

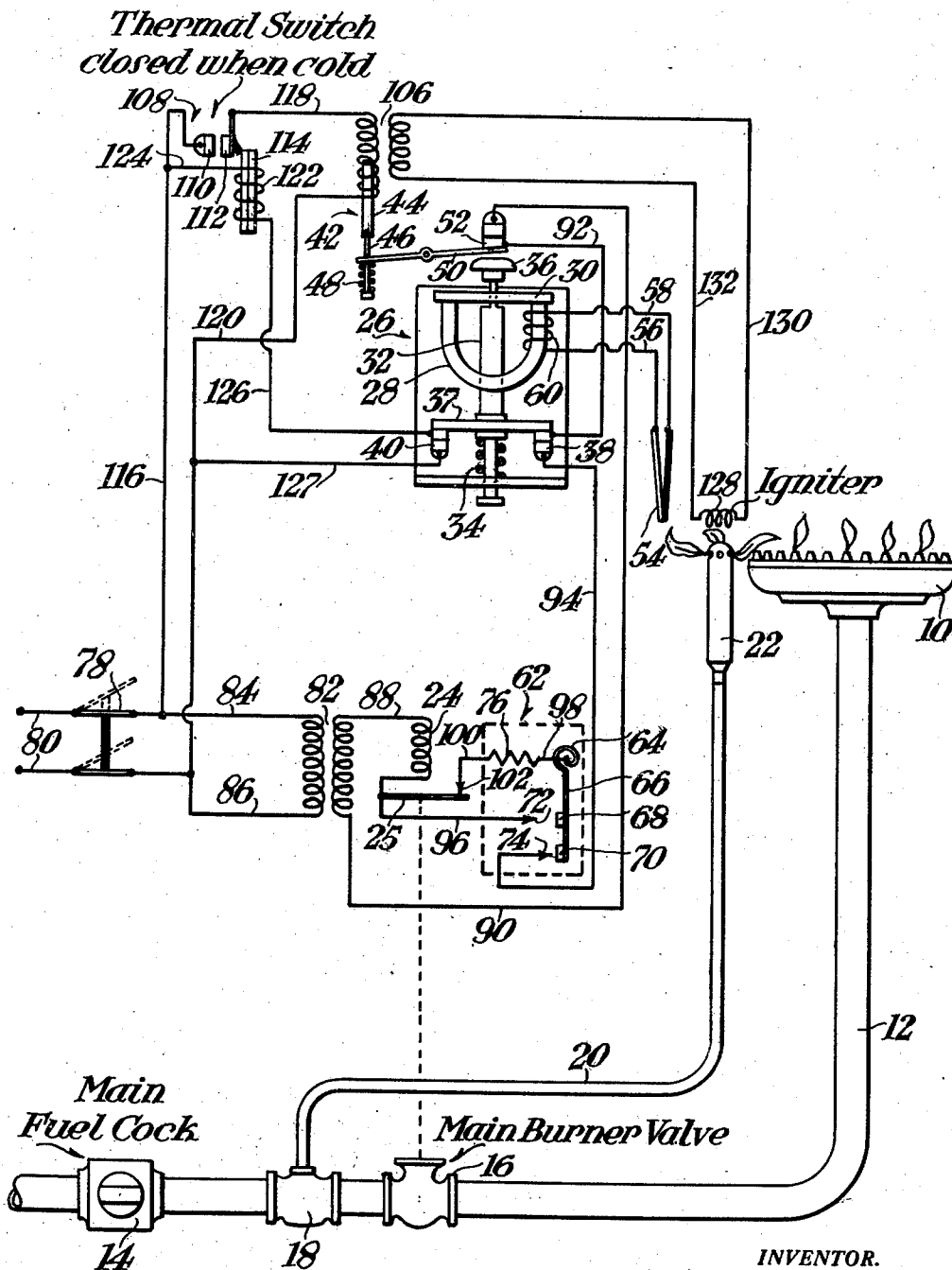
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CONTROL AND IGNITION SYSTEM FOR FUEL BURNERS

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CONTROL AND IGNITION SYSTEM FOR
FUEL BURNERS

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This invention relates to control and ignition systems for fuel burners and, more particularly, to electrically operated systems therefor.

