United States Patent

Genbauffe

[15] **3,692,239**

[45] **Sept. 19, 1972**

[54] **CONTROL SYSTEM FOR A DOUBLE BURNER OVEN OR THE LIKE AND IMPROVED PARTS AND METHOD FOR THE SAME OR THE LIKE**

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[73] Assignee: **Robertshaw Controls Company**, Richmond, Va.

[22] Filed: **Feb. 11, 1971**

[21] Appl. No.: **114,691**

Related U.S. Application Data

[63] Continuation of Ser. No. 670,648, Sept. 26, 1969, abandoned.

[52] **U.S. Cl.** .....**236/15 A**, 236/60 D

[51] **Int. Cl.**.....**F23n 1/00**, G05d 23/02

[58] **Field of Search**.....236/15 A, 68 A, 99; 126/273, 126/39

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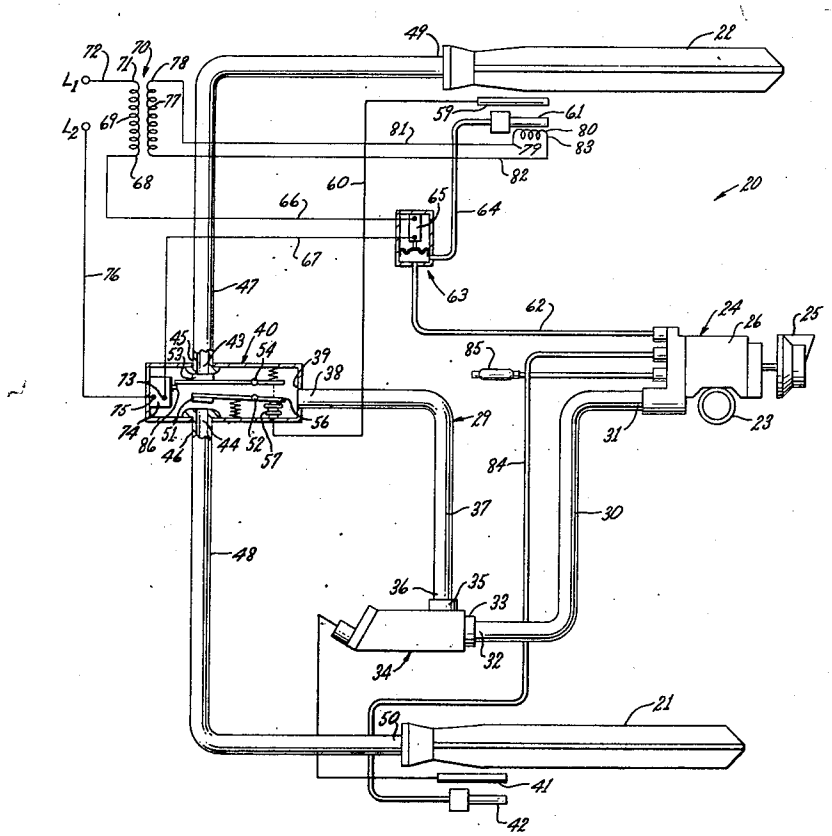
Primary Examiner—William E. Wayner

Attorney—Auzville Jackson, Jr., Robert L. Marben and Candor and Candor

[57] **ABSTRACT**

This disclosure relates to a control system for a bake burner and a broil burner of a domestic oven or the like wherein a control device is adapted to interconnect a source of fuel to a conduit means leading to the bake burner and the broil burner, the conduit means having a diverter valve therein intermediate the control device and the burners with the diverter valve being so constructed and arranged that the same will direct the fuel issuing thereto from the control device only to the bake burner when the selector means of the control device is set for a baking operation and will only direct the flow of fuel issuing thereto to the broil burner when the selector means of the control device is set for a broiling operation. In addition, a safety valve is disposed in the conduit means either intermediate the control device and the diverter valve means or intermediate the diverter valve means and the bake burner to be only opened when a certain flame means exists at a bake pilot burner means for the bake burner, the control device thermostatically controlling the operation of the bake pilot burner means.

12 Claims, 33 Drawing Figures



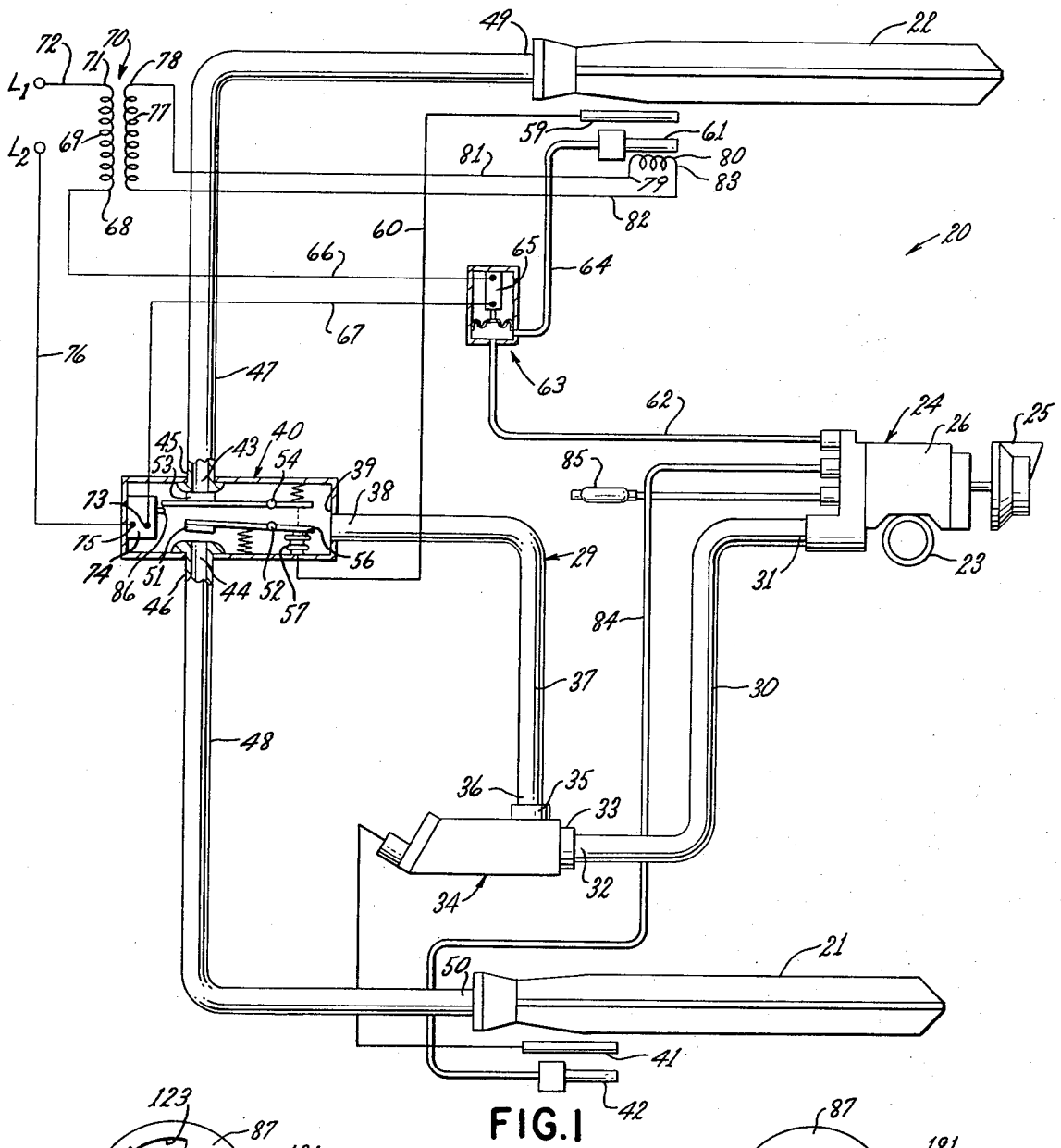


FIG. 1

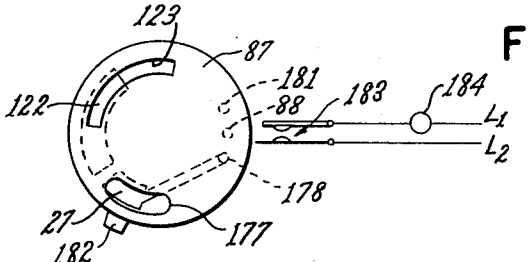


FIG. 6A

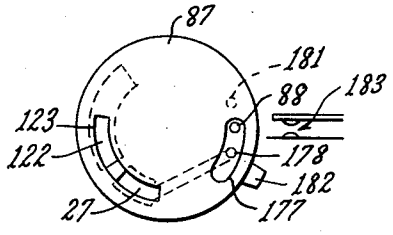


FIG. 7A

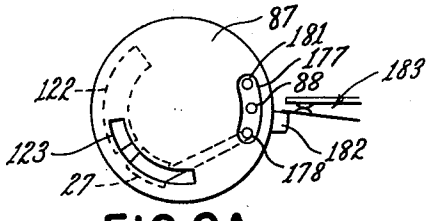


FIG. 8A

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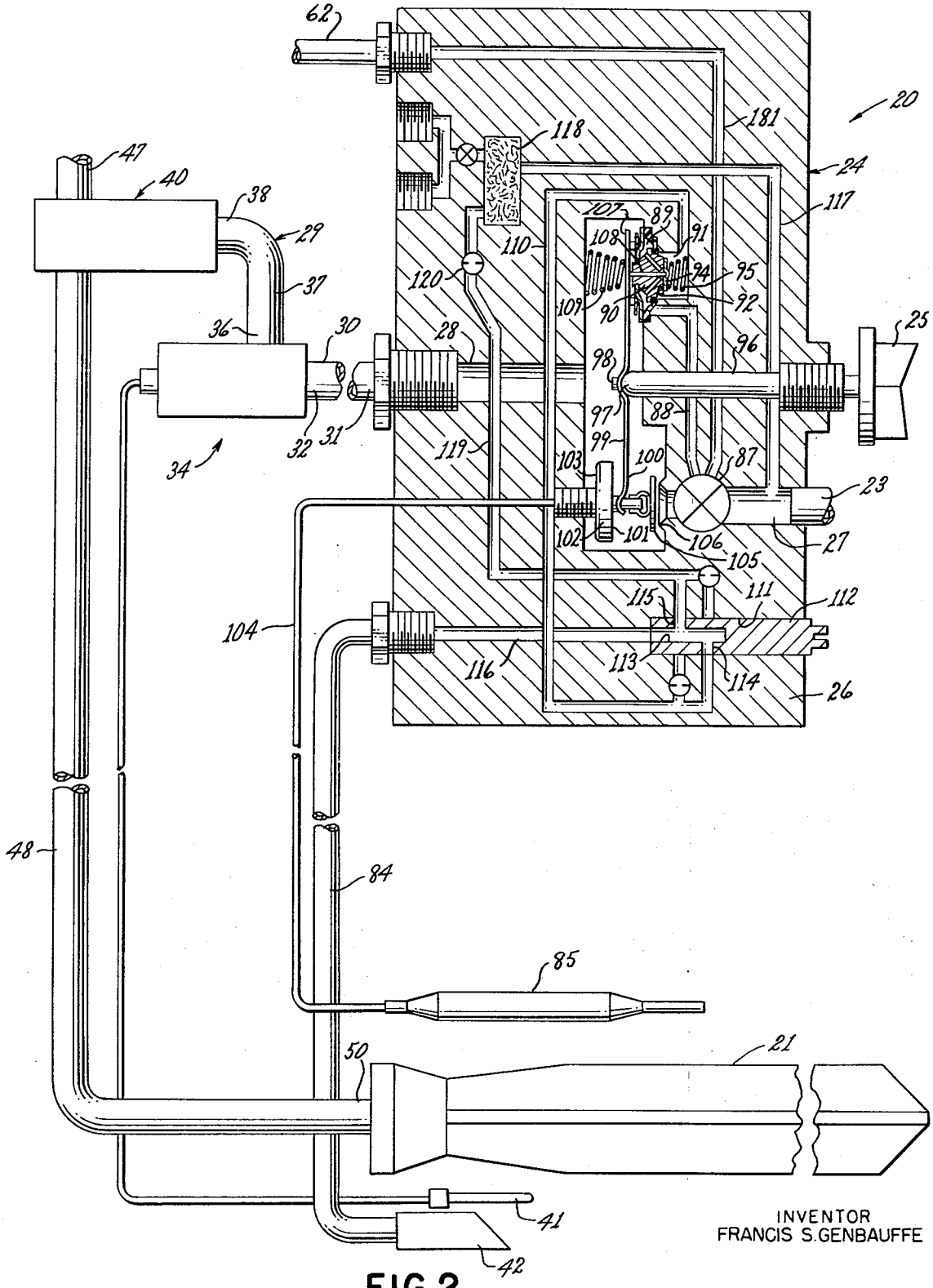


