

April 17, 1956

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2,742,232

CONTROL DEVICE

Original Filed May 11, 1948

4 Sheets-Sheet 1

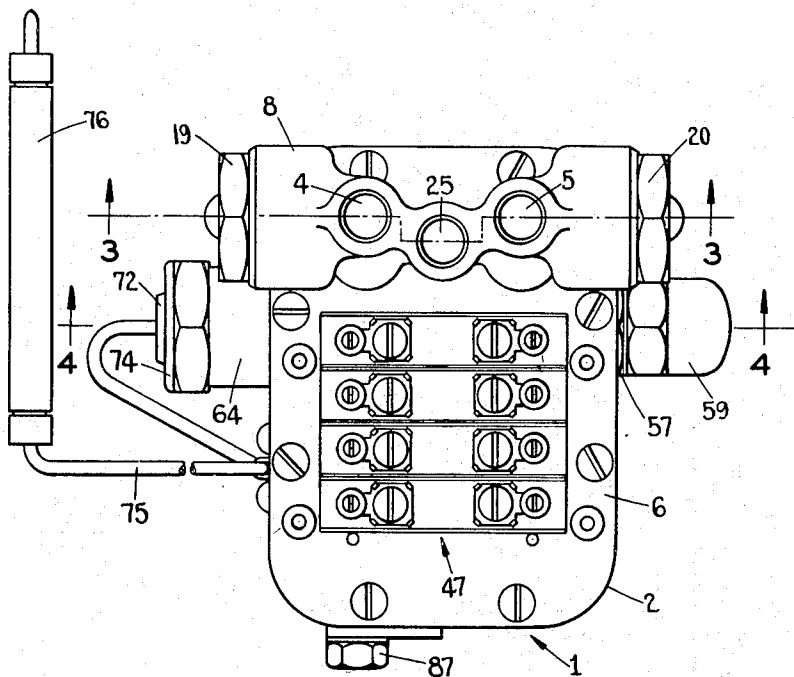
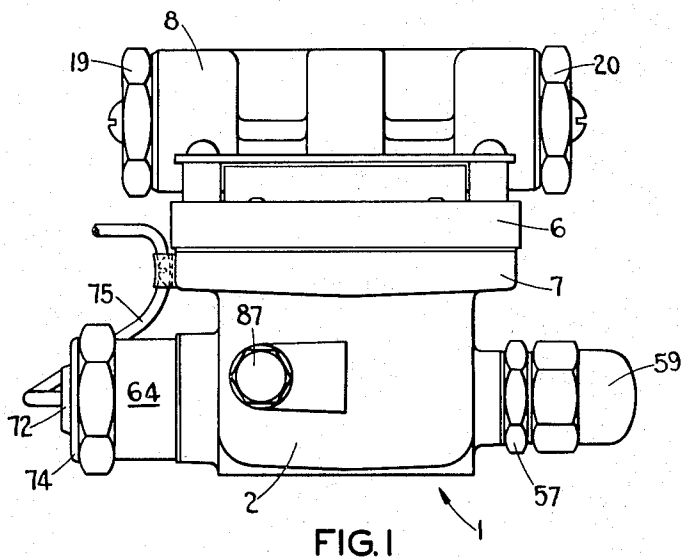