Systems of the character indicated have been arranged with safety control devices adapted to be supplied with electrical energy from a thermocouple or thermopile during the running period. As such energy is usually of insufficient value to start the system in operation, it has been proposed to employ energy from a source of commercial supply for the starting period. The present invention is particularly concerned with means to make such systems generally adapted for space heating services where the fuel flow control device may be a standard article of commerce and not subject to modification for the proposed use.

An object of this invention is to utilize a single electromagnetic valve for condition and safety control in conjunction with a gaseous fuel burner without requiring alteration or modification in standard forms of valves to adapt it for such uses.

Another object of the invention is to employ thermoelectric energy independent of any outside source for operating the safety control device during the burner running period while utilizing energy from a commercial source of supply in connection with this device during the starting period only.

Another object of the invention is to render the system self-starting and recycling as long as the main fuel and electric control devices are turned on.

Another object of the invention is to incorporate the required transformers for adjusting the voltages to different circuit elements while utilizing certain characteristics thereof for dual purposes where feasible.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing which is a schematic view of a control and ignition system for gaseous fuel burners embodying the invention.

Referring more particularly to the drawing, a main burner 10 is supplied with fuel by a main fuel pipe 12 in which a main fuel shut-off cock 14 is provided. The flow of fuel in the pipe 12 is also under the control of an electromagnetic valve 16 which is biased to closed position. Interposed between the main fuel cock 14 and the electromagnetic valve 16 is a T connection 18 having a reducing outlet to accommodate a conduit 20 for

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supplying fuel to a pilot burner 22 located adjacent the main burner 10.

The electromagnetic valve 16 is preferably of standard commercial form having an operating coil 24 and armature 25 which are shown separated therefrom in the drawing for purposes of clarity in illustration. As will be apparent hereinafter, the electromagnetic valve 16 may be provided with a manual setting device for opening the valve in the event of a power failure and an automatic resetting device for superseding the manual control when the power supply is resumed. As such types of manual-set, automatic-reset devices are well known to those skilled in the art, illustration of the details thereof has been omitted and further description is deemed unnecessary. As this description proceeds it will be apparent that the coil 24 of the electromagnetic valve 16 is assumed to be either energized or deenergized for the purpose of permitting or preventing flow of fuel to the main burner 10 and that such energization is sufficient to overcome the bias of the valve 16 to closed position.

The electromagnetic valve 16 is under control of an electromagnetic device designated generally by the reference numeral 26. This device comprises a horseshoe magnet 28 having an armature 30 movable between attracted and released positions relative to the pole faces thereof. A stem 32 has lost motion connection with the armature 30 and is reciprocable relative to the horseshoe magnet 28 for moving the armature to released position under bias of a coil spring 34. The stem 32 is provided with an enlarged head 36 which is adapted to engage the armature 30 and to move it toward the pole faces of the horseshoe magnet 28 against the bias of the spring 34. When the armature 30 is engaged with the pole faces of the horseshoe magnet 28, that is, in its attracted position, then a contact bar 37 carried by the stem 32 is positioned thereby so that first and second switch contact pairs 38 and 40 at opposite ends of the bar respectively are closed. It will be understood that these contact pairs both comprise the usual fixed and movable contacts.