FIG.2

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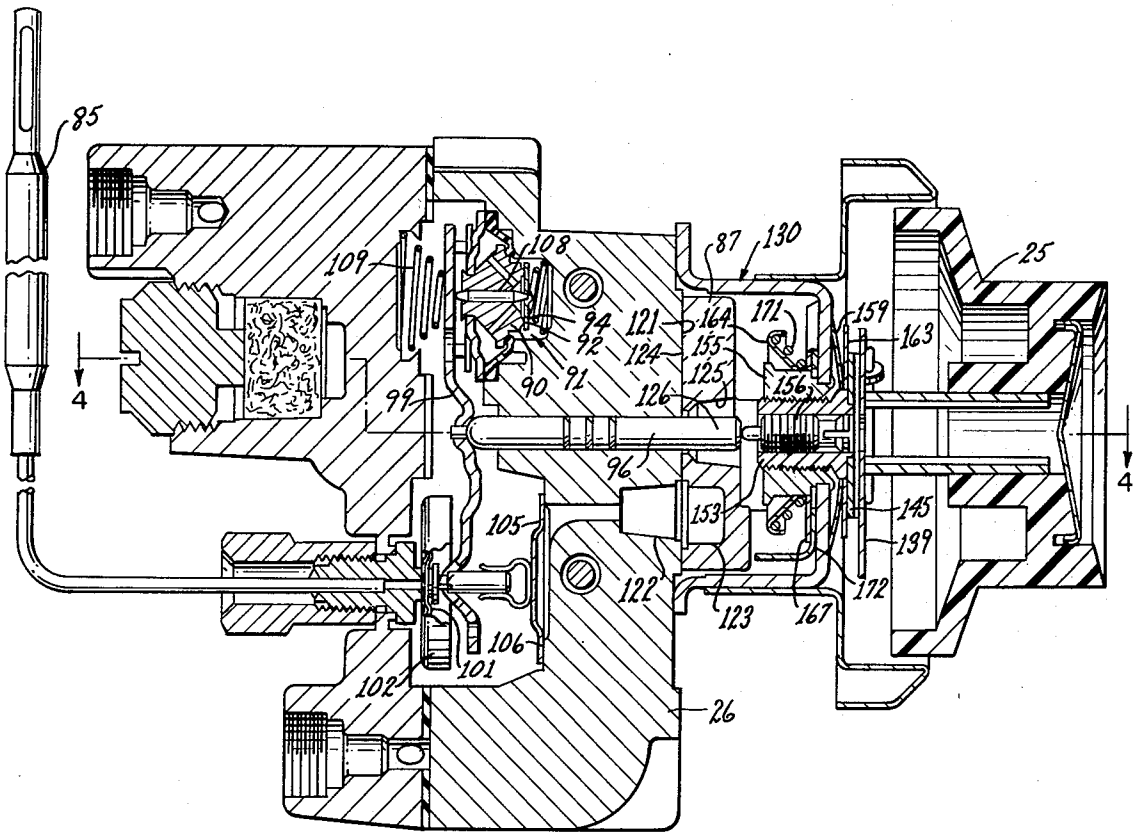


FIG.3

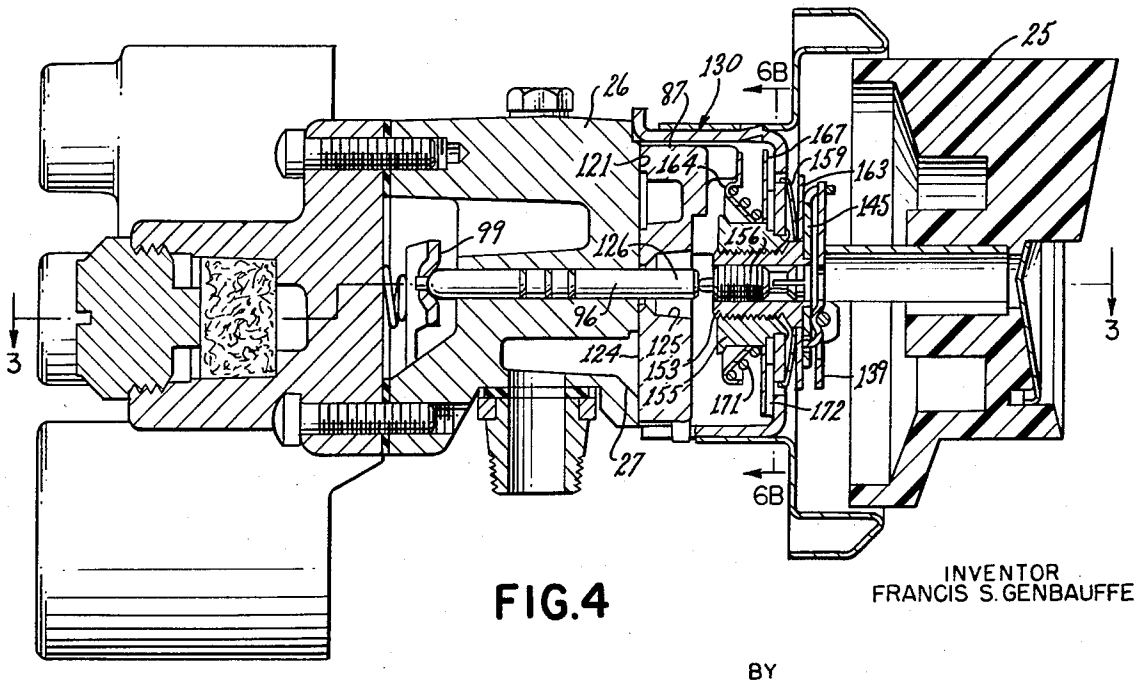


FIG.4

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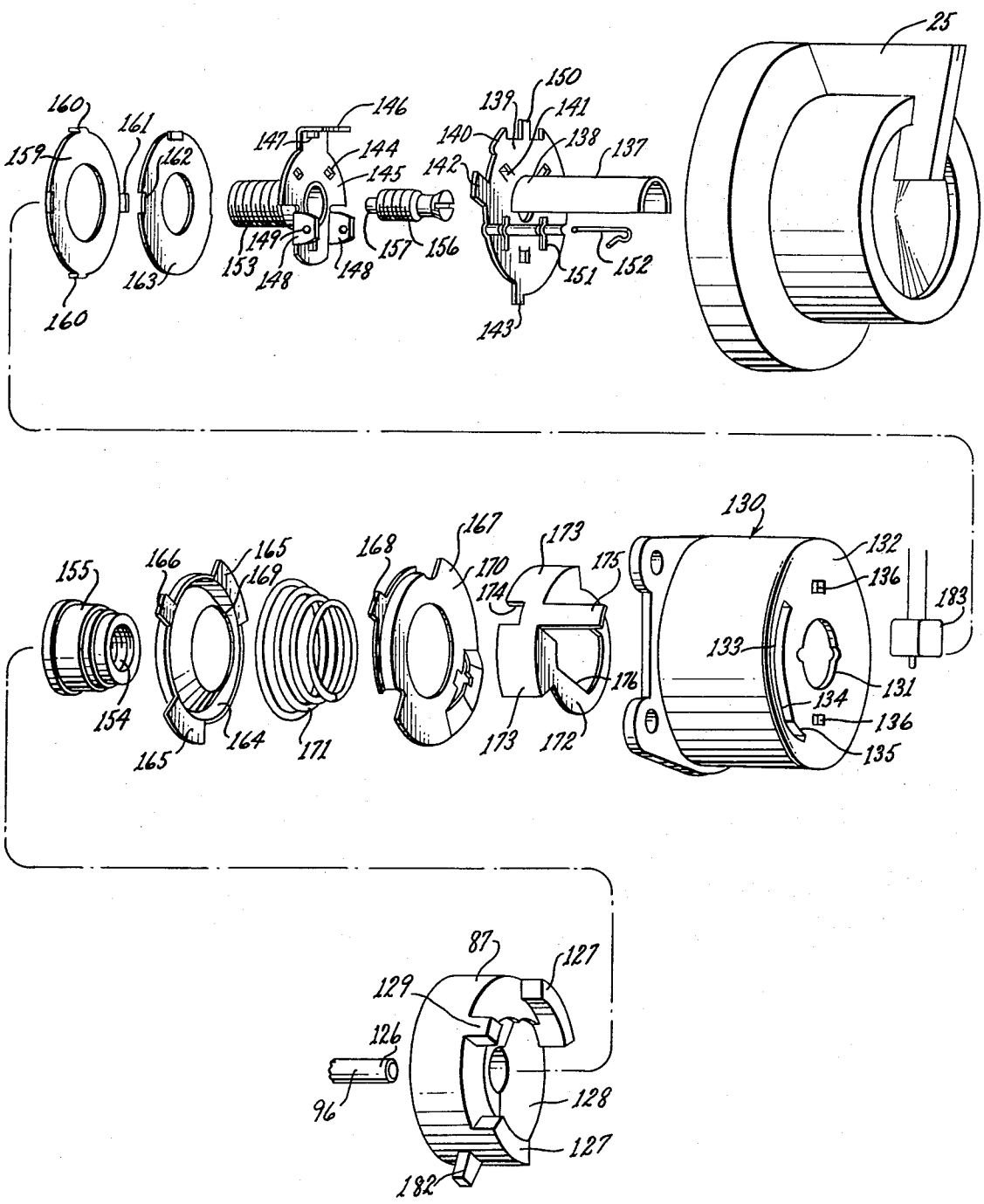


FIG.5

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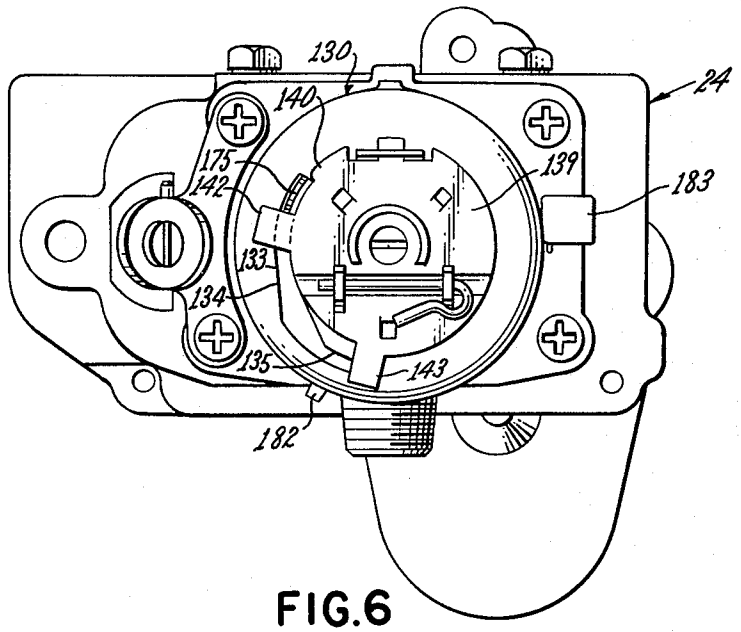


FIG.6

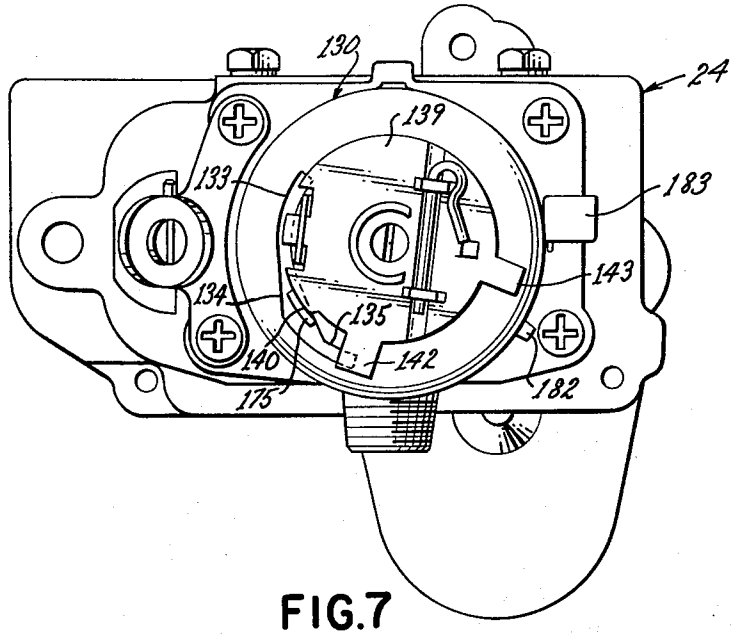


FIG.7

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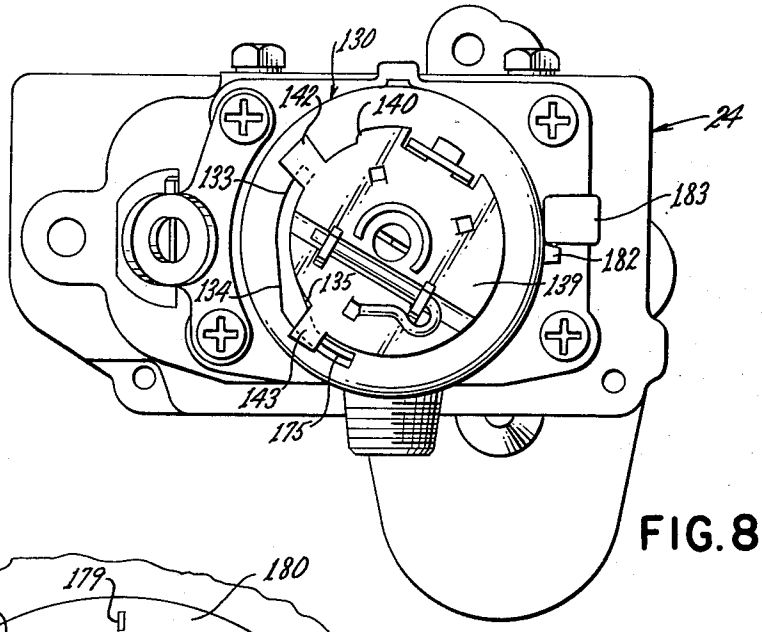