FIG. 2

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4 Sheets-Sheet 2

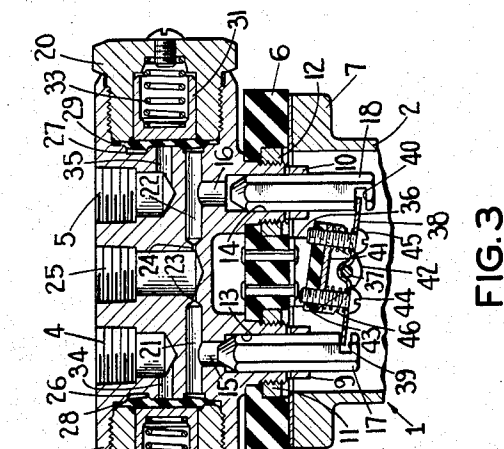


FIG. 3

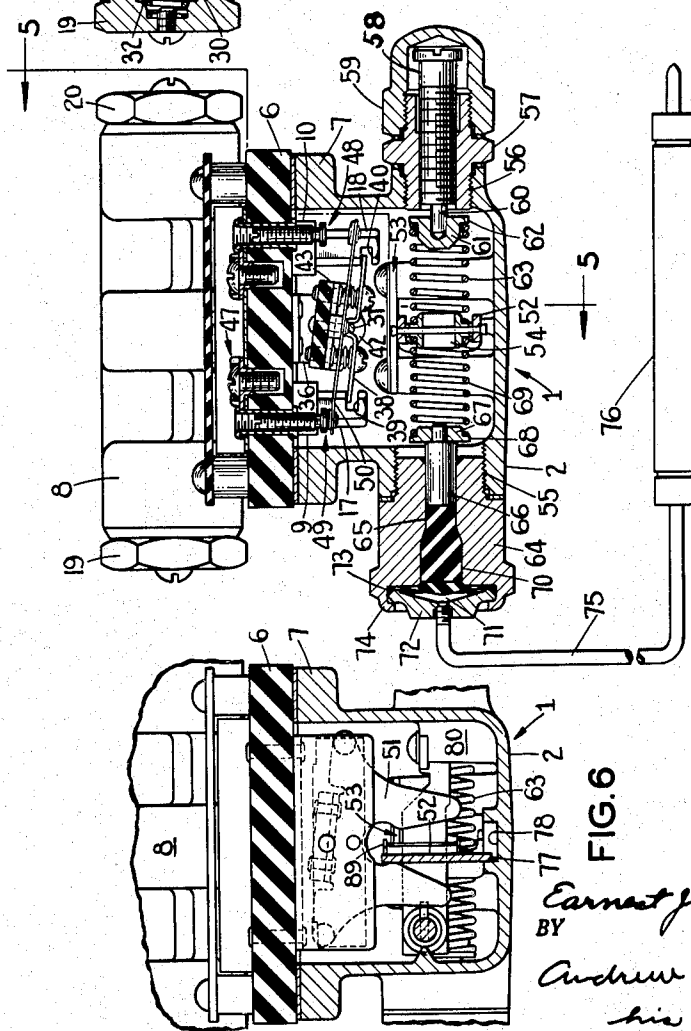


FIG. 4

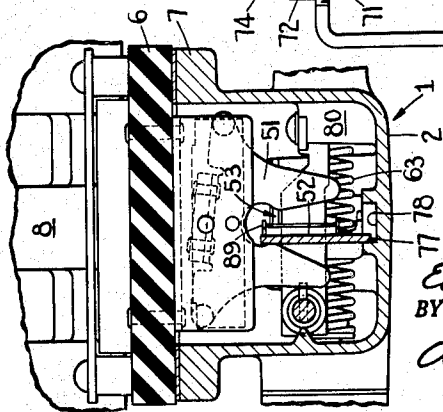


FIG. 6

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4 Sheets-Sheet 3

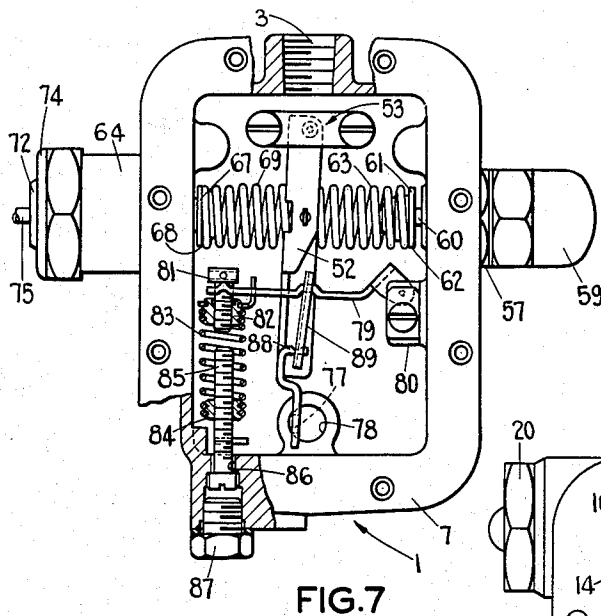


FIG. 7

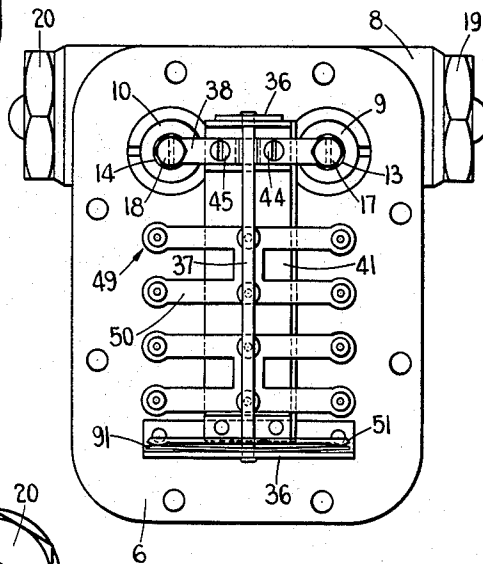


FIG. 8

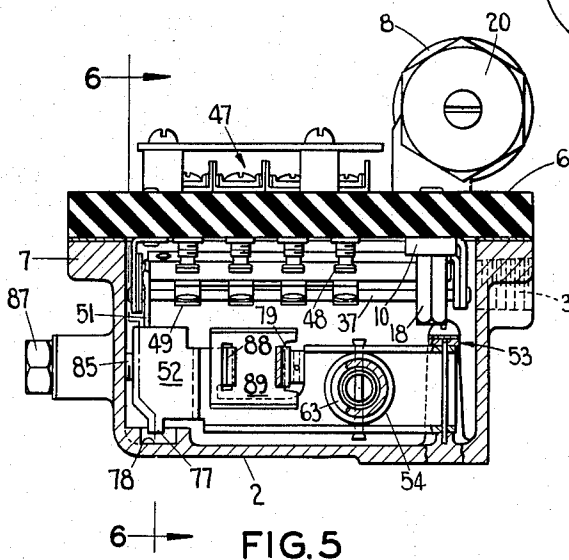


FIG. 5

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4 Sheets-Sheet 4

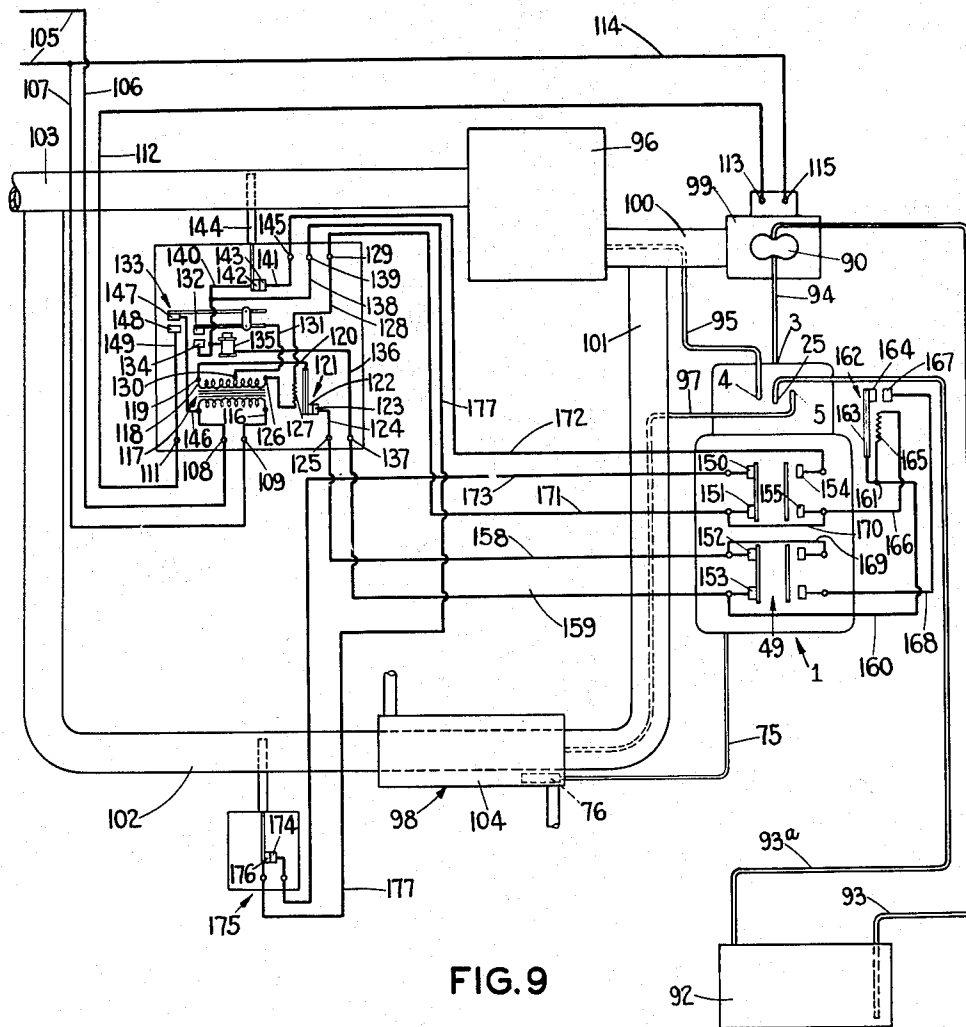


FIG. 9

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1

2,742,232

CONTROL DEVICE

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Original application May 11, 1948, Serial No. 26,429, now Patent No. 2,638,121, dated May 12, 1953. Divided and this application May 6, 1953, Serial No. 355,743

2 Claims. (Cl. 237—2)

This invention relates to new and useful improvements in liquid fuel burner systems and more particularly to control devices therefor.

One of the objects of this invention is to provide a control system having a plurality of liquid fuel burners having a common supply of fuel.

Another object is to provide a control device for selectively directing the flow of liquid fuel to each of a plurality of liquid fuel burners.

Another object is to provide a liquid flow controlling device having a pressure determining means therein and having a means for leading fuel back to the source of supply at pressures below that determined by the pressure determining means.

Another object is to provide a control device having a means for selectively directing the flow of fuel to two burners and for transferring control between two control systems which control the operation of said burners.

Another object is to provide a novel valve and switch combination in a liquid fuel burner control device.

