjust itself on the seat 20 and afford a better seating relation, and the sleeve is not subjected to any overbalanced weight of the plug 16. If the pivot 18 were arranged horizontally, it is apparent that the plug 16 would hang downwardly at an angle to the stem and cause its lower portion to be nearer to the seat 20 of the sleeve than its upper portion. If, in this condition, the stem 17 were then moved to draw the plug 16 toward seating position, first the lower edge of the plug 16 would engage the seat 20 and move the sleeve, without overcoming the overbalanced weight of the plug sufficiently to cause it to seat about its entire periphery.

The body is provided also with a tubular portion 25 through which the stem 17 extends to the outside of the body, suitable oil sealing grooves 26 being provided on the stem so as to afford an effective seal between the stem 17 and the tubular portion 25 of the body.

Carried on the body 10 is a rigid tubular extension 27 and at the outer end of the extension 27 is a yoke having arms 29 to which are connected the ends of bi-metal thermostatic elements or levers 30, respectively. The opposite ends of the elements 30 are connected to the arms of a yoke 31. A plug 32, of electrically insulating material, is mounted on the yoke 31. Mounted in the plug 32 is a metallic rod 33, one end of which, as indicated at 34, extends beyond the plug 32 and into closely spaced relation to the pilot burner 1, the portion 34 providing a spark terminal for a high frequency spark mechanism, later to be described.

The rod 33 is connected to the stem 17, suitable electrical insulation 36 being interposed between the stem and rod so as to insulate the valve proper from the rod 33. The thermostatic levers 30 are arranged so that, upon heating, they move the valve plug 16 in the opening direction and upon cooling they return the valve plug to the closing position. If desired, a suit-

able spring may be utilized as a return means for the plug 16.

In order to supply the high frequency spark, the rod 33 is connected by a suitable wire 37 to the high frequency terminal of a high frequency spark mechanism 38. The high frequency spark mechanism 38 is connected to a 110 volt alternating current circuit by the wire 39 and the wires 40 and 41, a suitable switch being provided between the wires 40 and 41, as better illustrated in Figure 3. As therein illustrated, the valve body 10 is provided with a terminal plug 42 of electrical insulating material, the plug 42 being in sealed relation in a suitable upright bore 43 in the valve body. The wires 40 and 41 extend through the plug 42 and are provided with terminal contacts 44 and 45 which are exposed within the bore 43. Mounted within the bore 43 is a vertically reciprocable plunger 46 which may be metal. At its upper end, the plunger 46 carries a contactor 47 which is insulated from the plunger and is arranged to bridge between the contacts or terminals 44 and 45 and establish a circuit between the wires 40 and 41 when the plunger 46 is in a fully raised position in the bore 43.

The bore 43 is connected by a primary inlet duct 48 to the interior of the main valve body on the inlet side of the plug 16 so that when the gas cock 14 is operated to admit gas to the main valve through the passage 12, gas also passes through the primary inlet duct 48 to the under side of the plunger. The plunger is of such size that the pressure of the gas admitted to the inlet side of the valve plug 16 is sufficient to lift the plunger to the top of the bore 43 and thereby establish the circuit between the wires 40 and 41. The completion of this 110 volt circuit in this manner renders the high frequency spark mechanism operative to produce a high frequency spark at the terminal 44 in firing relation to the pilot burner. Leading from the bore 43 is a primary outlet duct 49 which, through a suitable duct 50, admits gas to the pilot burner 1 where it is ignited by the sparks.

In addition to the ducts 48 to 50, inclusive, a secondary inlet duct 51 is provided and connects the bore 43 with the main valve at the outlet side of the plug 16. For example, this connection may be directly between the bore 43 and the outlet passage 15 of the main valve. The secondary inlet duct 51 opens into the bore 43 at a position above the uppermost position of the plunger 46. A secondary outlet duct 52 is connected with the bore 43 at a position such that it is blocked by the plunger 46 when the plunger is in raised position, but is unblocked by the plunger when the plunger is in a lowered position wherein it blocks the duct 49. The secondary outlet duct 52 is connected with the duct 50 or is otherwise connected with the pilot.