FIG. 8

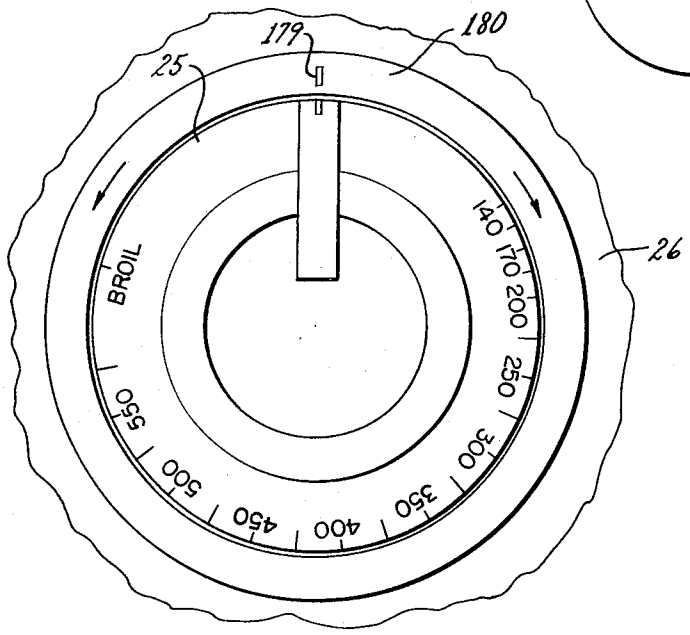


FIG. 9

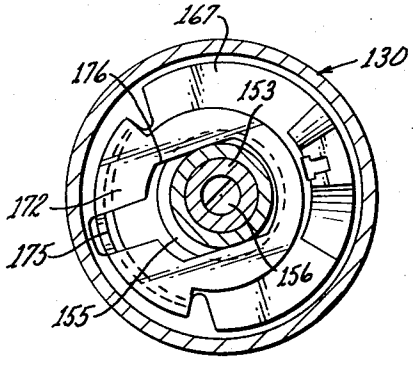


FIG. 7B

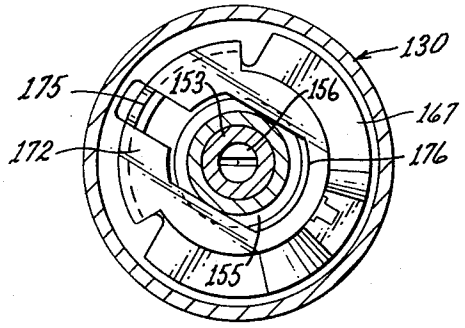


FIG. 6B

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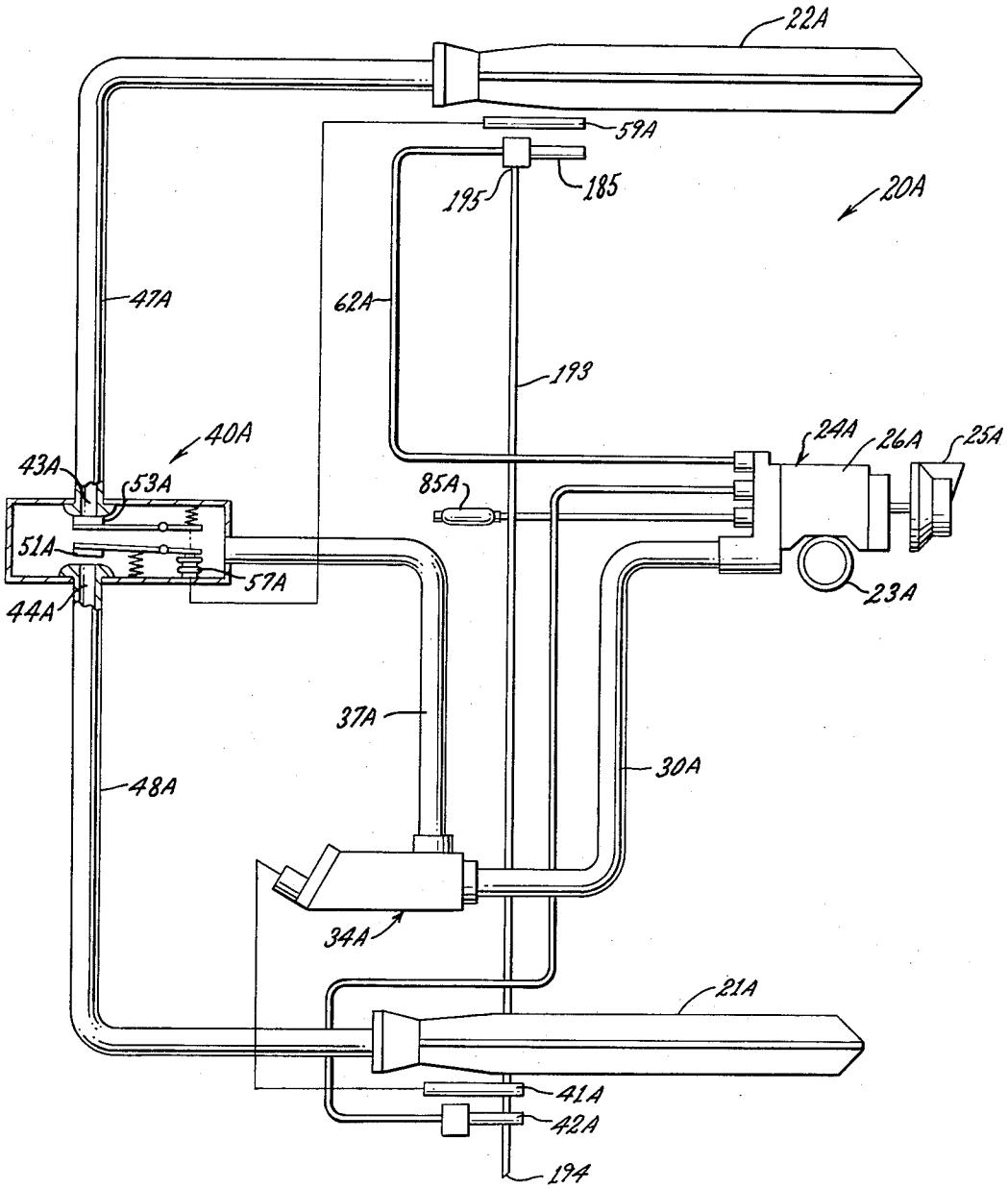


FIG.10

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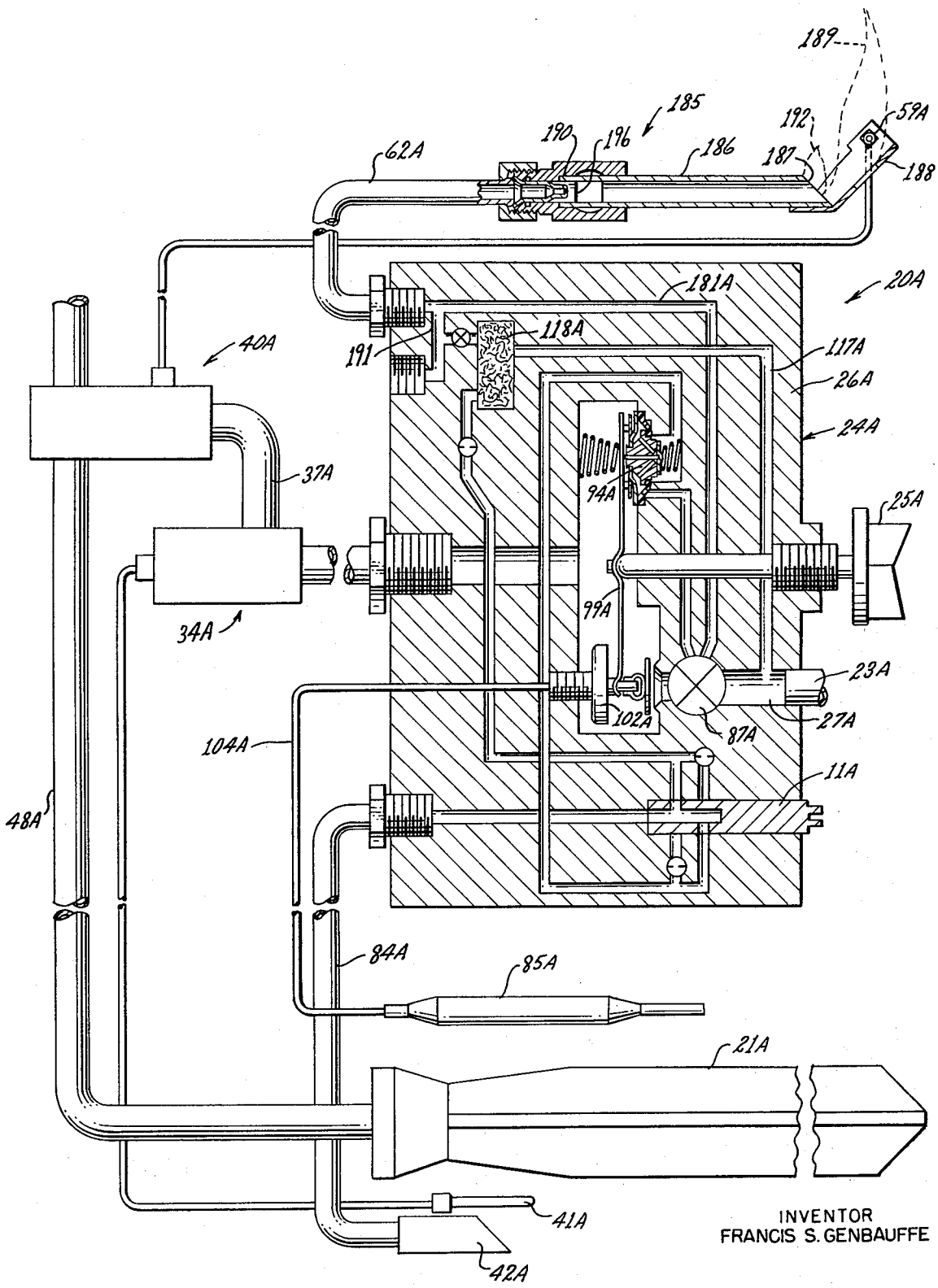


FIG.11

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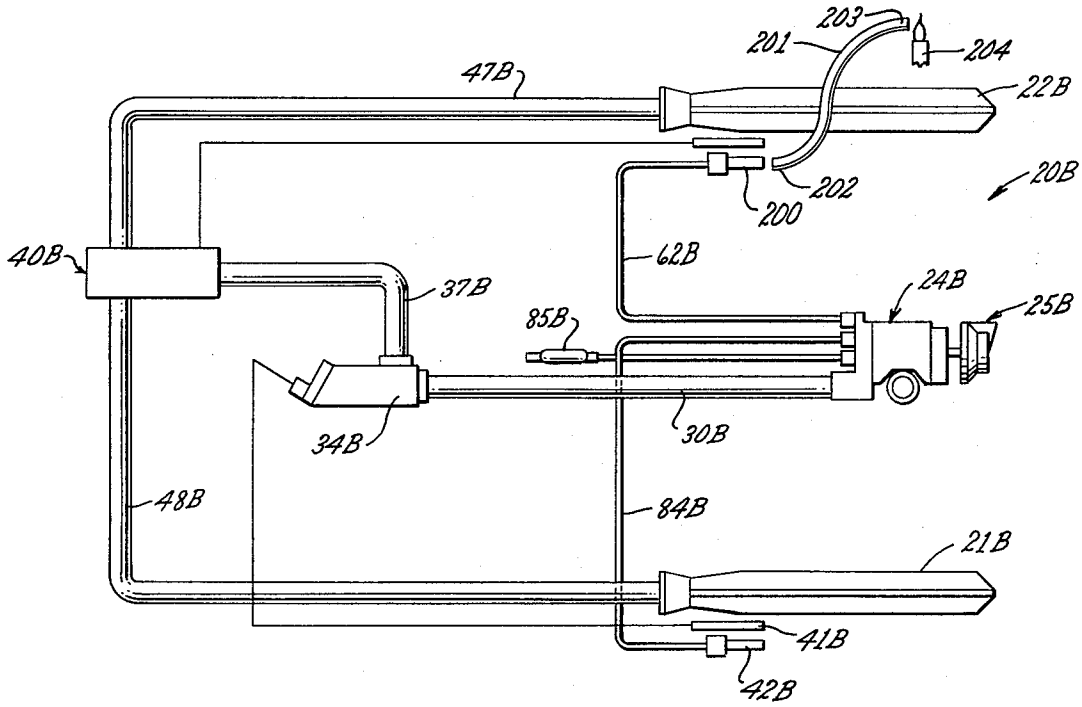


FIG.12

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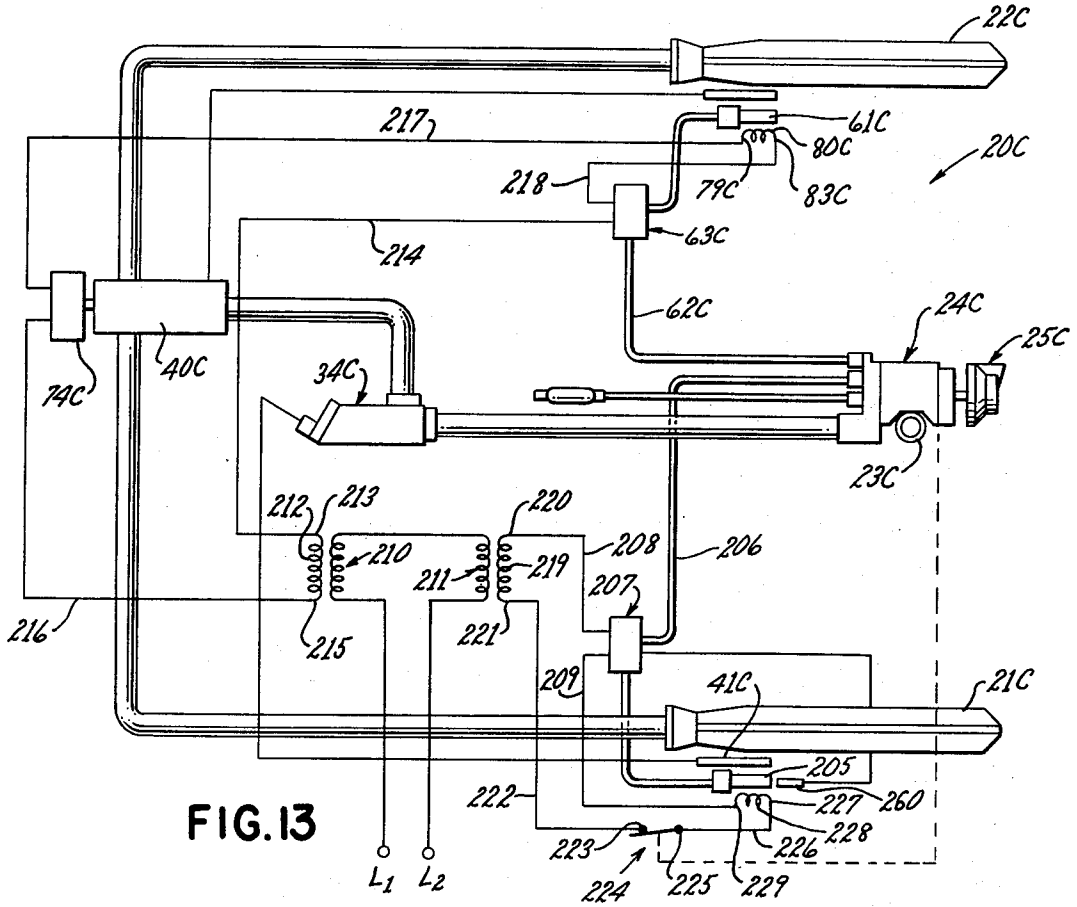