Another object is to provide a control device for a two burner control system by which the fuel supply is discontinued to one burner before the control valve switches the supply from that burner to the other.

Another object is to provide a novel means of adjustment for an operating lever in a control device.

Another object is to provide a control device having a novel means for inducing a snap or quick action of an operating member.

Other objects will become apparent from time to time throughout the specification and claims as hereinafter related.

This invention consists of the new and improved control system and control device therefor and of the combination and cooperation of the parts thereof which will be described more fully hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings to be taken as part of the specification, there is clearly and fully illustrated one preferred embodiment of this invention in which drawings:

Figure 1 is a view in front elevation of a control device embodying this invention,

Fig. 2 is a top plan view of this control device,

Fig. 3 is a sectional view taken on the section line 3—3 of Fig. 2 of this control device and which shows the construction and relation of the control valves to the various outlet passageways,

Fig. 4 is a sectional view taken on the section line 4—4 of Fig. 2, and which shows the thermostatic means for operating this device,

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4 and which shows the liquid inlet to the control device and the actuating lever therefor,

Fig. 6 is a sectional view taken on the section line 6—6 of Fig. 5,

Fig. 7 is a plan view of this control device with the

2

cover member removed and shown in partial section to show the means for adjusting the snap acting device,

Fig. 8 is a bottom plan view of the cover member of this device when removed, and

Fig. 9 is a diagrammatic view of this control device installed in a control system for controlling a pair of liquid fuel burners.