As a result of this arrangement, when gas is admitted through the inlet passage 12 to the main valve while the main valve is closed, the plunger 46 is raised from the position illustrated in Figure 3 to the fully raised position illustrated in Figure 2. In this latter position, contact is made between the contact 47 and the terminal contacts 44 and 45, thus establishing a high frequency spark at the pilot burner. Concurrently with the establishment of this spark, gas is admitted to the pilot burner through the primary inlet duct 48, bore 43, primary outlet duct 49, and the duct 50. Thereupon the pilot burner is ignited and heats the thermostatic elements or

levers 30. These elements, when heated, move the main valve plug 16 to open position, thus permitting gas to flow around the valve plug through the sleeve 19 to the outlet passage 15, and then to the service burner. However, when gas is admitted to the outlet passage 15 in this manner, it also flows through the secondary inlet duct 51 into the bore 43 at a position above the plunger. Up to this time, the plunger 46 has been held in raised position, as illustrated in Figure 2, by the differential in fluid fuel pressure at opposite ends of the plunger 46. However, as a result of the admission of gas through the secondary inlet duct 51, the gas pressure at opposite ends of the plunger 46 is substantially equalized, or the differential is so reduced that the plunger drops by its own weight to the position illustrated in Figure 3. When the plunger drops to this latter position, the primary outlet duct 49 is blocked but gas continues to flow to the pilot through the secondary inlet duct 51, the upper portion of the bores 43, the secondary outlet duct 52 and the duct 50.

In case the pilot is accidentally extinguished, the thermostatic elements 30 become unheated and the cycle above described is repeated immediately upon seating of the plug 16 on the seat 20. Again, when the thermostats are heated for moving the main valve plug 16 to the open position, the plug opens a predetermined amount with respect to its seat 20, and thereafter the seat follows along with the plug and maintains a fixed distance therefrom as the plug continues to move in the opening direction. Consequently, if the pilot is extinguished for any reason, the valve plug 16 seats very promptly on the seat 20 and the thermostatic elements do not have to be permitted to cool completely to cause seating. As a result the valve cuts off the supply of gas to the main burner within two to four seconds after the pilot becomes extinguished and does not admit gas to the main burner again until the pilot has been relighted by the high frequency spark.

The above invention has been described herein in connection with gaseous fuel and in connection with a main valve body in which the various ducts and connections are provided directly in the valve body. It is apparent, however, that the various elements may be separately disposed and connected by suitable conduits, if desired.

Having thus described my invention, I claim:

1. The combination with a service burner, a pilot burner in igniting relation thereto, a main control valve for admitting fluid fuel to the service burner when the valve is open and for stopping the flow of fuel thereto when the valve is closed, thermally responsive means in heating relation to the pilot burner and operative when heated to open the main valve, said main valve tending to close when the thermally responsive means are unheated, of differential pressure operated ignition means rendered operative to ignite the pilot in response to a differential in pressure of fluid fuel at opposite sides of the main valve when the main valve is closed and rendered inoperative in response to substantial equalization of the pressure of fluid fuel at opposite sides of the main valve when the main valve is open.

2. The combination with a service burner, a pilot burner in firing relation thereto, a main control valve for admitting fluid fuel to the service burner when the valve is open and for stopping the flow of fuel thereto when the valve is closed, mechanism including thermally respon-

sive means in heating relation to the pilot burner and operative when said means are heated to open the main valve and to close the main valve when the thermally responsive means are unheated, a second mechanism operable to ignite the pilot burner, of means for rendering said second mechanism operative and inoperative, and normally tending to remain in a position to render said second mechanism inoperative, and operated, when the main valve is closed, by pressure of the fluid fuel admitted to the main valve, to render the second mechanism operative to ignite said pilot burner, and said last mentioned means being operative to render the second mechanism inoperative when the main valve is open.