FIG. 13

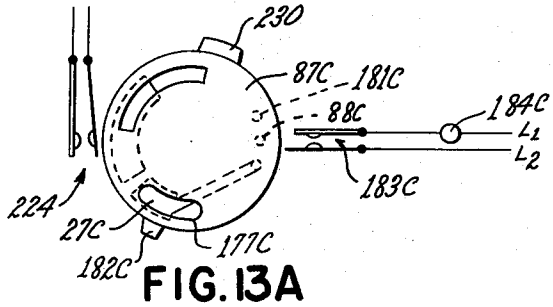


FIG. 13A

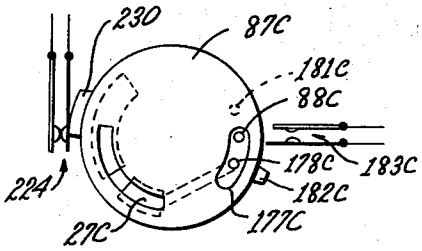


FIG. 13B

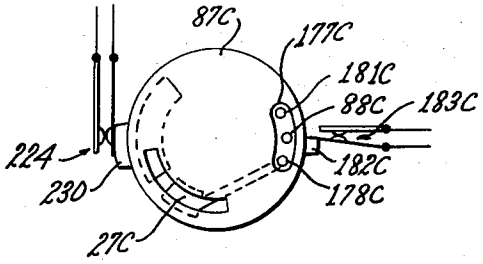


FIG. 13C

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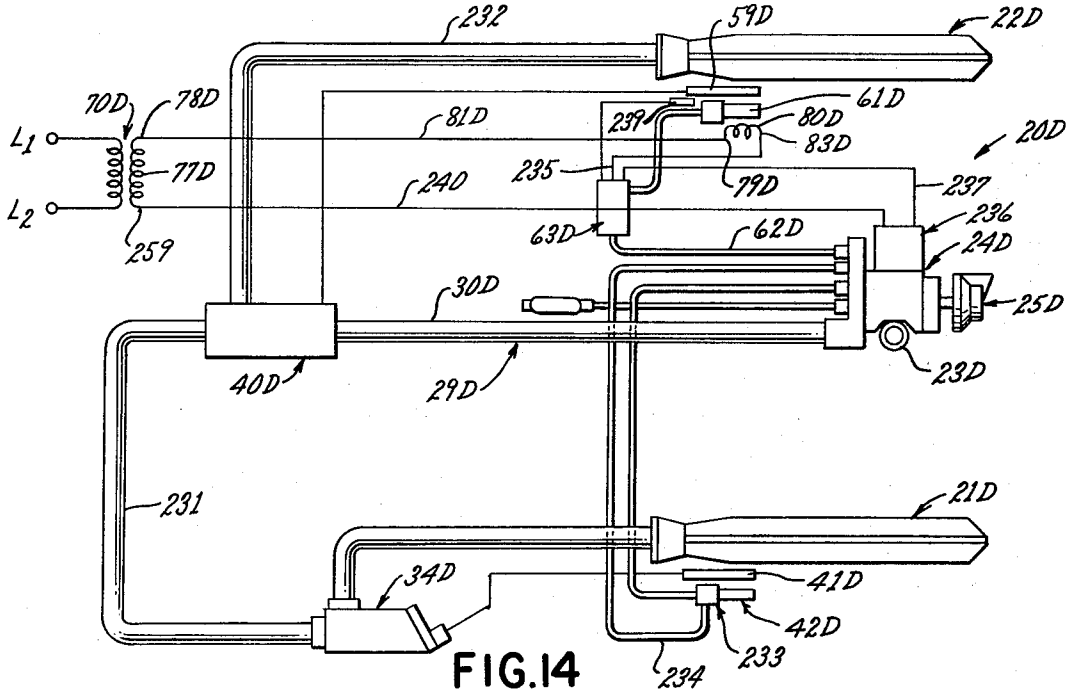


FIG.14

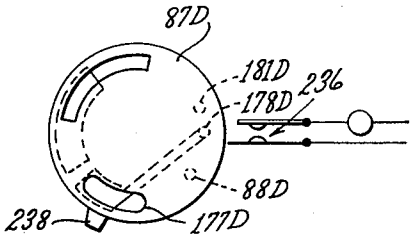


FIG.14A

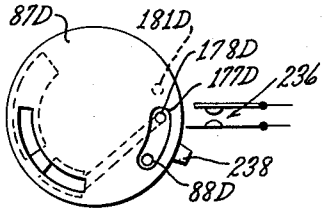


FIG.14B

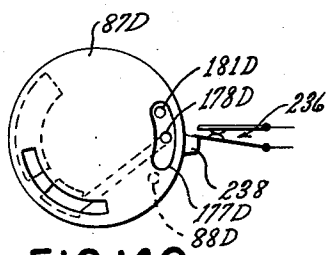


FIG.14C

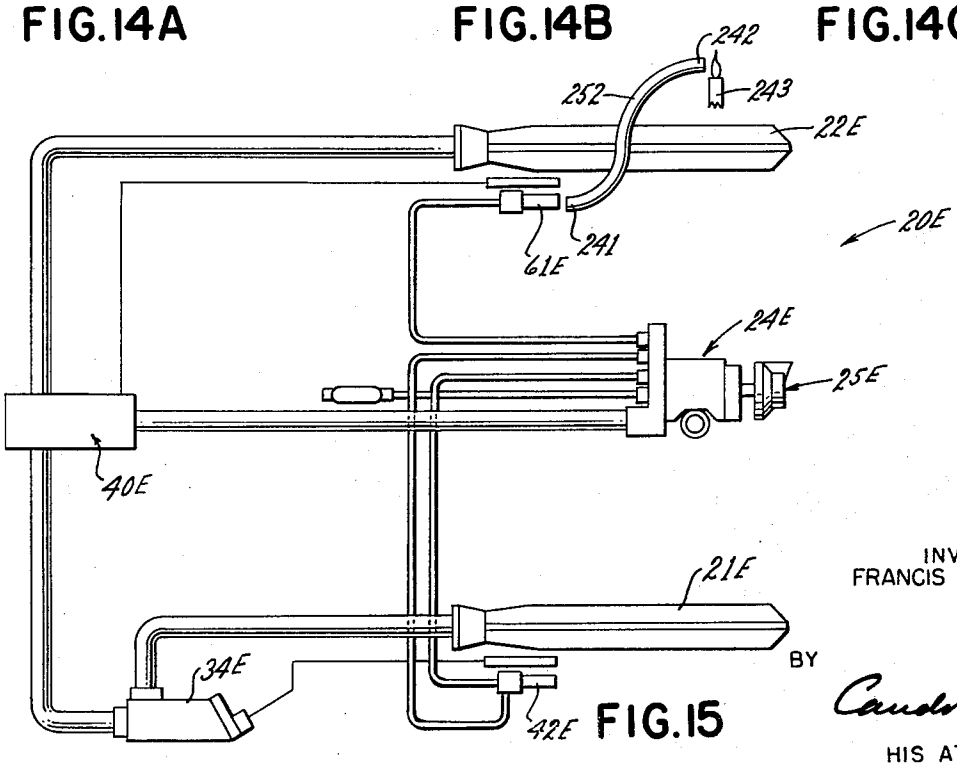


FIG.15

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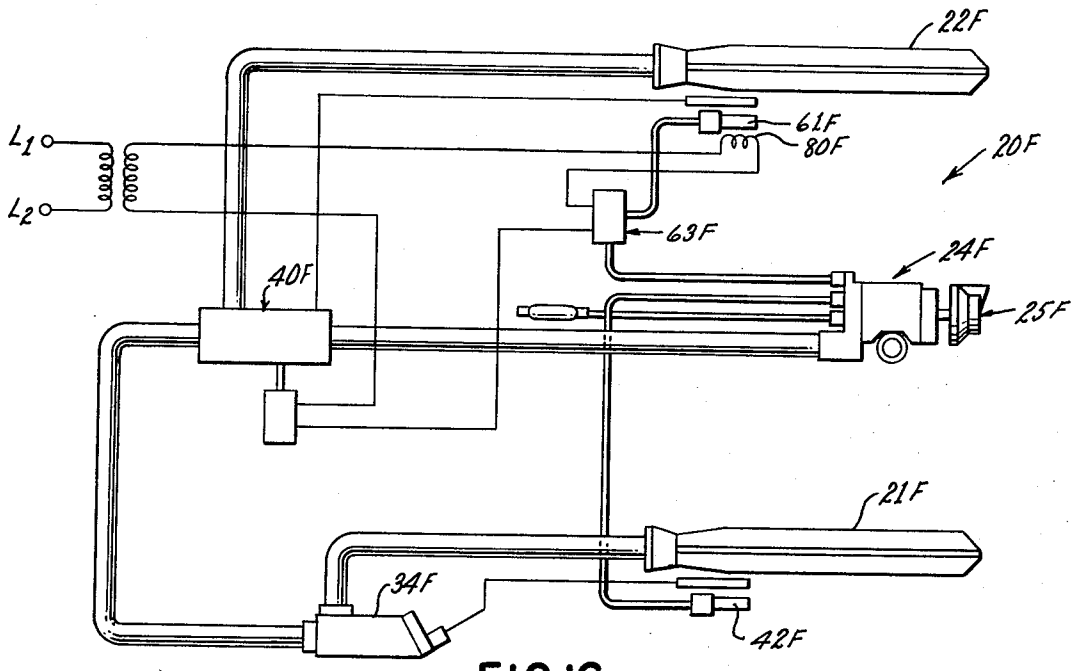


FIG.16

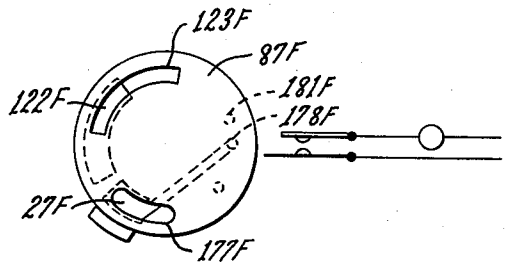


FIG.16A

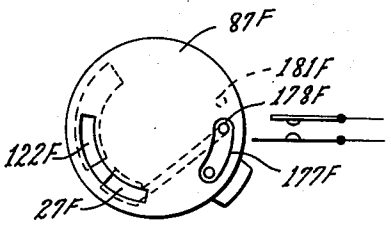


FIG.16B

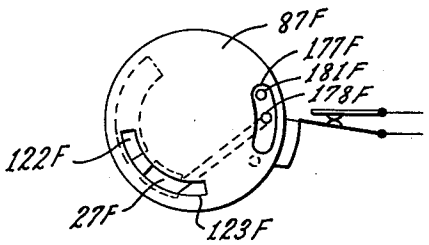


FIG.16C

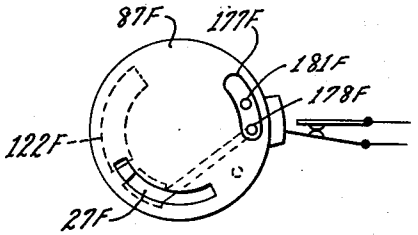


FIG.16D

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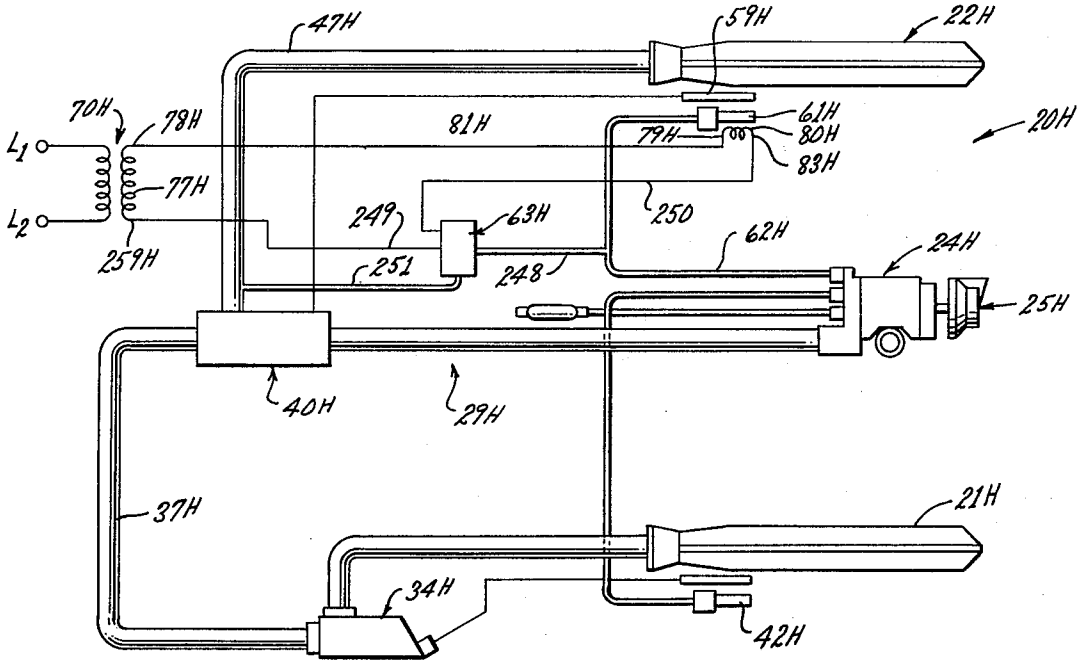