Referring to the drawings by characters of reference, there is a control device 1 comprising a liquid fuel receiving casing 2 having an inlet passageway 3 and a pair of outlet passages 4, 5. The casing 2 has a cover member 6 of an electric insulating material which is secured to and seals the open top of the casing, the cover member 6 being secured to the casing 2 on a flange 7 which extends around the open top of the casing. There is a valve casing member 8 which is secured to the cover member 6 along one end portion thereof. The valve casing 8 has a pair of projecting portions 9, 10 which extend through a pair of apertures in the cover member 6. The projecting portions 9, 10 are externally screw-threaded and are secured to the cover member 6 by a pair of nuts 11, 12. The projecting portions 9, 10 have bores 13, 14 therein which open into smaller bores 15, 16 forming valve ports and cooperating with the bores 13, 14 to form valve seats. There are a pair of valve members 17, 18 which fit slidably in the bores 13, 14 and which function to control flow of liquid fuel therethrough. The valve members 17, 18 are of polygonal cross-section to permit flow of fuel to the valve ports 15, 16. The valve casing 8 has a pair of cylindrical cavities at each end thereof in which are screw-threadedly secured a pair of plug members 19, 20. The bores or ducts 15, 16 open respectively into passages 21, 22 which communicate at one end thereof through bleed orifices 23, 24 into a bleed or auxiliary outlet passageway 25. The other ends of the passages 21, 22 communicate with annular cavities 26, 27 respectively which are closed by resilient elastic diaphragms 28, 29 respectively of a pair of diaphragm type check valves. The plug members 19, 20 in the valve casing 8 are each hollow and have hollow operating pistons 30, 31 therein which are held compressively against the diaphragms 28, 29 by helical springs 32, 33. The diaphragms 28, 29 which are clamped in position by the plug members 19, 20 respectively, are held compressively closing a pair of passages 34, 35 which open into the outlet passages 4, 5. Secured to the under surface of the cover member 6 is a bracket 36 which supports the fulcrum pin 37 of an operating lever 38 which controls the opening and closing movement of the valves 17, 18. The operating lever 38 fits at its opposite ends into lost-motion slots 39, 40 in the valve 17, 18. The operating lever 38 is adjustably secured to a lever supporting member 41 which is formed of sheet metal having a plane central portion and downturned projections or ears 42 at each end through which extends the pivot pin 37. There is a supporting member 43 of an electric insulating material which is secured to and carried by the lever supporting member 41. The operating lever 38 has a grooved central portion which rides on the pivot pin 37 and has a pair of apertures on opposite sides of the fulcrum pin 37 through which extend a pair of bolts 44, 45 which are adjustably secured in the supporting members 41, 43. There is a helical spring 46 surrounding each of the bolts 44, 45 which is positioned between the lever supporting member 41 and the lever 38 and which holds the lever 38 compressively against the heads of the bolts 44, 45. It is obvious then that the lever 38 can be rotatably adjusted relative to the supporting member 41 by proper inward and outward adjustment of the bolts 44, 45, thereby permitting adjustment of the amount of opening of the control valves 17, 18.

The cover member 6 of the casing 2 carries four pairs of electrical contact terminals or binding posts 47 which are connected to fixed contacts 48 of an electric switch. There are four pairs of movable switch contacts 49 which are carried by the supporting member 43 on the lever supporting member 41 and which are connected thereto by resilient arms 50. It is seen then that upon rocking movement of the lever in one direction one of the valves is opened and one closed and two pairs of movable contacts are closed against their respective fixed contacts while two pair of movable contacts are opened. The lever supporting member 41 has a downturned and bifurcated projecting portion 51 at the end opposite the valves. There is a lever 52 which is pivoted on a bracket 53 and which extends between the prongs of the bifurcated projection 51. The lever 52 when moved engages one or the other of the prongs of the bifurcated projection 51 and causes the lever and electric contacts to be rocked. Positioned between flanges on the lever 52 there is a pivoted member 54 which has a pair of annular shoulders cut into the opposite faces thereof. The casing 2 has a pair of apertures 55, 56 which are oppositely aligned in line with the pivoted annular member 54. There is a plug member 57 which is screw-threadedly secured in the aperture 56 and which has an adjustment screw 58 extending longitudinally therethrough into the chamber enclosed by the casing 2. The adjustment screw 58 is enclosed by a cover member 59 which is screw-threadedly secured to the exterior of the plug member 57. The adjustment screw 58 has a small projecting portion 60 which projects into a cylindrical cavity in a spring supporting member 61. The supporting member 61 has an annular flange 62 thereon against which bears one end of a helical spring 63, the other end of which bears against one annular shoulder of the pivoted member 54. At the opposite side of the casing 2 there is a plug member 64 which is screw-threadedly secured in the aperture 55. The plug member 64 has a bore 65 extending substantially along the longitudinal axis thereof, which bore is of reduced size in the inner end portion thereof. There is a piston member 66 which slidably fits the reduced end portion of the bore 65 and which extends into the chamber enclosed by the casing 2 and which has an annular shoulder upon which seats a spring supporting member 67 having a flange 68. There is a helical spring 69 which is compressively positioned between the flange portion 68 of the member 67 and the other annular shoulder of the pivoted member 54, the springs 69, 63 being oppositely aligned. Positioned in the enlarged portion of the bore 65 and extending partially into the reduced portion is an elastic plug member 70 of a resiliently elastic material such as a rubber or synthetic rubber. The bore 65 at its enlarged end opens into a cylindrical recess or cavity 71 which is closed by a cover member 72. The enlarged open end of the bore 65 is closed off from the cavity 71 by a flexible diaphragm 73 of a resiliently elastic material such as rubber or synthetic rubber. The diaphragm 73 is secured against the end wall of the recess 71 by the cover member 72 and abuts the plug member 70, the cover member 72 being held rigidly in position by an inturned annular flange 74. The cover member 72 has an aperture therein opening into the cavity 71 and in which is sealed a tube or conduit 75 which leads to a thermostatic bulb element 76. The bulb element 76 contains an expansible fluid which is responsive to temperature and operable to transmit an expansive force to the cavity 71 which is expanded thereby and its force transmitted through the diaphragm 73 and plug 70 to move the piston 66. The aforementioned movement of the piston 66 is transmitted through the spring 69 to the lever 52 for operating the control lever 38. The lever 52 has a projecting portion 77 at its free end portion which extends into a cylindrical recess 78 in the bottom wall of the casing