The resetting movement of the armature 30 to attracted position is under control of an electromagnetic resetting device designated generally by the reference numeral 42. The resetting means comprises a magnet plunger 44 having a swivel connection 46 depending therefrom and carrying a coil spring 48 which serves to support one end of a pivoted lever 50 loosely on the connection 46. The opposite end of the lever 50 carries a movable contact forming one of a third pair of switch

contacts 52 associated with the electromagnetic device 26. It will be observed that the lever 50 is spaced from the enlarged head 36 of the stem 32 when all the contact pairs 38, 40 and 52 are engaged. The arrangement is such that upon upward movement of the magnet plunger 44, as will occur upon attraction thereof by means to be described, the lever 50 will be rotated on its pivotal mounting causing the end carrying the movable contact of contact pair 52 to engage the enlarged head 36 and reset the armature 30 in attracted position relative to the pole faces of the horseshoe magnet 28.

The electromagnetic device 26 is adapted to be energized by thermoelectric means for maintaining the armature 30 in attracted position after it has been reset to such position by the resetting means 42. As shown, the thermoelectric means comprises a thermocouple 54 exposed to the heat of a flame at the pilot burner 22 and connected by wires 56 and 58 to a winding 60 for the horseshoe magnet 28. It will be understood that the electromagnetic device 26 does not receive sufficient energy from the thermocouple 54 to attract the armature 30 into engagement with the pole faces of the horseshoe magnet 28, but that the resetting means 42 is relied upon for such operation. However, after the armature 30 has been thus reset, the thermocouple 54 will generate sufficient energy to retain the armature 30 in attracted position provided that the pilot burner 22 is producing a flame.

The electromagnetic valve 16 is also under the control of a device responsive to a condition caused by operation of the main burner 10. As disclosed in this embodiment, this condition responsive device is designated generally by the reference numeral 62 and takes the form of a room thermostat comprising a bimetallic spiral 64 carrying an arm 66 provided with a pair of spaced contacts 68 and 70. The contact 68 is cooperable with a fixed contact 72 and the contact 70 is cooperable with a fixed contact 74. A heater coil 76 is provided for accelerating operation of the bimetallic spiral 64. Devices of the type disclosed schematically herein are well known to those skilled in the art and further description of details is deemed unnecessary.

The general arrangement of the thermostatic device 62 is such that upon a drop in temperature of the space being heated by main burner 10 the bimetallic spiral 64 moves in a clockwise direction to engage contacts 70 and 74 and thereafter contacts 68 and 72; the contact arrangement being such that upon initial engagement of contacts 70 and 74 there still remains a gap between contacts 68 and 72. When the thermostat is satisfied, the bimetallic spiral 64 will move in a counter-clockwise direction to disengage contacts 68 and 72 and thereafter to disengage contacts 70 and 74. The device thus provides a definite temperature differential for energizing and deenergizing the coil 24 of the electromagnetic valve 16. Moreover, neither of the pairs of contacts 68, 72 or 70, 74 is required to make or break the full load of the electromagnetic valve 16 thus reducing arcing and wear of the contacts. It will be understood that other commercially available forms of thermostatic devices could be substituted and that it is not essential that two contacts be employed for closing a single circuit.

Electrical energy from a commercial source of supply is controlled by a double-pole main switch 78 connected to the line wires 80. Preferably, a transformer 82 is connected in the electromag-

netic valve circuit (hereinafter called the first circuit) and has its primary coil connected by wires 84, 86 to the main switch 78. The secondary coil of the transformer 82 is connected at one end by a wire 88 to one end of the electromagnetic valve coil 24 and the opposite end thereof is connected by a wire 90 to the fixed contact of the third contact pair 52. The first circuit also includes the thermostatic device 62 and the first and third contact pairs 38 and 52, respectively. The connections may be traced by wire 92 from the movable contact of third contact pair 52 to movable contact of first contact pair 38, wire 94 from fixed contact of first contact pair 38 to fixed contact 74 of the thermostatic device 62, movable contact 70, arm 66, movable contact 68, fixed contact 72 and wire 96 to the opposite end of the electromagnetic valve coil 24.

The heater coil 76 for the thermostatic device 62 is connected at one end by a wire 98 to the bimetallic spiral 64 and at the opposite end by a wire 100 to a fixed contact 102 which is adapted to be engaged by one end of the armature 25 of the electromagnetic valve 16. The armature 25 is permanently connected at the opposite end to the wire 96.