FIG.17

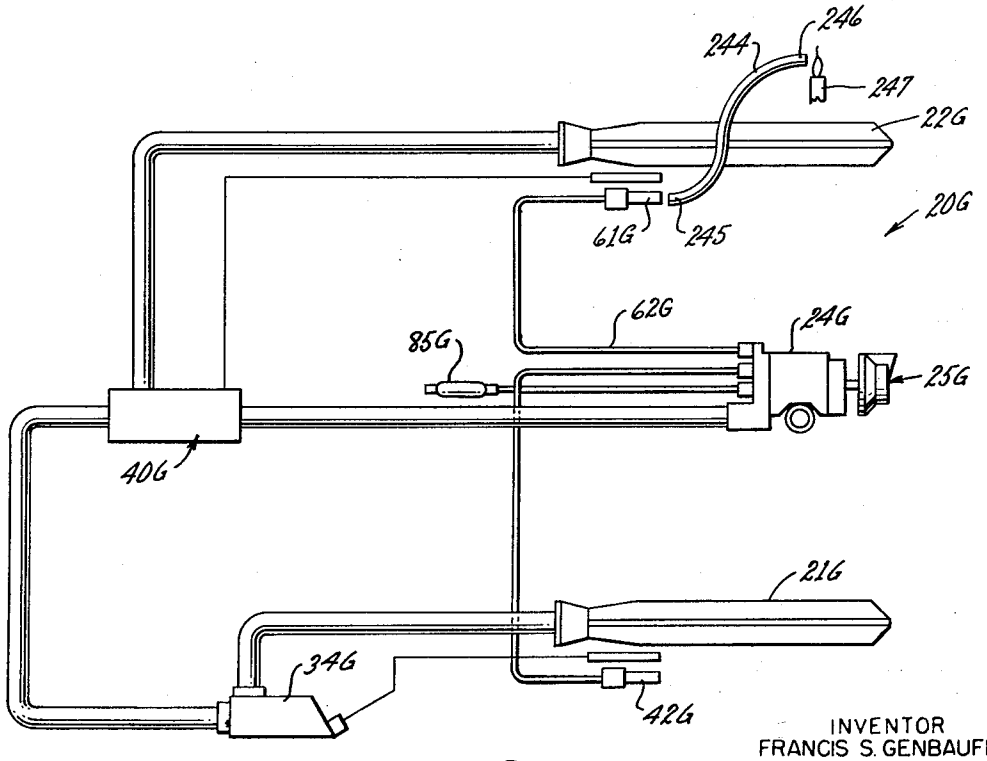


FIG.18

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CONTROL SYSTEM FOR A DOUBLE BURNER OVEN OR THE LIKE AND IMPROVED PARTS AND METHOD FOR THE SAME OR THE LIKE

This application is a continuation of application Ser. No. 670,648, filed Sept. 26, 1969, now abandoned.

This invention relates to an improved control system for a double-burner oven arrangement and to improved parts and to improved methods for such a control system or the like.

While control devices have been provided for effectively directing a flow of fuel to a bake burner or to a broil burner of a single oven cooking cavity or chamber depending upon the position of a selector knob of the control device, this invention provides an improved control system for such bake and broil burners wherein a diverter valve is disposed in a conduit means leading from a control device to the bake and broil burners to be operated in such a manner that when the control device is set for a baking operation, the diverter valve will direct all fuel issuing into the conduit means from the control device only to the bake burner and when the selector means of the control device is set for a broiling operation, the diverter valve means will direct all of the flow of the fuel issuing into the conduit means from the control device only to the broil burner.

In addition, this invention provides a control system wherein the broil burner can be operated by the control device of this invention at any selected temperature well below the normal broiling temperature for a broiling operation or the like.

Accordingly, it is an object of this invention to provide an improved fuel control system having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide improved parts for such a control system or the like.

A further object of this invention is to provide an improved method of operating such a control system or the like.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIG. 1 is a schematic view illustrating the improved control system of this invention.

FIG. 2 is an enlarged schematic view of part of the control system illustrated in FIG. 1 and illustrates schematically the control device utilized with the system of FIG. 1.

FIG. 3 is a cross-sectional view of the control device of the system of FIG. 1 and is taken on line 3—3 OF FIG. 4.

FIG. 4 is a cross-sectional view of the control device of FIG. 3 and is taken on line 4—4 thereof.

FIG. 5 is an exploded perspective view of various parts of the control device of FIGS. 3 and 4.

FIG. 6 is a front view of the control device of FIGS. 3 and 4 with the selector knob and cooperating means removed to illustrate the control device in its off position.

FIG. 6A is a schematic view illustrating the disc valve member of the control device of FIGS. 3 and 4 when disposed in the off position of FIG. 6.

FIG. 6B is a cross-sectional view taken on line 6B—6B of FIG. 4 to illustrate the clutching member of the control device when the control device is set in its off position of FIG. 6.

FIG. 7 is a view similar to FIG. 6 and illustrates the control device in a baking position thereof.

FIG. 7A is a view similar to FIG. 6A and illustrates the disc valve set in the baking position of FIG. 7.

FIG. 7B is a view similar to FIG. 6B and illustrates the clutching members of the control device when set in the baking position of FIG. 7.

FIG. 8 is a view similar to FIG. 6 and illustrates the control device of FIGS. 3 and 4 set in its broiling position.

FIG. 8A is a view similar to 6A and illustrates the disc valve member set in the broiling position of FIG. 8.

FIG. 9 is an enlarged front view of the selector knob means for the control device of FIGS. 3 and 4.

FIG. 10 is a schematic view of another control system of this invention.

FIG. 11 is a view similar to FIG. 2 and illustrates certain parts of the control system of FIG. 10.

FIG. 12 is a schematic view of another control system of this invention.

FIG. 13 is a schematic view of still another control system of this invention.

FIG. 13A is a schematic view illustrating the disc valve member of the control device of FIG. 13 when the control device is disposed in its off position.

FIG. 13B is a view similar to FIG. 13A and illustrates the system of FIG. 13 in a baking position thereof.

FIG. 13C is a view similar to FIG. 13A and illustrates the disc valve member of the control device set in its broil position.

FIG. 14 is a schematic view of another control system of this invention.

FIG. 14A is a view similar to FIG. 6A and illustrates the disc valve member of the control device of the system of FIG. 14 set in its off position.

FIG. 14B is a view similar to FIG. 14A and illustrates the control device set in its bake position.

FIG. 14C is a view similar to FIG. 14A and illustrates the system of FIG. 14 when set in its broil position.

FIG. 15 is a schematic view of a modification of the system of FIG. 14.

FIG. 16 is a schematic view of still another control system of this invention.

FIG. 16A is a view similar to FIG. 6A and illustrates the disc valve member of the control device of FIG. 16 set in its off position.

FIG. 16B is a view similar to FIG. 16A and illustrates the control device of the system of FIG. 16 set in its bake position.

FIG. 16C is a view similar to FIG. 16A and illustrates the disc valve member of the control device of the system of FIG. 16 set in its broil position.

FIG. 16D is a view similar to FIG. 16A and illustrates the flame adjusting operation of the system of FIG. 16 when set in its broil position.

FIG. 17 is a schematic view of another control system of this invention.

FIG. 18 is a schematic view of a modification of the control system of FIG. 17.

While the various features of this invention are hereinafter described and illustrated as being particularly adaptable to provide a control system for a double burner domestic oven or the like, it is to be understood

that the various features of this invention can be utilized singly or in any combination thereof to provide means for operating other control systems or the like.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the same are merely utilized to illustrate some of the wide variety of uses of this invention.

Referring now to FIGS. 1 and 2, an improved control system of this invention is generally indicated by the reference numeral 20 and includes a bake burner 21 and a broil burner 22 adapted to be disposed in a domestic cooking apparatus or the like to effect the cooking operation of a single cooking cavity or chamber by having a source of fuel 23 selectively directed thereto by a control device 24 of this invention in a manner hereinafter described. However, the control system 20 is so constructed and arranged that a selector means 25 of the control device 24 can be set to thermostatically control the operation of the broil burner 22 at any desired temperature setting well below the normal temperature setting for a broiling operation as will be apparent hereinafter.

As illustrated in FIGS. 1 and 2, the control device 24 includes a housing 26 having an inlet means 27 adapted to be fluidly interconnected to the fuel supply manifold 23 in any suitable manner and has an outlet means 28 interconnected to a conduit means 29 leading to the bake burner 21 and broil burner 22.

In particular, the conduit means 29 includes a first conduit 30 having one end 31 fluidly interconnected to the outlet 28 of the control device 24 and the other end 32 interconnected to an inlet 33 of a safety valve means 34. An outlet means 35 of the safety valve means 34 is interconnected to one end 36 of another conduit 37 of the conduit means 29 which has its other end 38 interconnected to an inlet 39 of a diverter valve means 40 of this invention.

The safety valve means 34 can be of the type disclosed in U.S. Pat. to Branson et al., No. 3,233,830, wherein the valve means 34 prevents fluid communication between its inlet means 33 and its outlet means 35 when a flame detector means 41 senses that a certain flame means does not exist at a bake pilot burner means 42 for the bake burner 21. For example, the bake pilot burner means 42 can be of the type disclosed in the aforementioned U.S. Pat. to Branson et al. or of the type disclosed in the U.S. Pat. to Riehl, No. 3,308,871, wherein the same is adapted to be continuously supplied a small amount of fuel from the control device 24 to maintain a continuously burning small standby flame which is not sensed by the detector means 41. However, when the bake pilot burner means 42 is additionally supplied fuel by the control device 24 in a manner hereinafter described, the bake pilot burner means 42 creates a large heater flame that is detected by the detector means 41 to cause the safety valve 34 to open and remain open as long as such heater flame exists at the bake pilot burner means 42 to fluidly interconnect the conduit 30 with the conduit 37.

The diverter valve means 40 has a pair of outlets 43 and 44 respectively interconnected to ends 45 and 46 of conduits 47 and 48 forming part of the previously described conduit means 29 and respectively having the other ends 49 and 50 thereof fluidly interconnected to the broil burner 22 and bake burner 21.

The diverter valve means 40 is so constructed and arranged that a first valve member 51 is pivotally mounted at 52 and is normally biased to an open position thereof to maintain the outlet means 44 normally opened. A second valve member 53 is pivotally mounted at 54 and is normally biased to be in a closed position to normally close the outlet means 43.

A movable wall 56 of a power element 57 for the diverter valve 40 is so constructed and arranged that when the same is in a collapsed condition as illustrated in FIG. 1, the same permits the valve member 51 to be in an open position and the valve member 53 to be in a closed position. However, when the power element 57 is expanded for a broiling operation in a manner hereinafter described, the movable wall 56 thereof moves upwardly to first cause closing of the valve member 51 against the outlet means 44 before the movable wall 56 will cause opening movement of the valve member 53 away from the outlet means 43 for a purpose hereinafter described.

The interior of the power element 57 is interconnected to a bulb 59 by a capillary tube 60 so that when the bulb 59 senses that no certain flame means exists at a broil pilot burner means 61 for the broil burner 22, the power element 57 collapses and has the movable wall 56 thereof moved downwardly in FIG. 1 a sufficient distance so that the spring means of the diverter valve means 40 will cause the valve member 51 to completely close the outlet means 43 of the diverter valve 40 and fully open the outlet means 44 thereof. However, when the certain flame means exists at the broil pilot burner means 61, the bulb 59 causes the power element 57 to expand in such a manner that movable wall 56 thereof moves upwardly in opposition to the force of the spring means a distance sufficient to first cause the valve member 51 to fully close the outlet means 44 of the diverter valve means 40 and, thereafter, cause the valve member 53 to move downwardly and fully open the outlet means 43.

The control device 24 of this invention is so constructed and arranged in a manner hereinafter set forth, that when the selector means 25 is set in a position for a broiling operation, the control device 24 directs fuel through a conduit means 62 to a conventional pressure sensing switch means 63 that will permit the fuel to pass therethrough to a conduit means 64 leading to the broil pilot burner means 61. However, the pressure sensing switch means 63 is so constructed and arranged that when the fuel is directed thereto by the control device 24 through the conduit means 62 in a manner hereinafter described, the same automatically closes an electrical switch 65 to interconnect an electrical lead 66 with an electrical lead 67.

The lead 66 is electrically interconnected to one end 68 of a primary coil 69 of an electrical transformer means 70, the other end 71 of the coil 69 being electrically interconnected to a power source lead L_1 by a lead 72. The lead 67 is interconnected to a terminal 73 of an electrical switch 74 operated by the end of the valve member 53 of the diverter valve means 40 in a manner hereinafter described. Another terminal 75 of the electrical switch 74 is interconnected to the other power source lead L_2 by a lead 76.

The transformer means 70 includes a secondary winding or coil 77 having one side 78 interconnected to

one side 79 of an ignition coil 80 by a lead 81 while the other side 82 of the winding 77 is interconnected to the other side 83 of the ignition coil 80 by a lead 82.

The general operation of the control system 20 illustrated in FIG. 1 will now be described.