2, the walls of the cylindrical recess 78 functioning as limit stops for the lever 52. There is another lever 79 which is pivoted on a bracket 80 on the side wall of the casing 2 and which has an adjustment screw or bolt 81 at its free end portion. There is a threaded member 82 screw-threadedly secured on the bolt 81 and to which is secured one end of a helical spring 83. The other end of the spring 83 is secured to a screw-threaded member 84 on an adjustment bolt 85 which extends through an aperture 86 in the end wall of the casing 2, the aperture 86 having an enlarged outer end portion which is closed by a bolt-like closure member 87. The lever 52 has an inturned flange portion 88 on its free end against which is pivoted one end of a pivoted member 89, the other end of which is pivoted against the mid-portion of the lever 79. The pivoted member 89 is compressively held by the force of the spring 83 between the lever 79 and the flange portion 88 of the lever 52 and is operable to transmit a biasing thrust therebetween.

In operation this control device functions as follows:

Liquid fuel is supplied to the chamber enclosed by the casing 2 through the inlet 3 under pressure by a pump 90 (shown diagrammatically in Fig. 9). This fuel is discharged through the open valve 14 under pressure and through the passages 16, 22 to the annular cavity 27 which is closed by the diaphragm check valve 29. The check valve 29 is set to open at a predetermined pressure of say 60 p. s. i. at which pressure the diaphragm 29 forces the piston 31 into the cylindrical cavity in the plug member 20 against the spring 33. As the diaphragm 29 is moved, the opening to the passage 35 is opened to permit flow through that passage into the outlet passage 5, which leads to one of the burners controlled by this device. When the heat output in the one burner has reached a sufficient amount the thermostatic bulb 76 which is responsive to said heat output will transmit the fluid expansion to the chamber 71 and an expansive force through the diaphragm and plug member as heretofore described to the piston 66 which acts through the spring 69 to move the lever 52 against the force of the spring 63. The amount of force required to move the lever 52 may be adjusted by the adjustment screw 58 which determines the compressive force exerted by the spring 63 which adjustment will determine the temperature of the bulb element 76 which is required to cause the lever 52 to be moved. As the lever 52 is moved, the pivoted member 89 pivots therewith and causes the lever 79 to move outward thus tensioning the spring 83. When the lever 52 has moved to an over-center position the spring 83 acting through the lever 79 and the pivoted member 89 will cause the lever 52 to move through the remainder of its travel with a snap action. The movement of the lever 52 with a snap action will cause it to engage one of the prongs of the bifurcated projection 51 and to rock the lever 38 and electrical contact arms with a snap action. There is a friction spring 91 which is positioned between the end portion 51 of the lever supporting structure 41 and the supporting bracket 36 which functions to hold the lever supporting member 41 in any predetermined position when a rocking force is not being applied thereto. This spring bears against two raised or embossed portions of the projecting portion 51 and will hold the lever supporting member 41 at one of the two extremes of movement with the valve and switch contacts closed while the lever 52 is moving the distance between the prongs of the bifurcated projection 51. When the lever 52 engages the other prong of the bifurcated projection 51 the lever supporting member 41 will begin to move and thus begin to open one of the valves and one set of switch contacts and begin to close the other valve and the other set of switch contacts. The lever 38 which operates the valves 17, 18 extends into the slotted end portions 39, 40 of these valves and is operable to

