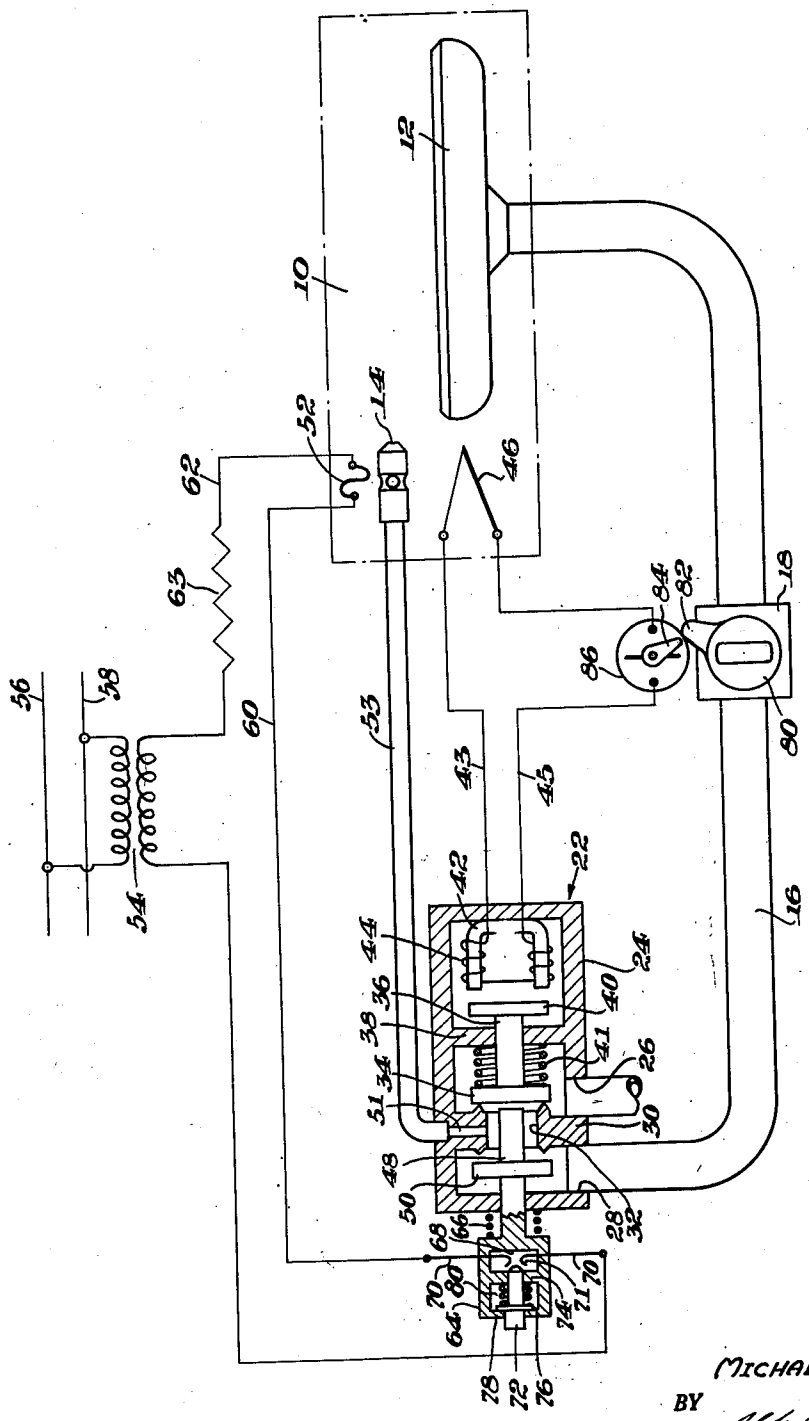
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IGNITION AND CONTROL SYSTEM FOR FUEL BURNERS

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IGNITION AND CONTROL SYSTEM FOR FUEL BURNERS

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This invention relates to control and ignition systems for fuel burners and, more particularly, to combined thermoelectric pilot control and electric ignition apparatus for domestic gas ranges.

It has been proposed to combine electric ignition means with a thermoelectric type control for automatic pilots by incorporating a manually open switch with the reset stem of the control. Thus, operation of a push button will close the switch for energization of the igniter either prior to or simultaneously with the resetting operation. In the simple system described, the automatic pilot does not provide 100% shut-off. Moreover, the operation of the main fuel cock to closed position does not immediately affect the automatic pilot if the thermostatic element should be heated at that time.