When the selector means 25 of the control device 24 is disposed in its off position, the control device 24 prevents the source of fuel 23 from being interconnected to the conduit 30 of the conduit means 29 and also prevents any additional amount of fuel from being directed to the bake pilot burner means 42 through conduit means 84 to create the previously described large heater flame at the bake pilot burner means 42 whereby the safety valve means 34 is in a closed position to prevent fluid communication between the inlet means 33 and outlet means 35 thereof even though a small standby flame is continuously burning at the bake pilot burner means 42. Also, when the selector means 25 of the control device 24 is disposed in its off position, no fuel is directed by the control device 24 to the conduit means 62 leading to the burner pilot means 61 whereby the detector 59 causes the diverter valve 40 to be disposed and maintained in the position illustrated in FIG. 1 wherein the valve means 51 closes off the outlet means 43 leading to the broil burner 22 and fully opens the outlet means 44 leading to the bake burner 21 even though no fuel is issuing thereto.

When the selector means 25 is moved to a position for a baking operation in a manner hereinafter described, the control device 24 does not supply fuel to the broil pilot burner means 61 whereby the diverter valve means 40 will remain in the position illustrated in FIG. 1. However, since the temperature in the oven is below the temperature selected by the selector means 25, the control device 24, in a manner hereinafter described, supplies an additional amount of fuel through the conduit 84 to create the previously described large heater flame at the bake pilot burner means 42 to be detected by the detector means 41 which will open the safety valve means 34 to interconnect the inlet means 33 thereof with the outlet means 35. Also, when the selector knob 25 is set at any on position, the same interconnects the source of fuel 23 with the conduit means 30 whereby fuel now can pass through the opened safety valve means 34 and be directed by the diverter valve 40 to the bake burner 41 to be ignited by the bake pilot burner means 42.

The control device 24 continuously supplies fuel to the bake burner 21 to heat the oven until temperature sensing bulb 85 of the control device 24 determines that the temperature of oven is at or above the temperature selected by the knob 25 whereby the control device 24, in a manner hereinafter described, will terminate the flow of the additional fuel through the conduit 84 leading to the bake pilot burner means 42 so that the heater flame at the bake pilot burner means 42 will no longer exist. Thus, the detector 41 will close the safety valve 34 to prevent fuel from being directed to the bake burner 21. However, when the temperature in the oven falls below the temperature selected by the knob 25, the bulb means 85 will again cause the control device 24 to create the large heater flame at the bake pilot burner means 42 to open the safety valve 34 in the manner previously described to permit fuel to again issue from the main burner means 21 and be ignited by the bake pilot burner means 42.

Thus, it can be seen that in any baking operation selected by the selector means 25 of the control device 24, the bake burner means 21 will be cycled on and off by the control device 24 to tend to maintain the temperature effect in the oven at the temperature effect selected by the selector knob 25, such baking operation not effecting the operation of the broil burner 22.

When the housewife or the like desires to utilize the control system 20 for a broiling operation, the housewife sets the selector knob 25 in a broiling position thereof in a manner hereinafter described whereby not only is the additional amount of fuel supplied by the control device 24 through the conduit means 84 to create the heater flame at the bake pilot burner means 42 to open the safety valve 34, but also fuel is directed by the control device 24 through the conduit 62 to pass through the pressure sensing switch means 63 and issue from the broil pilot burner means 61. As the fuel is directed through the switch means 63 by the control device 24 in its broil setting, the switch means 65 thereof closes to place the primary winding 69 of the transformer 70 across the power source leads L_1 and L_2 to create a current flow in the secondary winding 77 of the transformer means 70 whereby the igniter coil 80 is energized to ignite the fuel now issuing from the broil pilot burner means 61. Once the broil pilot burner means 61 is ignited, the now continuously burning flame at the broil pilot burner means 61 is detected by the detector means 59 to cause the movable wall 56 of the power element 57 to move upwardly in FIG. 1 and first close the outlet means 44 thereof before opening the outlet means 43 whereby the fuel being directed to the diverter valve means 40 by the opened valve safety means 34 can only be directed by the diverter valve means 40 to the broil burner 22 and not to the bake burner 21.

However, as the valve member 53 of the diverter valve means 40 is moving downwardly to open the outlet 43, the end of the valve member 53 trips a plunger 86 of the switch 74 to disconnect the terminals 73 and 75 thereof whereby the ignition coil 80 will cease to operate as the primary winding 69 of the transformer means 70 is no longer placed across the power source leads L_1 and L_2. The switch 74 is reset to again interconnect the terminals 73 and 75 when the valve member 53 moves from its open position back to its closed position when the control device 24 is subsequently turned to its off position or to a baking position to terminate the flow of fuel to the broil pilot burner 61.

Thus, the fuel issuing from the broil burner 22 by the diverter valve means 40 will be ignited by the broil pilot burner means 61 and will be continuously supplied fuel by the control device 24 as long as the temperature in the oven is below the temperature effect selected by the selector means 25 for the broiling operation.

However, should the temperature in the oven exceed the temperature effect selected by the knob 25 during the broiling operation, the control device 24, in a manner hereinafter described, will terminate the flow of the additional amount of fuel through the conduit means 84 whereby the heater flame at the bake pilot burner means 42 will no longer exist and the safety valve means 34 will close to prevent fuel from being directed to the broil burner means 22. However, fuel is still being supplied by the control device 24 to the broil

pilot burner means 61 so that a flame still burns at the broil pilot burner means 61.

Subsequently, when the temperature effect in the oven falls below the selected temperature effect, the control device 24 will again supply the additional amount of fuel through the conduit means 84 to create the heater flame at the bake pilot burner means 42 so that the safety valve 34 will again open to permit fuel to issue to the broil burner 22 to be ignited by the broil pilot burner means 61.

However, the control system 20 of this invention is so constructed and arranged that when the control device 24 is set for a normal high temperature broiling operation, the flame at the broil burner 22 will never go out as described above, but when the selector means 25 is set for a low temperature effect broiling operation, such as for a rotisserie operation, the broil burner 22 will be cycled on and off in the above manner.

The particular details of the control device 24 of this invention for effecting the above operation of the control system 20 will now be described.

The control device 24 includes a disc valve member 87, FIG. 2, interconnected to the selector means 25 so that when the selector means is moved to an "on" position thereof in a manner hereinafter described, the disc valve 87 not only interconnects the inlet 27 with the outlet 28, but also interconnects the inlet 27 with a passage means 88 leading to a chamber 89 defined by a valve seat member 90 carried by the housing 26. The chamber 89 is separated from a chamber 91 by a valve seat 92 on the valve seat member 90, the valve seat 92 being opened and closed by a valve member 94 urged to the closed position by a compression spring 95.

An axially movable fulcrum pin 96 is carried by the housing 26 in such a manner that the axial position of the fulcrum pin 96 relative to the housing 26 is controlled by the selector or control knob 25 in a manner hereinafter described. The fulcrum pin 96 has a rounded end 97 provided with a cylindrical projection 98 passing through a suitable aperture in a lever 99 whereby the lever 99 is fulcrumed on the end 97 of the fulcrum pin 96.

One end 100 of the lever 99 bears against a movable wall 101 of an expansible and contractible element 102 having a wall 103 fixed to the housing 26, the interior of the expansible and contractible element 102 being interconnected to the oven temperature sensing bulb 85 by a conduit 104. The movable wall 101 of the expansible and contractible element 102 carries a valve member 105 for opening and closing a valve seat 106 in a manner hereinafter described.

The other end 107 of the lever 99 is adapted to engage a plunger 108 carried by the valve seat member 90 and engaging the valve member 94, the end 107 of the lever 99 being urged in a clockwise direction in FIG. 2 by a compression spring 109. Thus, the opening and closing of the valve member 94 is controlled by the lever 99 in relation to the temperature sensed by the bulb 85 and the axial position of the fulcrum pin 96 in a manner hereinafter described.

The chamber 91 of the housing 26 is interconnected to a passage means 110 leading to a bore 111 in the housing 26, an adjusting key 112 being rotatably disposed in the bore 111 and having a longitudinal bore 113 interconnected to the exterior of the key 112 by transverse bores 114 and 115. The longitudinal bore 113 of the adjusting key 112 is disposed in communication with a passage 116 leading to the conduit 84 interconnected to the bake pilot burner means 42.

Another passage 117 is formed in the housing 26 and is interconnected with the inlet passage 27 at a point upstream from the disc valve 87 as well as to a filter chamber 118. The filter chamber 118 is interconnected to a passage 119 leading to the bore 111 in the manner illustrated in FIG. 2, the passage 119 having an orifice 120 therein.

Thus, it can be seen that when the adjusting key 112 is disposed in the "on" position, as illustrated in FIG. 2, fuel from the supply conduit 23 is adapted to pass through the passages 117 and 119 to the passage 115 of the adjusting key 112 and, thus, to the bake pilot burner means 42 to provide the previously mentioned small standby flame, which does not affect the safety valve means 34.

However, when the disc valve 87 is moved to an opened position for a baking operation or a broiling operation and the valve member 94 is moved to an opened position in a manner hereinafter described, the additional fuel being supplied through the passage 110 to the passage 114 of the adjusting key 112 causes the bake pilot burner means 42 to provide the previously described large heater flame which is sensed by the bulb 41 and causes the safety valve means 34 to open. However, when the valve member 94 closes, the additional supply of fuel to the pilot burner 42 is terminated whereby the large heater flame ceases to exist, even though the small standby flame continues, whereby the safety valve 34 will close.

Thus, as the valve member 94 cycles between its opened and closed positions in a manner hereinafter described, the safety valve means 34 is cycled on and off to maintain the temperature of the oven at a temperature selected by the control knob 25 in the manner previously described.

As illustrated in FIGS. 4, 5 and 6A, the housing means 26 defines a flat valve surface 121, interrupted by the spaced inlet 27 and an outlet 122 adapted to be interconnected together by a groove 123 in the disc valve 87.

In particular, the groove 123 in the disc valve 87 interrupts a valve surface 124 thereof with the valve surface 124 being disposed in sealing and sliding contact with the valve seat surface 121 of the housing 26, the disc valve 87 having an opening 125 passing therethrough and loosely receiving the end 126 of the fulcrum pin 96.

As illustrated in FIG. 5, the disc valve 87 has a pair of spaced arcuate embossments 127 formed on the side 128 thereof and a smaller substantially rectangular embossment 129 intermediate the embossments 127 for a purpose hereinafter described.

A cup-shaped member 130 forms part of the housing means 26 and is telescopically disposed over the disc valve 87, the member 130 having an aperture 131 passing there through in the closed end 132 thereof. The closed end 132 has a cam slot 133 formed therein and defining opposed camming edges 134 and 135 best illustrated in FIGS. 6 and 7. In addition, a pair of apertures 136 pass through the wall 132.

A C-shaped shaft 137 has one end 138 thereof interconnected to a plate member 139 having three outwardly projecting tangs 140, 143 and 142. In addition, rearwardly directed tangs 141 are formed in the plate member 139 and are adapted to register with apertures 144 formed on another plate member 145.

The plate member 145 has a bent over tang 146 provided with a slot 147 and a pair of ears 148 having apertures 149 passing therethrough. The members 139 and 145 are adapted to be assembled together with another tang 150 of the member 139 received in the slot 147 of the member 145 and with the ears 148 of the member 145 passing through slots 151 of the plate member 139 and pinned thereto by a pin means 152 passing through the apertures 149. In this manner, rotation of the shaft 137 by the control knob 25 causes like rotation of the plate member 145.

The plate member 145 carries a tubular extension 153 both internally and externally threaded, the tubular extension 153 adapted to be threadedly received in a threaded bore 154 of a member 155 fixed in the aperture 131 of the housing part 130.

An adjusting screw 156 is threaded in the tubular part 153 of the plate 145 and has an end 157 adapted to abut the end 126 of the fulcrum pin 96.

Thus, rotation of the control knob 25 fastened on the other end 158 of the C-shaped shaft 137 causes the member 153 to be threaded into or out of the fixed threaded member 155 to adjust the axial position of the fulcrum pin 96.

A bowed spring-like washer 159 is provided and has tangs 160 adapted to register in the apertures 136 of the housing part 130, the spring means 159 having reversely directed tangs 161 adapted to be received in notches 162 in a washer-like member 163, the spring member 159 and washer-like member 163 being disposed between the closed wall 132 of the housing part 130 and the plate member 145 to place an outward force on the plate-like member 145, and, thus provide "feel" in adjusting the rotational position of the knob 25 relative to the housing 26.

A spring retainer 164 is provided and has outwardly directed tangs 165 adapted to rest on the embossments 127 of the disc valve 87 and another tang 166. Another spring retainer 167 is provided and has an outwardly directed tang 168 similar to tang 166 of the spring retainer 164, retainers 164 and 167 respectively having openings 169 and 170 passing therethrough so that the same can be telescoped on the fixed threaded member 155. A compression spring 171 is adapted to be disposed between the spring retainers 164 and 167 to compact a clutch member 172 against the inside surface of the wall 132 of the housing part 130.

The clutch part 172 has a pair of depending flanges 173 defining a notch 174 therebetween adapted to not only receive the tangs 168 and 166 of the spring retainers 167 and 164, but to also receive the rectangular embossment 129 of the disc valve 87. In addition, the clutch member 172 has an outwardly directed tang 175 adapted to pass through the cam slot 133 of the housing part 130, the clutch part or drive member 172 having an aperture 176 passing therethrough to loosely receive the fixed member 155.

The operation of the control device 24 as utilized in the system 20 of this invention, with the parts heretofore described, will now be described.

Assuming that the control knob 25 is disposed in its "off" position as illustrated in FIGS. 2, 6, 6A and 6B, the groove 123 of the disc valve 87 is in such a position that the same does not interconnect the inlet 27 with the outlet 122 nor the inlet 27 with the passage means 88 whereby no fuel issues from the bake burner 21 and only a small standby flame exists at the bake pilot burner means 42 as the adjusting key 112 is normally disposed in the "on" position as illustrated in FIG. 2.