5

provide a lost motion in the opening of these valves. When the lever 38 begins its movement it must move from one side of one of the slots 39 and 40 to the other side of the slot before the valve can begin to open. The oil pressure at which the burner is operated is normally about 90 p. s. i. and this pressure is sufficient to resist opening of the valve which is closed until the operating pressure drops to a small value of say, 10 p. s. i. The lost motion feature in the valves and the pressure which holds the valve 17 closed is operable to hold the valve closed while permitting the switch contacts to open. With the switch contacts open the pump is deenergized and when the pressure in the valve casing drops to the lower pressure (10 p. s. i.) the valves and switch contacts are permitted to move through the remainder of their travel to re-establish the pump and burner circuit and to open and close the respective valves as required. The switch contacts which are opening and closed in sequential synchronization with the opening and closing of the valves are operable to switch between two sets of control circuits which control the operation of the pump 90 which supplies fuel to the open one of the valves. The central outlet passageway 25 or bleed passageway communicates through reduced openings or orifices 23, 24 with the passages 21, 22 leading from the outlet 15, 16 from the valve 17, 18. During periods when only one of the burners supplied by this control device is in operation the switching of the valve and switch contacts will deenergize the pump 90 but the inertia of the pump will cause a fuel pressure to continue for a short time and fuel could be supplied through the open valve to the inactive burner. With the bleed outlet and lost motion valve opening described, this short supply of fuel through the inactive burner valve port would be so reduced in pressure as to be insufficient to open the check valve and would be bled through the orifices and discharged through the bleed outlet 25 and a connecting conduit back to the source of fuel supply.

In Fig. 9 the control device heretofore described is shown installed in a control system for controlling flow of fuel to a household heating burner and a domestic water heating burner. In this system there is a fuel sump 92 for supplying fuel to a conduit 93 leading to the pump 90, the pump 90 supplying fuel through the conduit 94 to the inlet 3 of the control device. From the control device 1 one conduit 95 leads to a house heating burner 96 and another conduit 97 leads to a domestic water heating burner 98. The burners 96, 98 are supplied with air by a common motor driven fan 99 by which motor the pump 90 is driven. There is an air duct 100 leading from the fan 99 to the burner 96 and a branch duct 101 leading to the burner 98. The stack 102 from the burner 98 is connected to the stack 103 of the house heating burner 96. The thermostatic bulb element 76 is responsive to the temperature of the water supply and is inserted in the water heating jacket 104 surrounding the burner 98. The electric control system for the control of the burners 96, 98 is as follows:

There is a main power source 105 from which a pair of conductors 106, 107 run to the terminals 108, 109 of an electric primary control device 110. From the terminal 111 on the control device 110 a conductor 112 runs to the terminal 113 of the motor of the fan 99 which is connected to the main power source 105 by a conductor 114 leading from the other fan motor terminal 115. The terminals 108, 109 of the control device 110 are connected to the primary 116 of a transformer 117. The transformer 117 has a secondary coil 118 which has three terminal connections thereon. From one of the secondary terminals 119 a conductor 120 runs to a thermostatic warp switch 121, the contacts 122, 123 of which are normally closed. From the fixed contact 123 of the warp switch 121 a conductor 124 leads to a terminal 125 of the control device 110. From the terminal 126 of the transformer secondary 118 a conductor runs to a

6

heater coil 127 for the thermal warp switch 121, the heater coil 127 being connected by a conductor 128 to a terminal 129 on the control device 110. From the terminal 130 of the transformer secondary 118 a conductor 131 leads to a movable contact 132 of a bipole relay switch 133. The fixed contact 134 of the relay switch 133 is connected to the relay coil 135 which is in turn connected by conductor 136 to the terminal 137 of the control device 110. The fixed relay contact 134 is also connected by a conductor 138 to a terminal 139 of the control device 110 and by conductors 140, 141 and the closed contacts 142, 143 of a thermostatic stack switch 144 to the control device terminal 145. There is a jumper 146 which leads from the transformer primary 116 to a second movable contact 147 cooperable with a fixed contact 148 of the relay switch 133. The fixed contact 148 of the relay switch 133 is connected by a conductor 149 to the terminal 111. On the control device 1 there are a plurality of pairs of fixed switch contacts 150 and 151, 152 and 153, 154 and 155, 156 and 157 with which cooperate the movable pairs of contacts 49. There is a conductor 158 running from the terminal 125 of the control device 110 to the fixed contact 152 of the control device 1. The terminal 137 of the control device 110 is connected by a conductor 159 to the contact 153, which contact is connected by a conductor 160 to the terminal 161 of a room thermostat 162. The thermostat terminal 161 is connected to a bi-metal element 163 which carries a movable contact 164 and is also connected to a compensating heater coil 165 which is in turn connected by a conductor 166 to the contact 155 of the control device 1. The fixed contact 167 which cooperates with the movable contact 164 is connected by a conductor 168 to the contact 157 of the control device 1. There is a jumper wire 169 connecting the contacts 152 and 156 of the control device 1 and a similar jumper 170 connecting the contacts 151, 155. From the contact 151 a conductor 171 leads to the terminal 129 of the control device 110 and a conductor 172 similarly connects the contact 154 to the terminal 145. From the terminal 150 a conductor 173 leads to the fixed contact 174 of a thermostatic stack switch 175, the other contact of which (176) is normally closed thereagainst. From the movable contact 176 of the thermostatic stack switch 175 a conductor 177 leads to the terminal 139 of the control device 110.