3. A control and ignition device for a pilot burner and service burner combination comprising a pilot burner, a main fluid fuel control valve having an inlet passage arranged for connection to a source of fluid fuel and an outlet passage arranged for connection with a service burner, closure means in the valve body and operatively disposed between the passages, an auxiliary valve having a body with an upright bore therein, a plunger reciprocable in said bore, said auxiliary valve body having a primary inlet duct connecting with said bore below the plunger and connected with the inlet side of the main valve whereby the plunger is raised by the pressure of the fuel admitted from the inlet side of the main valve through the primary inlet duct, said auxiliary valve body having a secondary inlet duct connecting with the bore above the uppermost limit of the plunger and connected with the outlet side of the main valve, said auxiliary valve body having a primary outlet duct positioned to be blocked by the plunger when the plunger is in a lowered position, said primary outlet duct being connected to the pilot burner, a secondary outlet duct connected with the pilot burner and connected with said bore above the plunger at a position to be blocked by the plunger when the plunger is raised to a predetermined position by the admission of fluid fuel through the primary inlet duct, thermally responsive means in heating relation to the pilot and operative to open the main valve when heated, said main valve tending to close when the thermally responsive means is unheated, means operable to ignite the pilot burner, means operated by the plunger when the plunger is in fully raised position to render the last named means operative.

4. In a pilot burner and service burner combination, a main fluid fuel control valve having an inlet passage for connection to a source of fluid fuel and an outlet passage for connection with a service burner, closure means operatively disposed between the passages, an auxiliary valve having a body with a cavity therein, a primary inlet duct connecting the cavity to the inlet passage, a secondary inlet duct connecting the cavity to the outlet passage, a primary outlet duct connecting the cavity to the pilot burner, and a secondary outlet duct connecting the cavity and the pilot burner, auxiliary movable valve means in the cavity and normally blocking the passage of fluid fuel from the primary inlet duct to the outlet duct and operative, when the main valve is closed, by fluid pressure admitted to the cavity through the primary inlet duct to move and admit gas to the primary outlet duct and to close the secondary outlet duct, and rendered operative when the main valve is opened and fluid is admitted through the secondary inlet duct to move and close the primary inlet duct and primary out-

let duct and to connect the secondary outlet duct and the secondary inlet duct, ignition mechanism rendered operative for igniting the pilot burner when the auxiliary valve means is moved to position to block the secondary outlet duct, thermally responsive means in heating relation to the pilot and connected to the main valve and operative when heated to open the main valve, said main valve tending to close when the thermally responsive means are unheated.

5. A safety ignition system for a gas service burner of the type having a gas pilot in igniting relation to the service burner and wherein both the pilot and service burner are supplied with gas from a conduit having a manually controllable service valve; a normally closed stop valve in the conduit between the service valve and the service burner, a thermostat associated with the pilot and operatively connected to the stop valve in a manner to cause the stop valve to be opened consequent upon heating of the thermostat by the pilot flame, electrical ignition means in igniting relation to the pilot and including an electrical circuit and a switch for controlling the circuit to render the ignition means operative, and a pressure operable device normally tending to remain in an idle position and being movable into an active position to operate the switch, said device being subjected to gas pressure between the service valve and stop valve in a manner to move the device to active position when the service valve

is opened and before the stop valve is opened, and being subjected to counteracting pressure so as to actuate the switch in a manner to render the ignition means inoperative consequent upon opening of the stop valve.

6. A safety ignition system for a gas service burner of the type having a gas pilot in igniting relation to the service burner and wherein both the pilot and service burner are supplied with gas from a conduit, having a manually controllable service valve; a normally closed stop valve in the conduit between the service valve and the service burner, a thermostat thermally associated with the pilot and connected mechanically to the stop valve in a manner to open the stop valve consequent upon heating of the thermostat by the pilot flame, electrical ignition means arranged to establish a spark in igniting relation to the pilot and including a normally open electrical circuit and a switch adapted and arranged to close the circuit and a pressure operable device normally tending to remain in an idle position and being movable into an active position to close the switch, said device being subjected to gas pressure between the service valve and stop valve in a manner to move the device to active position when the service valve is opened and before the stop valve is opened, and being subjected to counteracting pressure so as to open the switch consequent upon opening of the stop valve.

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