A second circuit is connected to the source 90 under control of the main switch 78 and in parallel with the first circuit. The second circuit includes the primary coil of a second transformer 106 which also forms an operating coil for the magnet plunger 44. A thermal switch, designated generally by the reference numeral 108, has fixed and movable contacts 110 and 112, respectively, included in the second circuit. The thermal switch 108 is preferably of the bimetallic snap switch type and includes a bimetallic element 114 which serves to operate the movable contact 112 with snap action when heat is applied to the element causing it to warp. The thermal switch 108 is adapted to be closed when the bimetallic element 114 is unheated and the contacts 110 and 112 are at such time engaged.

The second circuit is thus closed and may be traced from the wire 84 by wire 116, fixed contact 110, movable contact 112, wire 118, primary coil of the transformer 106, and wire 120 to the wire 86.

The bimetallic element 114 is heated by a coil 122 wrapped around or otherwise disposed in proximity to the element 114 and such coil may be connected at one end by a wire 124 to the wire 116, at the opposite end by a wire 126 to the movable contact of the second pair of switch contacts 40, and by a wire 127 from the fixed contact of pair 40 to wire 120. An electric igniter 128 is provided for igniting the pilot burner 22 and is connected to the secondary coil of the second transformer 106 by wires 130 and 132.

In the operation of the device, the system is turned on by opening the main fuel cock 14 and closing the main switch 78; it being apparent that these devices could be interconnected for simultaneous operation if desired. Fuel is supplied to the pilot burner 22 through the conduit 20 connected to the main fuel pipe 12 but the electromagnetic valve 16 which is biased to closed position prevents fuel from being supplied to the main burner 10. Electrical energy is supplied to the primary coil of the second transformer 106 through the second circuit described since the thermal switch 108 is closed at this time. The energizing of the primary coil of the second transformer 106 causes the magnet plunger 44 of the resetting device 42 to be picked up. As the secondary coil of the second transformer 106 is now

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energized, the igniter 128 is also energized and serves to ignite the fuel flowing from the pilot burner 22.

When the magnet plunger 44 picks up, the lever 50 is rotated on its pivotal mounting and causes the third contact pair 52 to be opened. The lever 50 also engages the enlarged head 36 of the stem 32 of the electromagnetic device 26 and overcomes the bias of the coil spring 34 to reset the armature 30 in engagement with the pole faces of the horseshoe magnet 28. The contact arm 37 attached to the stem 32 simultaneously causes the first and second contact pairs 38 and 40, respectively, to be closed. It is apparent that the first circuit in which the electromagnetic valve coil 24 is included is opened by the opening of the third contact pair 52 so that no fuel can flow to the main burner 10.

The closing of the second contact pair 40 energizes the heater coil 122 for the thermal switch 108 through the described circuit and, after a predetermined period, the bimetal arm 114 warps sufficiently to cause the thermal switch 108 to open its contacts 110, 112. Thus, the second circuit which includes the primary coil of the transformer 106 is opened and the magnet plunger 44 is no longer attracted. Since the secondary coil of the second transformer 106 is now deenergized, the igniter 128 which is in circuit therewith is likewise deenergized for the duration of the running period of the burner.

The pivotal movement of the lever 50 resulting from dropping of the magnet plunger 44 causes the third contact pair 52 to again be closed. However, if during this starting period the fuel from the pilot burner 22 is ignited by the igniter 128, then the thermocouple 54 has been sufficiently heated by the pilot burner flame to energize the winding 60. The armature 30 will then remain in its attracted position relative to the pole faces of the horseshoe magnet 28 and the first and second contact pairs 38 and 40 remain closed. As the third contact pair 52 is also closed, the first circuit is established through the connections described for the electromagnetic valve 16 provided that the thermostatic device 62 is calling for heat and has closed its contacts 68-74. The electromagnetic valve 16 will then be operated to open position and fuel will be supplied to the main burner 10 where it is ignited by the flame from the pilot burner 22. It should be noted that the second contact pair 40 being closed causes the heater coil 122 to remain energized and maintain the thermal switch 108 in its open position.