In operation this control system functions as follows:

The control device 1 is shown diagrammatically and corresponds to the position shown in the various views of the device itself. In the position shown, the hot water tank 104 has cooled and the movable pairs of contacts 49 have closed against the fixed pairs of contacts 150 and 151, 152 and 153 to complete a control circuit for supplying fuel to the hot water heater. In this position (see Fig. 3) the valve 18 of the control device is open and operable to permit passage of fuel to the hot water heater 98 through conduit 97. A circuit is completed from the main power source 105 to conductors 106, 107 to the primary 116 of the transformer 117. With the transformer 117 energized a circuit is completed from the transformer secondary terminal 119 by way of conductor 120, closed contacts 122, 123 of the warp switch 121 and conductor 124 to the control device terminal 125. From the terminal 125 the circuit runs through conductor 158 to the contact 152 of the control device 1, through the closed switch contacts to the contact 153 and thence by conductor 159 to the terminal 137 of the control device 110. From the terminal 137 the circuit runs by conductor 136 to the coil 135 of the relay 133 and thence by conductor 138 to the terminal 139. From the terminal 139 the circuit runs by conductor 177 through the closed contacts 174, 176 of the stack switch 175 and by conductor 173 to contact 150 of the control device 1. From contact 150 the circuit is completed through the closed contacts 49

to contact 151 and thence by conductor 171 to terminal 129 of the control device 110. From the terminal 129 the circuit is completed by conductor 128 and the heater coil 127 to the terminal 126 on the transformer secondary 118. It is thus seen that a circuit is completed through the coil of the relay switch 133 to the closed contacts of the timer warp switch 121 and through the closed contacts of the stack switch 175. When the relay switch 133 is energized the movable contacts 132, 147 are closed against the fixed contacts 134, 148. When the contacts 147, 148 are closed the circuit is completed from the main power source by conductor 106 and conductor 146, the closed contacts 147, 148 and conductor 149 to the terminal 111 of the control device 110. From the control terminal 111 the circuit runs by conductor 112 to the motor of the fan 99 and by conductor 114 back to the main power source. It is then seen that upon energization of the relay switch 133 the circuit is completed through the fan motor for operation of the fan 99 and for operation of the pump 90 which supplies fuel through the open valve 18 and outlet 5 in the control device 1 to the hot water burner 98 through the conduit 97. Simultaneous with the establishment of the circuit for energization of the fan and pump a circuit is completed through the closed contacts 132, 134 of the relay switch from the terminal 130 of the transformer secondary 118. This circuit is a holding circuit which runs from the terminal 118 by conductor 131, closed contacts 132, 134, the relay coil 135, conductor 136 to the terminal 137 of the control device 110. From the terminal 137 the circuit runs by conductor 159, contacts 152, 153, conductor 158, terminal 125, conductor 124, the closed contacts 123, 122 of the warp switch 121 and conductor 120 back to the terminal 119 of the transformer secondary 118. Since the initial energizing circuit for the relay switch 133 was established through the heater 127 for the warp switch 121 and the stack switch 175, it will be obvious that unless the initial circuit is opened within a short predetermined time the heater 127 will cause the contacts 122, 123 of the warp switch 121 to open thus deenergizing the relay 133 and stopping the fan and pump. The stack switch 175 has a thermostatic element positioned in the stack from the hot water burner and upon occurrence of flame in the hot water burner the thermostatic element will cause the contact 176 to move away from the contact 174 in the stack switch 175 thus breaking the circuit through the heater coil 127 of the warp switch 121 and deenergizing the initial circuit for energizing the relay 133. The burner 98 will then continue to heat until the domestic hot water supply is heated to the desired temperature at which time the thermostatic power element bulb 76 will have been heated sufficiently to transmit power to the control device 1 and cause the levers to move thus closing the valve 18 and opening the valve 17 and opening and closing the corresponding switch contacts. As was described heretofore the lost motion in the opening of the valve 17 is such that the circuit through the switch contacts across the terminals 150 and 151, 152 and 153 in the control device 1 are broken and the pump 90 de-energized prior to the opening of the valve 17 so that fuel will not be ejected through the valve 17 should the household burner 96 not require heat. With the valve 17 open and the switch contacts 154 and 155, 156 and 157 closed which occurs sequentially to the opening of contacts 150 and 151, 152 and 153 the control device 1 is now in position to supply fuel to the household burner 96 as required. As described before, the transformer 117 of the control device 110 is energized at all times from the main power source 105. With the switch contacts moved as described in the control device 1 a new circuit will now be completed from the terminal 119 of the transformer secondary 118