An object of this invention is to ensure complete shut-off of fuel to main and pilot burners upon operation of the automatic pilot in a combined electric ignition and automatic pilot control system.

Another object of the invention is to prevent flow of fuel from the main burner at all times that no pilot flame is present to ignite such fuel.

Another object of the invention is to preserve the simple and inexpensive features of the combined system while securing the additional advantages of the present invention.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing which is a schematic view of an oven burner installation having the control and ignition system applied thereto.

Referring more particularly to the drawing, an oven 10 shown in broken lines in the drawing is provided with a main burner 12 and a pilot burner 14 located in lighting proximity thereto. The flow of fuel is conducted to the main burner 12 by a main fuel pipe 16 under control of the usual manually operable control device here shown as a combined oven thermostat and gas shut-off cock 18. As is customary in such control devices, the manual rotation of the shut-off cock 18 to closed position will shut off flow of fuel in the main fuel pipe 16 as will operation of the combined thermostat when satisfied. As such devices are well known, further description is deemed unnecessary.

Interposed in the main fuel pipe 16 ahead of the shut-off cock 18 is the automatic pilot control device 22 previously mentioned. The device 22 comprises a hollow casing 24 having an inlet 26 and an outlet 28 to which opposite ends of the

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main fuel pipe 16 are connected respectively. A partition 30 extending across the interior of the casing 24 serves to separate the inlet 26 from the outlet 28 so that flow of fuel therebetween is permitted only by way of an axial opening 32 formed in the partition 30.

The flow of fuel through the opening 32 is under control of a control means shown as a valve member 34 which is adapted to be seated on the side of the partition 30 adjacent the inlet 26. The valve member 34 is provided with a stem 36 which extends through an apertured partition 38 and carries an armature member 40 on its projecting end. A coil spring 41 is operative between the valve member 34 and the apertured partition 38 for biasing the valve member 34 toward its seat on the partition 30 to establish the closed position of the valve member 34.

The armature member 40 forms part of an electromagnetic means and is adapted for movement between attracted and released positions relative to the pole faces of a horseshoe magnet 42 according to the energization or deenergization respectively of a winding 44 associated with the magnet 42. Due to the provision of the coil spring 41, the armature member 40 is biased to its released position and resetting means to be described hereinafter are employed to place it in the attracted position. The winding 44 is energized by thermoelectric current generated by a thermocouple 46 which is electrically connected by leads 43 and 45 to the winding 44 and is located to be heated by a flame at the pilot burner 14. It will be understood that the energy so generated is insufficient to attract the armature 40 from its released position but is sufficient to retain it in the attracted position upon completion of the resetting operation.

The reset means comprise a reset stem 48 which extends exteriorly of the casing 24 at the end opposite the magnet 42. The inner end of the reset stem 48 extends axially through the opening 32 and terminates adjacent the valve member 34. A closure disc 50 is carried on the reset stem 48 for seating upon the underside of the partition 30 to interrupt the flow of fuel through the opening 32 when the valve member 34 is disengaged from its seat during the resetting operation. An opening 51 is provided in the partition 30 for connection with a conduit 53 leading to the pilot burner 14 for supplying fuel thereto during the resetting operation. It will be understood that the casing 24 and associated parts are shown in schematic form herein and suitable provision would be made in commercial

structures for leakage prevention and other necessary requirements not forming part of the essential arrangement herein disclosed.

The ignition system of this invention comprises an igniter 52 in the form of a coil of wire of suitable electrical resistivity which is positioned to ignite the fuel issuing from the pilot burner 14 when the wire is brought to igniting temperature. The igniter is adapted to be energized for such purpose from a suitable source of electric energy such as the domestic current supply. To this end, a transformer 54 is provided in this embodiment and has its primary coil connected at one end to a line wire 56 and the opposite end connected to a line wire 58. One terminal of the secondary coil of the transformer 54 is connected by a wire 60 to one terminal of the igniter 52 while the other terminal of the secondary of transformer 54 is connected by a wire 62 to the opposite terminal of the igniter 52.