When the operator desires to turn on the oven for a set baking temperature thereof, the operator grasps the knob 25 and rotates the same in a counterclockwise direction as illustrated in FIG. 7 whereby rotation of the knob 25 causes like rotation of the plate 139 whereby the tang 140 of plate 139 bears against the tang 175 of the drive member 172 to cause like rotation therewith. As the drive member 172 is being rotated, the same, through the notch 174 thereof, rotates the spring retainers 167 and 164 as well as the disc valve 87 to bring the groove 123 of the disc valve 87 in such a position that the same fully interconnects the inlet 27 with the outlet 122, as well as to have a groove 177 of the valve member 87 interconnect a ranch inlet port 178 of the housing 26 to the passage 88 as illustrated in FIG. 7A.

However, when the disc valve 87 is rotated to its fully "on" position, it can be seen that the edge 135 of the cam slot 133 slides the drive member 172 radially outwardly to the position illustrated in FIGS. 7 and 7B whereby the tang 140 of the plate member 139 is no longer in engagement with the tang 175 of the drive member 172 so that the control knob 25, when further rotated in a counterclockwise direction for setting the desired baking temperature does not further rotate the disc valve 87 from its fully "on" position as illustrated in FIGS. 7, 7A and 7B. Thus, the sliding movement of the drive member 172 declutches the disc valve 87 from the control knob or manipulator means 25.

During the rotational movement of the control knob 25 from its position to a set baking temperature position thereof, the threaded member 153 of the plate 145 is backed out of the fixed threaded member 155 in such a manner that the fulcrum pin 96 is adjusted to a new position thereof to the right in FIGS. 2, 3, and 4 as selected by the temperature setting of the control knob 25.

This axial movement of the pin 96 from its "off" position to its selected baking temperature position permits the compression spring 109 to pivot the lever 99 on the fulcrum pin 96 in such a manner that the pin 108 carried by the valve seat member 90 is moved to the right in FIG. 2 to open the valve member 94 away from the valve seat 92 so that fuel in the passage 88 is now adapted to pass into the chamber 91 and, thus, to the bake pilot burner means 42 to create the large heater flame at the bake pilot burner means 42 whereby the bake burner 21 will be operated in the manner previously described.

Should a malfunction occur in the control device 24 of this invention, so that the valve member 94 will not close whereby the bake burner 21 remains on in a runaway condition, the increased temperature in the oven will cause the movable wall 101 of the power element 102 to further move to the right in FIG. 2 to bring the valve member 105 closer to the valve seat 106 to throttle the flow of fuel to the bake burner 21 in such a

manner that the bake burner **21** cannot produce a temperature in the oven above a predetermined safe temperature. Such safety feature also applies for the broiling operation hereinafter described.

When it is desired to turn off the system **20** of this invention, the operator rotates the control knob **25** back to the "off" position illustrated in FIG. **6**. As the plate **139** is being rotated to its "off" position, the tang **142** thereof engages the tang **175** of the drive member **172** and rotates the drive member **172** therewith, whereby the disc valve **87** is rotated back to its "off" position, the drive member **172** sliding radially inwardly relative to the disc valve **87** by means of the edge **134** of the cam slot **133** in the housing part **130** from the position illustrated in FIGS. **7** and **7A** back to the position illustrated in FIGS. **6** and **6A**. As the control knob **25** is rotated back to its "off" position, the tang **175** on the drive member **172** engages the end of the slot **133** when the control knob is disposed in its "off" position whereby the cam slot **133** determines the "off" position of the control knob **25**.

When it is desired to utilize the control system **20** of this invention for a broiling operation, the housewife or the like turns the selector means or control knob **25** in a counterclockwise direction in the manner previously described through the bake range until the control knob **25** as illustrated in FIG. **9** has the "broil" setting thereof placed adjacent the mark **179** on an outer stationary ring **180** of the housing means **26**. As the control knob **25** is being slowly rotated and as the same approaches the "broil" setting thereof, it can be seen in FIG. **8** and **8A** that the tang **143** of the member **139** engages the tang **175** of the drive member **172** to rotate the same in a counterclockwise direction until the tang **175** engages the lower end of the cam slot **133** which is the "broil" position of the control knob **25**. This further rotation of the drive member **172** causes further like rotation of the valve member **87** whereby the groove **177** of the valve member **87** additionally interconnects the branch inlet port **178** of the housing **26** with the passage means **181** in the housing means **26** that leads to the conduit **62** for the broil pilot burner means **61**.

If desired, the valve member **87** can have an outwardly directed actuator **182** adapted to close a normally open switch means **183** when the valve member **87** has been moved to its "broil" position as illustrated in FIG. **8A** whereby the closed switch means **183** will place a "broil" indicating light member **184** across the power source lead L_1 and L_2 to indicate to the housewife or the like that the control knob **25** has been set for a broiling operation which occurs in the manner previously described because the diverter valve **40** is now under the control of the broil pilot burner means **61** to divert the flow of fuel from the control device **24** to only the broil burner **22** to be operated in the manner previously described.

Since a normal broiling operation takes place at approximately 625° F. or the like, the rotation of the control knob **25** to the "broil" position previously described has adjusted fulcrum pin **96** in such a manner that the valve member **94** is completely moved away from the valve seat **92** so that the large heater flame at the bake pilot burner means **42** remains constant to maintain the safety valve means **34** in an open condition and produce a continuous flame broiling operation by the broil burner **22**. However, should the temperature sensing bulb **85** sense that the temperature in the oven is exceeding the aforementioned 625° F. or the like, the movable wall **101** of the power element **102** moves to the right in FIG. **2** to cause the valve member **105** to produce a throttling down or modulating action on the flow of fuel passing through the valve seat **106** well before the valve member **94** will close against its valve seat **92** so that the flame at the broil burner **22** will not go out and will not tend to exceed the aforementioned 625° F. temperature in the oven for the system **20**.

It may be found that the housewife or the like desires to utilize the broil burner **22** for a cooking operation at a temperature well below the aforementioned 625° F. normal broiling temperature for the oven.

Therefore, the housewife or the like, after setting the control knob **25** at the "broil" setting thereof previously described so that the indicating light **184** will be turned on and the valve member **87** will be disposed in the position illustrated in FIGS. **8** and **8A**, the housewife can then rotate the control knob **25** in a clockwise direction back to a desired temperature setting for the oven whereby the fulcrum pin means **96** will be so adjusted to tend to maintain the temperature in the oven at the selected broiling temperature by the bulb **85** causing the opening and closing of the valve member **94** to cycle the safety valve means **34** between its opened and closed positions to maintain the temperature in the oven at the selected broiling temperature without causing the bake burner **21** to be operated as the valve member **87** is maintaining the flow of fuel to the broil pilot burner means **61**.

Therefore, it can be seen that this invention provides an improved control system for a double burner oven or the like as well as improved parts and method for such system or the like.

In addition, the system **20** of this invention overcomes a particular disadvantage of prior known all gas systems where both burners become operating under conditions of loss of control during a baking operation, such as by a broken temperature sensing bulb means **85** or the like.

In particular, this invention overcomes the above disadvantage while still providing the single dial operation for the bake and broil temperature settings in a manner not provided by prior known systems.

For example, under conditions of loss of control, such as by a broken thermostat bulb **85**, only the bake burner **21** of this invention will be operated as the rise in temperature in the oven will not cause operation of the broil burner **22** as in prior known systems wherein a thermally operated broil safety valve will open when the oven temperature reaches a temperature sufficient to cause the flame detector for the broil safety valve to open whereby for this prior known type of system, a separate main flow broil selector cock is normally required in addition to a selector cock for a baking operation.

However, in the control systems of this invention, when such a high temperature is reached, the diverter valve **40** acts first to reduce or modulate the input flow of fuel to the bake burner **21** because, as the movable wall **56** of the lower element **57** moves upwardly, the

valve member **51** approaches the outlet means **44** with a modulating or throttling action so that the temperature cannot rise sufficiently in the oven to cause the power element **57** to open the valve member **53** and permit fuel to be directed to the broil burner **22**.

While the control system **20** of this invention has been previously described and illustrated as having an electrical ignition means for lighting the broil pilot burner means **61**, it is to be understood that such a system can utilize a "dual-rate" broil pilot burner means in much the same manner that the bake pilot burner means **42** is a "dual-rate" pilot burner means.

In particular, reference is now made to FIGS. **10** and **11** wherein another control system of this invention is generally indicated by the reference numeral **20A** and parts thereof similar to the system **20** previously described are indicated by like reference numerals followed by the reference letter "A".

Since the basic difference between the control system of FIGS. **10** and **11** and the control system **20** of FIGS. **1** and **2** is that the control system **20A** utilizes a "dual-rate" broil pilot burner means to eliminate the electrical ignition means **80** of the system **20**, only the details pertaining to such "dual-rate" broil pilot burner means need be described as the function and operation of the control system **20A** is identical to the function and operation previously described for the control system **20**.

As illustrated in FIGS. **10** and **11**, a "dual-rate" broil pilot burner means **185** is disposed adjacent the broil burner **22A** and is adapted to always have a small continuously burning standby flame that is not detected by the detector means **59A** of the diverter valve means **40A**.

In particular, the broil pilot burner means **185** is best illustrated in FIG. **11** and comprises a tubular member **186** having an outlet end **187** and a flame shield means or deflector **188** carrying the diverter valve detector **59A** to sense a large heater flame **189** only when the control device **24A** is set for a broiling operation. The inlet end **190** of the tubular member **186** is interconnected to the conduit **62A** leading to the housing **26A** of the control device **24A** and being in fluid communication with the previously described passage means **181A** that is interconnected to the inlet **27A** when the valve member **87A** is set in its "broil" position.

In addition, the passage **117A** of the housing **26A** which continuously supplies fuel to the bake pilot means **42A** to create the continuously burning small standby flame that is not detected by the detector **41A** of the safety valve means **34A** is also interconnected to the broil pilot burner means **185** by a branch passage means **191** leading from the chamber **118A**.

In this manner, a small amount of fuel is being continuously supplied to the pilot burner means **185** to continuously produce a small standby flame **192** at the outlet end **187** of the conduit **186** which is not detected by the detector **59A** of the diverter valve means **40A**.

However, it is well known that a continuously burning pilot in the top of an oven cavity is subjected being snuffed out by the burning combustion products from a bake burner disposed in the lower part of the oven cavity.

Therefore, to overcome this adverse problem a primary air conducting tube **193** is provided, as illustrated in FIG. **10**, having an inlet end **194** disposed well below the bake burner **21A** and having its upper end **195** interconnected to an opening **196** in the side of the tube **186** between its inlet end **190** and its outlet end **197** to continuously supply a sufficient amount of air to the fuel passing through the tube **186** to maintain the small standby flame **192** even though the bake burner **21A** may be operating.

Thus, the control system **20A** of this invention operates in the same manner as the system **20** previously described for both the baking and broiling operations thereof except that during the baking operation the broil pilot burner means **20A** has a continuously burning small standby flame **192** which will be increased in size to produce the large heater flame **189** only when the system **20A** is utilized for a broiling operation.

When the control knob **25A** of the control device **24A** is set in its "broil" position, the valve member **87A** will direct an additional amount of fuel through the conduit **62A** leading to the broil pilot burner means **185** to cause a large heater flame **189** which will not only be detected by the detector **59A** of the diverter valve means **40A** to direct fuel only to the broil burner **22A** in the manner previously described, but also the large heater flame **189** will ignite the fuel issuing from the broil burner **22A** for a broiling operation thereof.

Therefore, it can be seen that the control system **20A** of this invention does not require an electrical control system for ignition of the broil burner means **22A** as is required for the broil burner **22** of the control system **20** previously described.

If desired, the previously described control system **20A** can utilize another type of broil pilot burner means for the broil burner instead of the dual rate, primary air conducting tube pilot means **185** and can utilize a non-electrical ignition means therefor.

For example, reference is now made to FIG. **12** wherein another control system of this invention is generally indicated by the reference numeral **20B** and parts thereof similar to the system **20A** and **20** previously described are indicated by like reference numerals followed by the reference letter "B".

As illustrated in FIG. **12**, a broil pilot burner means **200** is fluidly interconnected to the conduits **62B** leading from the control device **24B** to receive fuel when the selector means **25B** is set in its broil position in the same manner as the system **20** previously described.

However, in order to provide ignition means for the pilot burner means **200**, a flash tube **201** is provided and has one end **202** adjacent the broil pilot burner means **200** and the other end **203** disposed adjacent a continuously burning pilot burner means **204** for the range top burners of the apparatus containing the system **20B**. In this manner, when the selector means **25B** of the control device **24B** is set in its broil position, fuel is directed to the broil pilot burner means **200** through the conduit **62B** and is ignited by the gas passing into the flash tube **201** at the end **202** thereof, being ignited by the standing pilot **204** at the end **203** and flashing back to the broil pilot burner means **200** in a manner well known in the art.

While the system **20**, **20A** and **20B** have been previously described as having continuously burning ignition means for the bake burner of the system, it is to be un-

derstood that the system of this invention can be a "-cold flame operation system" wherein no continuously burning ignition pilot means are provided for either the bake burner or broil burner thereof.

For example, reference is now made to FIGS. 13 and 13A—13C wherein another control system of this invention is generally indicated by the reference numeral 20C and parts thereof similar to the system 20 of FIG. 1 are indicated by like reference numerals followed by the reference letter "C".

As illustrated in FIG. 13, the control device 24C, safety valve means 34C and diverter valve means 40C function in the manner previously described with the broil pilot burner means 61C for the broil burner 22C being adapted to be ignited by the ignition coil means 80C in the manner previously described.