through the contacts 122, 123 of the warp switch 121 and by terminal 125 and conductor 158 to the contact 152 of the control device 1. From the contact 152 the circuit runs by the jumper 169 to and through the closed contacts 156, 157 and by conductor 168 to the fixed contact 167 of the room thermostat 162. If the room thermostat 162 is demanding heat and the contact 164 is closed against the contact 167 the circuit will be completed through the bimetal 163 and terminal 161, by conductor 160 to contact 153 of the control device 1. From the contact 153 conductors 159, 136 run to the coil 135 of the relay switch 133. From the relay coil 153 a circuit runs by conductor 140 to the closed contacts 142, 143 of the household burner stack switch 144 and by conductors 141, 172 to the contact 154 of the control device 1. From the contact 154 the circuit runs through contact 155, the conductor 166 to the compensating heater 165 on the room thermostat 162. A branch circuit runs from a contact 155 by jumper 170 to contact 151 which is connected by conductor 171 to a terminal 129 on the control device 110. The circuit is then completed from the terminal 129 by conductor 128 and the warp switch heater 127 to the terminal 126 on the transformer secondary 118. From this circuit it is seen that the circuit is completed through the room thermostat 162 as heat is called for and through the closed contacts of the stack switch 144, the relay coil 135, and through the contacts of the warp switch heater 121. When the relay switch 133 is energized and the contacts 147 and 148 closed, the circuit is completed as previously described through the fan motor for energizing the fan 99 and the pump 90 for supplying of fuel to the household burner through the open valve 17 and outlet 4 by conduit 95. Upon closing of the contacts 132, 134 of the relay switch 133, a circuit is established from the transformer secondary terminal 130 through the closed contacts 132, 134, the relay coil 135, conductors 136, 159, 160 to the room thermostat 162. From the room thermostat 162 the circuit runs by conductor 168, contacts 156, 157, jumper 169, conductors 158, 124, the closed contacts 122, 123 of the warp switch 121 and conductor 120 leading back to the transformer secondary terminal 119. As was described before, the initial circuit for the energization of the relay coil 135 runs through the closed contacts of both the stack switch 144 and the warp switch 121, and the warp switch heater 127. Since the holding circuit for the relay coil 135 through the closed contacts 132, 134 also runs through the closed contacts of the warp switch 121 it is necessary that the initial relay coil energizing circuit be broken within a short predetermined time or the opening of the warp switch contacts 122, 123 will de-energize both the initial and the holding circuits of the relay 133 and will stop the fan and pump. As was described for the control system of the water heater, the stack switch 144 performs a similar function to the stack switch 175 in that it is responsive to the occurrence of flame in the household burner 96. Upon occurrence of flame in the household burner 96 the stack switch contacts 142, 143 will open thus de-energizing the circuit through the warp switch heater 127 and leaving the holding circuit to the relay coil 135 in control of the operation of the fan and pump. As was described heretofore the holding circuit for the relay coil 135 includes the switch contacts of the control device 1 and the contacts 164, 167 of the thermostat 162 so that if the room thermostat should be satisfied the relay coil will be de-energized or if the household water supply should cool a sufficient amount that the switches of the control device 1 are moved the household heating circuit would similarly be broken. It should be noted that the check valves 28, 29 and the bleed outlet 25 as described heretofore permit the bleeding of fuel back to the sump 92 by a conduit 93^a. This bleed

9

arrangement together with the delayed opening of the valve as previously described prevents fuel from being discharged into the household burner 96 when the control device 1 switches over from the water heating burner 98 if the room thermostat 162 is not calling for heat and causes fuel pressure created by the inertia of the pump 90 to be relieved through the bleed outlet 25 back to the sump 92.

From the description heretofore given it is seen that there is provided a pair of circuit networks for controlling a two burner system whereby the demand of heat by the domestic water heating system will switch the control device 1 to a position for supplying fuel to the water heating burner 98 and switch to a control system for the burner 98. Similarly, when the water supply is adequately heated the control device will switch fuel back to the house heating burner 96 and place is control system in control.

This application is a division of my co-pending application, Serial No. 26,429, filed May 11, 1948, now Patent No. 2,638,121, granted May 12, 1953, for Control Device.

Having thus described the invention, what is claimed and is desired to be secured by Letters Patent of the United States is:

1. A control system comprising a house heating liquid fuel burner and a domestic water heating liquid fuel burner, a pair of valves controlling flow of fuel to said burners, thermostatic means responsive to the heat output of said domestic water heating burner and operable to control the opening and closing of said valves thereby to direct the flow of fuel to the respective burners in accordance with the requirement of the domestic water supply, electrical means for controlling the supply of fuel to said valves, a first electric circuit including means responsive to the heat output of said house burner and operable to control energization of said electric controlling means, a second electric circuit including means responsive to the occurrence of combustion in said domestic water heating burner and operable to control energization of said electric controlling means, an electric switch operable to switch control of said electric controlling means from said first to said second circuit, and said thermostatic valve operating means being operable to actuate said switch in sequential synchronization with the opening and closing of said valves.

10

2. A control system comprising a house heating liquid fuel burner and a domestic water heating burner, a pair of valves controlling flow of fuel to said burners, thermostatic operating means responsive to the heat output of said domestic water heating burner and operable to control the opening and closing of said valves, said thermostatic means being operable to open one of said valves in the same motion that the other valve is closed thereby directing the flow of fuel to the respective burners in accordance with the heat requirements of the domestic hot water supply, an electrically driven pump for supplying fuel to said valves, a relay switch for controlling said pump, a first circuit network for controlling said relay switch; said first circuit network including a room thermostat for control, an energizing circuit and a holding circuit for the coil of said relay switch; said energizing circuit including a stack switch responsive to the occurrence of combustion in said house heating burner, a thermal warp switch operable as a timer to break said energizing circuit after a predetermined time if combustion fails to occur in said house heating burner; said holding circuit including said room thermostat; a second circuit network for controlling said relay switch; said second network including a relay energizing circuit and a relay holding circuit; said last-named energizing circuit including a stack switch responsive to the occurrence of combustion in said domestic water heating burner and including said warp switch timer; a switch having contacts in both of said networks and operable to determine which of said networks controls said relay switch, and said thermostatic operating means being operable to actuate said last-named switch in sequential synchronization with the opening and closing of said valves.

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