A resistor 63 is connected in the wire 62 for limiting the current to the igniter 52. Since the igniter 52 need only be energized during the resetting operation, suitable switching means are employed in the described series circuit to maintain the circuit normally open. To this end, the reset stem 48 is provided with an enlarged head 64 positioned exteriorly of the casing 24. A coil spring 66 is operative between the enlarged head 64 and the underside of the casing 24 to retain the reset stem 48 in an outwardly projected position with the closure disc 50 spaced from the partition 30. A single pole switching device is incorporated in the enlarged head 64 by the provision of a recess 68 therein within which a pair of resilient switch arms 70 are positioned with their oppositely curved ends 71 in spaced relation. The opposite ends of the resilient switch arms 70 are connected to opposite ends of the wire 60 in series circuit arrangement.

A momentary-contact push-button 72 is reciprocable relative to the enlarged head 64 into engagement with the curved ends 71 of the resilient switch arms 70 for closing the igniter circuit. The push button 72 projects through a partition 74 extending across the recess 68 and providing a bearing for the button 72. A collar 76 carried by the push button 72 is engaged on one side by a flange 78 formed on the enlarged head 64. Such engagement prevents ejection of the push button 72 from the enlarged head 64 under bias of a coil spring 80 which is operative between the opposite side of the collar 76 and the underside of the partition 74. The projecting end of the push button 72 beyond the flange 78 is adapted to be engaged by the operator for axial movement of the push button 72 relative to the reset stem 48. It will be understood that suitable provision for insulation, terminal connections and other common electrical requirements will be provided in the commercial form of switch.

In this embodiment of the invention means are employed to deenergize the electromagnet winding 44 whenever the manually operable control device is operated to closed position. Accordingly, the knob 80 of the shut-off cock 18 is provided with a projection or cam 82 which is adapted to engage the operating arm 84 of a single pole snap or toggle switch 86 positioned adjacent the shut-off cock 18 for such operation. The cam 82 is so positioned that closing operation of the switch 86 occurs just prior to the cracked open position of the shut-off cock 18. Thus, no fuel can flow to the main burner 12 unless the switch 86 is closed. Likewise, reverse rotation of the knob 80 operates the switch 86 to open position prior to complete closure of shut-off clock 18. It will be understood that the arrangement herein disclosed is schematic only and other types of switches and operating members can be substituted. The switch 86 is connected in the lead 45 and is of low resistance.

In the operation of the device described, the parts may be assumed to be in the position shown in the drawing with the shut-off cock 18 occupying an off position, there being no flow of fuel to the main burner 12 and the pilot burner 14 at this time. Rotation of the shut-off cock 18 to an open position will simultaneously set the temperature at which the oven thermostat combined therewith will operate. Moreover, the snap switch 86 is operated to closed position due to the mechanism described.

Manual operation of the reset stem 48 is then conducted by pressure applied to the enlarged head 64 and simultaneously to the push button 72. Such operation serves to close the circuit to the igniter 52 by engagement of the push button 72 with the resilient switch arms 70. Also, the axial movement of the reset stem 48 serves to disengage the valve member 34 from the partition 30 and also to seat the armature member 40 against the pole faces of the magnet 42. However, due to the simultaneous seating of the closure disc 50 on the partition 30, the flow of fuel between the inlet 26 and the outlet 28 for the pipe 16 to the main burner 12 is interrupted during this resetting operation. Fuel does however flow from the inlet 26 past the open valve member 34 and passage 51 to conduit 53 for the pilot burner 14.

The igniter 52 quickly reaches igniting temperature and serves to ignite the fuel flowing from the pilot burner 14. The thermocouple 46 becomes heated by the flame at the pilot burner 14, thus energizing the winding 44 sufficiently to retain the armature 40 in its attracted position. The push button 72 and the reset stem 48 are returned to their outwardly projected positions upon release of manual pressure thereon, whereupon the igniter 52 is deenergized and the closure disc 50 no longer prevents flow of fuel through the outlet 28 and pipe 16 to the main burner 12. Thus, since the valve member 34 is now retained in open position due to the operation of the electromagnetic means, the passage of fuel between the inlet 26 and outlet 28 is now established and such fuel flowing from the main burner 12 is ignited by the flame at the pilot burner 14. The apparatus is now in normal running condition with the main burner 12 under control of the oven thermostat incorporated with the shut-off cock 18. Upon completion of the cooking operation the shut-off cock 18 is rotated to closed position shutting off flow of fuel to the main burner 12. This operation also opens the switch 86 to deenergize the winding 44 and cause closure of the valve member 34. Flow of fuel to the pilot burner 14 thus ceases also.