The system will remain in operation under control of the thermostatic device 62 as long as the pilot burner 22 continues to produce a flame and there are no power interruptions. When the thermostatic device 62 is satisfied, the contacts 68, 72 thereof are first disengaged but the first circuit for the electromagnetic valve coil 24 is maintained as long as the contacts 70, 74 remain engaged. The opening of the contacts 70, 74 is accelerated by the provision of the heater coil 16 for the bimetallic spiral 64 and the electromagnetic valve coil 24 is then deenergized to cause the electromagnetic valve 16 to close.

In the event that the flame from the pilot burner 22 is extinguished, then the thermocouple 54 cools so as to deenergize the winding 60 causing release of the armature 30 from the pole faces of the horseshoe magnet 28. The contact pairs 38, 40 are opened by movement of the stem 32 under the bias of the spring 34. Thus, the first circuit including the electromagnetic valve coil

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24 is opened by the first contact pair 38 and the electromagnetic valve 16 moves to closed position to shut-off the flow of fuel to the main burner 10. Moreover, the opening of the second contact pair 40 causes deenergization of the heater coil 122 of the thermal switch 108. However, the contacts 110, 112 do not open until after a purge period, the length of which is determined by the time required by the bimetal 114 to cool.

The recycling character of the system is now apparent. After the bimetallic element 114 of the thermal switch 108 has caused the contacts 110, 112 to close, then the sequence of operation is the same as described when the system is first turned on. As the use of electrical energy from an outside source is depended upon for resetting the safety device only during the short starting period, it is apparent that the system is adapted for safety operation in the event that a power failure occurs. As previously described, the electromagnetic valve 16 is preferably of the commercially available manual-set, automatic-reset type and can therefore be manually moved to open position in the event that a power failure occurs causing this valve to be closed. The system will then operate under control of the thermostatic device 62 and upon resumption of the power supply the electromagnetic valve 16 is automatically reset from its manual set position without interruption of the fuel flow. The power consumption is very low due to the brief nature of the starting period and the deenergizing of the igniter during the running period of the burner.

While the invention described herein provides a relatively simple system of condition, safety control and ignition for gaseous fuel burners, it will be apparent that many changes can be made in the arrangement and combination of parts and in the details of construction herein disclosed within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means movable between fuel flow permitting and preventing positions for controlling the supply of fuel to the main burner, an electromagnetic device having contacts operable between open and closed positions for causing movement of said means between said positions, a first circuit including the source, said means and said contacts, a second circuit including the source and resetting means for said device operative to cause closure of said contacts, holding means operatively associated with said device for maintaining said contacts closed independently of said resetting means, means responsive to a flame at the pilot burner for rendering said holding means operative upon completion of said resetting operation, and timing means in said second circuit for rendering the same inoperative after a predetermined period during which said flame responsive means has time to become responsive.

2. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means movable between fuel flow permitting and preventing positions for controlling the supply of fuel to the main burner, an electromagnetic device having first and second contacts operable between open and closed positions, a first circuit including the source, said means and said first contacts, a second circuit including the source and resetting means for said device opera-

tive to cause closure of said first and second contacts, holding means operatively associated with said device for maintaining said first and second contacts closed independently of said resetting means, means responsive to a flame at the pilot burner for rendering said holding means operative upon completion of said resetting operation, timing means in said second circuit for rendering the same inoperative after a predetermined period during which said flame responsive means has time to become responsive, and control means for said timing means responsive to closure of said second contacts for initiating said period.

3. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means movable between fuel flow permitting and preventing positions for controlling the supply of fuel to the main burner, an electromagnetic device having first, second and third contacts operable between open and closed positions, a first circuit including the source, said means and said first and third contacts, a second circuit including the source and resetting means for said device operative to cause closure of said first and second contacts and opening of said third contacts, holding means operatively associated with said device for maintaining said first and second contacts closed independently of said resetting means, means responsive to a flame at the pilot burner for rendering said holding means operative upon completion of said resetting operation, timing means in said second circuit for rendering the same inoperative after a predetermined period during which said flame responsive means has time to become responsive, said third contacts becoming closed in said first circuit by operation of said resetting means when said second circuit is inoperative, and control means for said timing means responsive to closure of said second contacts for initiating said period.

4. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means movable between fuel flow permitting and preventing positions for controlling the supply of fuel to the main burner, an electromagnetic device for controlling movement of said means between said positions, said device including a relatively movable winding and armature, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to hold said armature and winding together and cause said electrically operable means to be held in said fuel flow permitting position but insufficiently to attract said armature and winding together and cause movement of said electrically operable means from said fuel flow preventing position, resetting means including primary and secondary transformer coils connected to the source for moving said armature and winding together to enable said device to cause movement of said electrically operable means to said fuel flow permitting position, a switch connected in series circuit with said primary coil and the source, means controlled by movement of said armature and winding together for operating said switch to open said circuit upon completion of said resetting operation, and an igniter electrically connected to said secondary coil for igniting the pilot burner to produce said flame prior to said switch operation.

5. In a control system for fuel burners having main and pilot burners and a source of electrical

energy, comprising in combination, electrically operable valve means for controlling the flow of fuel to the main burner and being biased to flow preventing position, an electromagnetic device for controlling movement of said valve means between fuel flow preventing and permitting positions, said device including a relatively movable winding and armature, first switch contacts adapted to be closed by movement of said winding and armature together, second switch contacts also adapted to be closed by the last said movement, a first circuit including the source, said valve means and said first switch contacts adapted when closed to cause said valve means to be moved against its bias to flow permitting position, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to maintain said first and second switch contacts closed but insufficiently to attract said armature and winding together to close said switch contacts, resetting means including primary and secondary transformer coils for moving said armature and winding together to close said first and second switch contacts, a second circuit including the source, said primary coil and switching means, means connected in series circuit with said second switch contacts and in parallel with said second circuit for operating said switching means to open said second circuit and cause de-energization of said primary and secondary coils upon completion of said resetting operation, and an igniter electrically connected to said secondary coil for igniting the pilot burner to produce said flame prior to said operation of said switching means.

6. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable valve means for controlling the flow of fuel to the main burner and being biased to flow preventing position, an electromagnetic device for controlling movement of said valve means between fuel flow preventing and permitting positions, said device including a relatively movable winding and armature, first and second switch contacts adapted to be closed by movement of said winding and armature together, third switch contacts adapted to be opened by the last said movement but being adapted to be closed independently of said movement, a first circuit including the source, said valve means and said first and third switch contacts adapted when closed to cause said valve means to be moved against its bias to flow permitting position, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to maintain said first and second switch contacts closed but insufficiently to attract said armature and winding together to close said first and second switch contacts, resetting means including primary and secondary transformer coils for moving said armature and winding together to close said first and second switch contacts, a second circuit including the source, said primary coil and switching means, means connected in series circuit with said second switch contacts and in parallel with said second circuit for operating said switching means to open said second circuit and cause de-energization of said primary and secondary coils upon completion of said resetting operation, said third contacts becoming closed in said first circuit by operation of said resetting means when said second circuit is opened, and an igniter elec-

trically connected to said secondary coil for igniting the pilot burner to produce said flame prior to said operation of said switching means.

7. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable valve means for controlling the flow of fuel to the main burner and being biased to flow preventing position, an electromagnetic device for controlling movement of said valve means between fuel flow preventing and permitting positions, said device including a relatively movable winding and armature, two pairs of switch contacts adapted to be operated by movement of said winding and armature together, one said pair being closed and the other pair opened by the last said movement, said other pair being adapted to be closed independently of said movement, a circuit including the source, said valve means and said two pairs of contacts adapted when closed to cause said valve means to be moved to flow permitting position, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to maintain said one pair of contacts closed but insufficiently to attract said armature and winding together to close said one pair of contacts, electromagnetic resetting means for said device connected to the source and operative when energized to move said armature and winding together to close said one pair and open said other pair of switch contacts, said resetting means being operative when deenergized for closing said other pair of contacts, and timing means operative to deenergize said resetting means after a predetermined period during which said thermocouple means has time to become heated and cause said one pair of contacts to remain closed.

8. In a control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable valve means for controlling the flow of fuel to the main burner and being biased to flow preventing position, an electromagnetic device for controlling movement of said valve means between fuel flow preventing and permitting positions, said device including a relatively movable winding and armature, two pairs of switch contacts adapted to be operated by movement of said winding and armature together, one said pair being closed and the other said pair being opened by the last said movement, said other pair being adapted to be closed independently of said movement, a circuit including the source, said valve means and said two pairs of contacts adapted when closed to cause said valve means to be moved to flow permitting position, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to maintain said one pair of contacts closed but insufficiently to attract said armature and winding together to close said one pair of contacts, electromagnetic resetting means for said device including primary and secondary coils of a transformer, said primary coil being connected to said source and operative when energized to cause said resetting means to move said armature and winding together to close said one pair and open said other pair of switch contacts, said resetting means being operative when deenergized for closing said other pair of contacts, an igniter electrically connected to said secondary coil for igniting the pilot burner to produce said flame, and

means operative to deenergize said resetting means and igniter after a predetermined period during which said thermocouple means has time to become heated and cause said one pair of contacts to remain closed.

9. An ignition and control system for fuel burners having a main and a pilot burner and a source of electrical energy, comprising in combination, electromagnetic valve means for the main burner biased to closed position, an electromagnetic device having a winding and an armature movable between attracted and released positions for controlling the energization of said valve means for movement thereof to open position, first and second switch contacts associated with said device and adapted to be closed in the attracted position of said armature, a third pair of switch contacts associated with said device and adapted to be opened in said attracted position of said armature but being adapted to be closed independently of said armature movement, switching means responsive to a condition caused by operation of the main burner, a first transformer having its primary coil connected to the source and its secondary connected in a circuit including said valve means, said switching means, and said first and third switch contacts, a second transformer having its primary coil connected to said source in parallel with the primary coil of said first transformer, a plunger magnet operatively associated with the primary coil of said second transformer and adapted when the latter is energized for resetting said armature to attracted position and simultaneously opening said third pair of contacts, said plunger magnet being adapted when said second transformer is deenergized for closing said third pair of contacts, thermocouple means exposed to the heat of a flame at the pilot burner and connected to said winding for energizing said device sufficiently to retain said armature in attracted position, an igniter for the pilot burner connected to the secondary of said second transformer and adapted when energized to produce said flame, a thermal switch in circuit with said primary of said second transformer and being closed when cold, and a heater coil for said thermal switch adapted to cause opening thereof and said deenergization of said second transformer and igniter after a predetermined period during which said thermocouple means has had time to become heated sufficiently to cause said armature to be retained in attracted position, said heater coil and second pair of contacts being in series circuit and jointly in parallel with said thermal switch and said primary of said second transformer for thereafter maintaining said thermal switch open during such time as said armature remains attracted.

10. In a control system for fuel burners having main and pilot burners and a source of electrical energy, the combination of electrically operable means connected to the source and being movable between positions for controlling the supply of fuel to the main burner, an electromagnetic device having contacts movable between open and closed positions for controlling the energization of said electrically operable means, means responsive to a flame at the pilot burner for controlling the energization of said device, and a second electrically operable means connected to the source and operatively associated with said electromagnetic device for resetting the same to cause closure of said contacts.