Should the flame at the pilot burner 14 become extinguished, then the thermocouple 46 will cool serving to deenergize the winding 44 and release the armature member 40 for movement under bias of the coil spring 41. Since the armature 40 and the valve member 34 are connected by the valve stem 36 for joint operation, the valve member 34 is caused to become closed to shut off flow of fuel to both the main burner 12 and the pilot burner 14.

An obvious modification would be to remove the push button 72 from the described location

and place relatively fixed control means, comparable to the switch arms 70, on the casing 24 for engagement by relatively movable contact means, comparable to the push button 72, and carried on the enlarged head 64 but not movable relative thereto. In such event, the operation of the reset stem 48 would also serve to energize the igniter 52 with a single push motion.

Many changes may be made in the details of construction and arrangement of parts within the scope of the appended claims and the invention is not limited to the precise embodiment shown and described herein.

I claim:

1. In a control and ignition system for fuel burning apparatus having main and pilot burners and a source of electric energy, the combination of an electric igniter for the pilot burner connected to be energized from the source, a casing having a fuel inlet and an outlet to the main burner, a partition in said casing between said inlet and outlet having an opening for supplying fuel from said inlet to the pilot burner, a valve member reciprocable relative to one side of said partition for controlling passage of fuel between said inlet and said outlet and opening, means for biasing said valve member to closed position, electromagnetic means having an armature operatively associated with said valve member and adapted when energized for holding said armature in an attracted position and said valve member in open position, thermoelectric means responsive to a flame at the pilot burner and connected in circuit for energizing said electromagnetic means but insufficiently to overcome said biasing means, reset means operable for overcoming said biasing means and resetting said armature to its attracted position for holding said valve member in open position, a closure member carried by said reset means and cooperable with another side of said partition for interrupting the supply of fuel to said outlet only during the resetting operation; a normally open switch controlling energization of said igniter and carried by said reset means for operation to closed position during the resetting operation; a manually operable control device movable between open and closed positions for controlling the fuel supply from said outlet to the main burner, and switch means for controlling said thermoelectric circuit and being operable to open position by movement of said control device to closed position for preventing energization of said electromagnetic means.

2. A control and ignition system for domestic gas ranges having a compartment provided with main and pilot burners, comprising an electric igniter located to ignite the pilot burner and adapted to be energized from a source of current supply, a main gas supply pipe connected to the main burner, a control valve casing interposed in said supply pipe, a valve member in said casing for controlling the gas supply, a pilot supply conduit connected to said casing and controlled by said valve member, electromagnetic means having an armature connected to said valve member and adapted when energized for holding said armature in an attracted position and said valve member in an open position, means for biasing said armature to a released position, thermoelectric means responsive to a flame at the pilot burner and connected in circuit for energizing said electromagnetic means but insufficiently to overcome said biasing means, reset means operable for resetting said armature to said attracted position, a normally open switch controlling energization of said igniter and carried by said reset means for operation to closed position during the resetting operation, a rotatable gas cock interposed in said supply pipe between said control casing and the main burner, and switch means in said thermoelectric circuit and being operable to open position by movement of said gas cock to closed position for manually deenergizing said electromagnetic means and causing closure of said valve member to shut-off the gas supply to both the main and pilot burners at the end of a cooking operation.

3. In a control system for fuel burning apparatus having main and pilot burners, the combination of automatic control means for controlling the fuel supply to both said burners and being biased to a fuel supply preventing position, electromagnetic means having an armature operatively associated with said control means and adapted when energized for holding said armature in an attracted position and said control means in a fuel supply permitting position, thermoelectric means responsive to a flame at the pilot burner and connected in circuit with said electromagnetic means for energizing the same but insufficiently to overcome said bias, reset means operable for overcoming said bias and resetting said armature in its attracted position for holding said control means in said fuel supply permitting position, means operatively associated with said reset means for interrupting the fuel supply to the main burner only during the resetting operation, a manually operable valve movable between open and closed positions for controlling the fuel supply to the main burner, and switch means cooperable with said valve for controlling said thermoelectric circuit and being operable to open position by movement of said valve to closed position for preventing energization of said electromagnetic means.

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