11. In a control system for fuel burners having

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main and pilot burners and a source of electrical energy, the combination of electrically operable means connected to the source and being movable between positions for controlling the supply of fuel to the main burner, an electromagnetic device having contacts movable between open and closed positions for controlling the energization of said electrically operable means, thermoelectric means responsive to the heat of a flame at the pilot burner for controlling the energization of said device but being incapable of causing closure of said contacts, a second electrically operable means connected to the source and operatively associated with said electromagnetic device for resetting the same to cause closure of said contacts, and timing means responsive to closure of said contacts for causing deenergization of said second means after a predetermined period during which said thermoelectric means has time to become heated.

12. In a control system for fuel burners having main and pilot burners and a source of electrical energy, the combination of electrically operable means connected to the source and being movable between positions for controlling the supply of fuel to the main burner, a first electromagnetic device having a pair of contacts movable between open and closed positions for controlling the energization of said electrically operable means, thermoelectric means responsive to the heat of a flame at the pilot burner for controlling the energization of said device but being incapable of causing closure of said contacts, a second electromagnetic device connected to the source and having a pair of contacts controlling the energization of said electrically operable means and a movable armature for operating said second pair of contacts, said armature being operatively associated with said first electromagnetic device for resetting the same to cause closure of said first pair of contacts while simultaneously opening said second pair of contacts to prevent energization of said electrically operable means during the resetting operation, and timing means responsive to closure of said first pair of contacts for causing deenergization of said second electromagnetic device after a predetermined period during which said thermoelectric means has time to become heated, said armature thereby causing closure of said second pair of contacts while said first pair of contacts remains closed to cause energization of said electrically operable means.

13. A control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means connected to the source and being movable between fuel flow preventing and permitting positions for controlling the supply of fuel to the main burner, thermomagnetic switch means responsive to a flame at the pilot burner and operable between a first position for causing energization of said electrically operable means for movement thereof to flow permitting position and a second position for causing deenergization of said electrically operable means

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for movement thereof to flow preventing position, means for resetting said thermomagnetic switch means in said first position including a second electrically operable means energized from the source, means responsive to movement of said thermomagnetic switch means to said first position for causing deenergization of said second electrically operable means, and control switch means responsive to changes in a condition to be controlled for controlling the energization of the first said electrically operable means for movement thereof between flow preventing and permitting positions independently of said thermomagnetic switch means.

14. A control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means connected to the source and being movable between positions for controlling the supply of fuel to the main burner, an electromagnetic device having contacts operable between open and closed positions for controlling energization of said electrically operable means for movement thereof between said positions, thermoelectric means responsive to a flame at the pilot burner for controlling the energization of said device, means for resetting said device to cause closure of said contacts including a second electromagnetic device energized from the source, timing means responsive to closure of said contacts for causing deenergization of said second device after a predetermined period during which said thermoelectric means has time to become heated by said flame, and control switch means responsive to changes in a condition to be controlled for controlling the energization of said electrically operable means for movement thereof between said positions independently of the first said electromagnetic device.

15. A control system for fuel burners having main and pilot burners and a source of electrical energy, comprising in combination, electrically operable means connected to the source and being movable between positions for controlling the supply of fuel to the main burner, an electromagnetic device having contacts operable between open and closed positions for controlling energization of said electrically operable means for movement thereof between said positions, thermoelectric means responsive to a flame at the pilot burner for controlling the energization of said device, means for resetting said device to cause closure of said contacts including a second electromagnetic device energized from the source, igniting means for the pilot burner, timing means responsive to closure of said contacts for causing deenergization of said second device and said igniting means after a predetermined period during which said thermoelectric means has time to become heated by said flame, and control switch means responsive to changes in a condition to be controlled for controlling the energization of said electrically operable means for movement thereof between said positions independently of the first said electromagnetic device.

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