However a dual rate bake pilot burner means 205 is utilized with the bake burner 21C of the system 20C. The bake pilot burner means 205 is interconnected to the control device 24C by a conduit means 206, the conduit means 206 being adapted to be interconnected directly to the fuel supply means 23C when the selector means 25C is in any on position and is being prevented from being in communication with the fuel supply means 23C when the selector means 25C is in its off position.

A pressure switch means 207 is disposed in the conduit means 206 and functions in the same manner as the pressure switch means 63C in the conduit means 62C leading to the broil pilot burner means 61C.

In particular, the pressure switch means 207 is only adapted to electrically interconnect a lead 208 to a lead 209 when fuel is directed into the conduit 206 by the control device 24C with such fuel passing through the pressure switch means 207 to the bake pilot burner means 205 to be ignited in a manner now to be described.

The power source leads L_1 and L_2 are interconnected to two primary windings or coils 210 and 211, the primary winding 210 cooperating with a secondary winding or coil 212 having one end 213 interconnected by a lead 214 to one side of the pressure switch 63C. The other side 215 of the secondary coil 212 is interconnected by the lead 216 to one side of the switch means 74C of the diverter valve 40C. The other side of the switch 74C of the diverter valve 40C is interconnected to one side 79C of the ignition coil 80C by a lead 217 while the other side 83C of the ignition coil 80C is connected to the other side of the pressure switch 63C by a lead 218.

In this manner, when the selector means 25C of the control device 24C is set in its broil position, the fuel being directed through the conduit 62C to the broil pilot burner 61C closes the switch 63C whereby the ignition coil 80C is energized to ignite the fuel issuing from the broil pilot burner means 61C in the manner previously described for the system 20 of FIG. 1.

The other primary winding 211 cooperates with a secondary winding or coil 219 having one side 220 thereof interconnected to the lead 208. The other side 221 of the secondary winding 219 is interconnected to a lead 222 interconnected to a terminal 223 of an electrical switch means 224 operated by the selector means 25C of the control device 24C in a manner hereinafter described.

The other terminal 225 of the switch means 224 is interconnected by a lead 226 to one side 227 of an electrical ignition coil 228 for the bake pilot burner means 205, the other side 229 of the ignition coil 228 being interconnected to the lead 209 of the pressure switch 207.

The disc valve member 87C of the control device 24C is so constructed and arranged as illustrated in FIG. 13A–13C that when the same is in the off position of FIG. 13A, a relatively long cam portion 230 is away from the electrical switch means 224 so that the natural resiliency in the switch means 224 maintains the same in an open position whereby the ignition coil means 228 cannot be energized.

However, when the selector means 25C of the control device 24C is rotated to any baking position thereof, such as illustrated in FIG. 13B, the cam means 230 closes the switch means 224 with the disc valve member 87C having the groove means 177C interconnecting together the ports 178C and 88C. However, the port 88C is modified from the port means 88 illustrated in FIG. 2 because the port means 88C not only leads to the valve means 94 of the control device 24C, but also leads to the passage means 117 because in the control device 24C, the passage means 117 is not directly interconnected to the inlet means 27C as in the embodiment of FIG. 2.

Thus, when the selector means 25C is disposed in any on position, the valve member 87C not only interconnects the source of fuel to the passage means 88 leading to the valve means 94, but also directs a small amount of fuel through the passage 117 to the dual rate bake pilot burner means 205 to be ignited by the ignition coil 228. In particular, with the valve means 87C in an on position, the cam means 230 closes the switch means 224 to place the ignition coil 228 in series with the secondary winding 219 so that the fuel now issuing from the bake pilot burner means 205 will be ignited.

Once a flame is burning at the bake pilot burner means 205, whether the same is a small standby flame or a large heater flame, such flame means is sensed by a detector means 260 operatively interconnected to the pressure switch means 207 to open the electrical switch thereof even though fuel is flowing through the conduit means 206 to terminate the operation of the ignition coil 228, the electrical switch in the pressure switch 207 being reset when the flame means cease to exist at the bake pilot burner means 205.

In this manner, whenever a heater flame appears at the bake pilot burner means 205, the same is detected by the detector means 41C previously described to open the safety valve means 34C for the purpose previously described.

As illustrated in FIG. 13C, the switch means 224 is also closed by the cam means 230 of the disc valve member 87C when the selector means 25C is set in its broil position, the control system 20C previously described when set in its broil position.

While the control systems 20, 20A, 20B and 20C previously described have the safety valve means 34 disposed in the conduit means 29 intermediate the control device 24 and diverter valve means 40, such safety valve means can be disposed between the diverter valve means 40 and the bake burner 21 according to the teachings of this invention.

In particular, another control system of this invention is generally indicated by the reference numeral 20D in FIGS. 14 and 14A—14C with parts thereof similar to the system 20 previously described being indicated by like reference numerals followed by the reference letter "D".

As illustrated in FIG. 14, the main fuel supply conduit means 29D leading from the control device 24D to the bake and broil burners 21D and 22D has the conduit section 30D directly interconnected to the diverter valve means 40D without the safety valve means 34 therein. However, a conduit section 231 of the conduit means 29D leads from the diverter valve 40D to the bake burner 21D and has the safety valve means 34D disposed therein while another conduit section 232 leads from the diverter valve 40D to the broil burner 22D in the same manner as the conduit section 47 previously described.

A dual rate pilot burner means 42D is provided adjacent the bake burner 21D and has, in addition, an outlet part 233 to provide a continuously burning secondary standby flame to be continuously supplied fuel through a conduit means 234 leading from the control device 24D and always in communication with the fuel supply manifold 23D. However, the bake pilot burner means 42D operates in the same manner as the dual rate pilot burner means 42 of the system 20 by having a small standby flame in addition to the flame means at the secondary outlet means 233 and is adapted to produce a large heater flame to be detected by the detector means 41D of the safety valve means 34D only when the selector means 25D is in a bake range position as will be apparent hereinafter.

The secondary winding 77D of the previously described transformer means 70D has the side 78D interconnected to the side 79D of the ignition coil 80D by the lead 81D. However, the other side 83D of the ignition coil 80D is interconnected to one side of the pressure switch means 63D by a lead 235. The other side of the electrical switch in the pressure switch means 63D is interconnected to an electrical switch means 236 by a lead 237, the electrical switch 236 normally being opened and being adapted to be closed by a cam means 238 on the disc valve means 87D in a manner hereinafter described only when the selector means 25D is disposed in its broil position. The other side of the switch means 236 is interconnected to the other side 259 of the secondary coil 77D by a lead 240.

The operation of the control system 20D will now be described.

When the housewife or the like turns the selector means 25D of the control device 24D to a baking position, such as illustrated in FIG. 14D, the disc valve member 87D is rotated to the position illustrated in 14D and has the groove 177D interconnecting the port 178D to the port 88D, the port 178D in the embodiment of the system 20D being disposed intermediate the port 88D and the port 181D leading to the conduit means 62D for the broil pilot burner means 61D.

Thus, the bake burner 21D will now be operating as long as a large heater flame exists at the bake pilot burner means 42D in the manner previously described to open the safety valve means 34D and will be cycled off when the control device 24D terminates the additional amount of fuel to the bake pilot burner means 42D to terminate the large heater flame thereof in the manner previously described for the control system 20.

When the housewife or the like desires to utilize the system 20D for a broiling operation, rotation of the selector knob 25D of the control device 24D to the broil position illustrated in FIG. 14C causes the groove 177D of the disc valve member 37D to fluidly interconnect the port 178D to the port 181D while preventing fluid communication between the port 178D and the port 88D. Simultaneously, the cam member 238 of the valve member 87D closes the switch means 236 to render the ignition coil 80D operative when the pressure switch 63D opens by the fuel passing through the conduit 62D from the port 181D.

In this manner, the ignition coil 80D will be energized to ignite the fuel now issuing from the broil pilot burner means 61D. A detector 239, similar to the detector 260 of FIG. 13 previously described, is operatively interconnected to the pressure operated switch 63D to terminate the closure of the electrical switch and the pressure switch 63D when the detector 239 detects a flame at the broil pilot burner 61D to thereby terminate the operation of the ignition coil 80D, the electrical switch in the pressure switch 63D being reset when the detector 239 no longer detects a flame means at the broil pilot burner means 61D.

Therefore, it can be seen that in order for the control system 20D to operate the broil burner 22D when the selector means 25D is set in its broil position, the safety valve means 34D need not be opened because the diverter valve means 40D will direct the entire flow of fuel from the control device 24D to the broil burner 22D when the detector means 59D detects a flame at the broil pilot burner means 61D in the manner previously described.

If desired, the electrical ignition means for the broil pilot burner means 61D of the system 20D of FIG. 14 can be eliminated and a flash tube arrangement can be provided for ignition thereof in much the same manner provided by the system 20B of FIG. 12. In particular, reference is now made to FIG. 15 wherein another control system of this invention is generally indicated by the reference letter 20E and parts thereof similar to the system 20D of FIG. 14 are indicated by like reference numerals followed by the reference letter "E".

As illustrated in FIG. 15, a flash tube 252 has one end 241 thereof adjacent the broil pilot burner means 61C and the other end 242 thereof adjacent a continuously burning pilot burner means 243 for the range top burners of the apparatus containing the system 20E, the flash tube 252 operating in the same manner as the flash tube 201 previously described to ignite the broil pilot burner means 61E each time fuel is directed thereto by the control means 24E being set in its broil position.

Another control system of this invention is generally indicated by the reference numeral 20F in FIG. 16 and 16A—16E wherein the safety valve means 34F is also disposed intermediate the diverter valve means 40F and the bake burner 21F in a manner similar to the control system 20D previously described except that the control system 20F permits a flame adjusting operation for the broil burner 22F and does not utilize a second auxiliary standby pilot flame means 233 of the system 20D. However, like parts of the system 20F are

indicated by the like reference numerals followed by the reference letter "F".

As illustrated in FIG. 16, the ignition coil 80F for the broil pilot burner means 61F of the system 20F is identical in operation and structure to the ignition coil arrangement 80C of FIG. 13.

The system 20F of FIG. 16 operates in substantially the same manner as the system 20D previously described for a baking operation wherein the safety valve means 34F is cycled between its opened and closed positions upon the cycling of the large heater flame of the bake pilot burner means 42F by the control device 24F in the manner previously described.

However, in the broil setting of the control device 24F, the disc valve means 87F thereof is so constructed and arranged that the same will provide means for adjusting the size of the flames at the broil burner means 22F from the normal flame means at a normal broil setting in a manner now to be described.

As illustrated in FIG. 16A–16D, the disc valve member 87F has the arcuate groove 123F so constructed and arranged that when the same is disposed in the broil position of FIG. 16C, the groove 123F interconnects the opening 122F with the inlet 27F to provide maximum fuel flow therebetween in the normal broil position of the selector means 25F by the tang 143, FIG. 8, driving the tang 175 to the position illustrated in FIG. 8 for a broil setting. However, the cam slot means 133–135 is longer in a counterclockwise direction in the valve member 87F so that even though the disc valve 87F is set in its normal broil position as illustrated in FIG. 16C, further counterclockwise rotation of the selector knob 25F will cause the tang 143 to drive the tang 175 progressively in a counterclockwise direction between the positions illustrated in FIG. 16C and FIG. 16D to progressively decrease the degree of fluid communication between the port means 27F and 122F by the slot 123F to progressively reduce the size of the flames at the broil burner 22F, the groove 177F still maintaining fluid communication between the port 178F and port 181F during such flame setting adjustment.

After the housewife, or the like, has adjusted the selector knob 25F to the desired flame setting position for a broiling operation, the broil burner 22F will be continuously supplied fuel by the control device 24F for the broiling operation at the selected flame height thereof with the valve member 105 of FIG. 2 preventing any runaway condition of the oven by throttling down such flow should the temperature of the oven exceed the safe limit thereof in the manner previously described.

Therefore, it can be seen that the system 20F of FIG. 16 cycles on and off the safety valve means 34F to maintain a baking temperature effect in the oven when the selector means 25F is set in a bake position thereof as illustrated in FIGS. 16D and will cause continuous on operation of the broil burner 22F in the same manner as the system 20D of FIG. 14 while permitting a flame size adjusting means for the flames at the broil burner 22F.

Of course, the electrical ignition means 80F for the system 20F could be eliminated and a flash tube igniting means for the broil pilot burner means 61F can be provided in the manner previously described.

For example, reference is now made to FIG. 18 wherein another control system of this invention is generally indicated by the reference numeral 20G with parts thereof similar to the system 20F indicated by like reference numerals followed by the reference letter "G".

As illustrated in FIG. 18, a flash tube 244 is provided and has one end 245 adjacent the broil pilot burner means 61G with the other end 246 thereof adjacent a continuously burning pilot burner means 247 for the top burners of the apparatus containing the system 20G, the flash tube 244 operating to ignite fuel issuing from the broil pilot burner means 61G when the selector knob 25G is set in its broil position in the manner previously described for the system 20B of FIG. 12.

While the pressure switch means 207 of FIG. 13 for the bake burner means 21C and the pressure switch means 63D for the broil burner 22D of FIG. 14 have each been illustrated as having the ignition system therefor terminate when a separate detector detects a flame at the respective pilot burner means, it is to be understood that the pressure switch means can terminate the operation of the ignition coil means when the pressure switch means detects a flow of fuel to the respective main burner.

For example, another control system of this invention is generally indicated by the reference numeral 20H in FIG. 17 and parts thereof similar to the system 20F are indicated by like reference numerals followed by the reference letter "H".

As illustrated in FIG. 17, the conduit means 62H leading to the broil pilot burner means 61H has a branch conduit 248 leading to the pressure switch 63H so that the electrical switch means of the pressure switch 63H will close to interconnect a lead 249 to a lead 250 when the selector means 20H is set in a broil position thereof. The lead 250 is interconnected to the side 83H of the ignition coil 80H while the lead 249 is connected to the side 259H of the secondary winding 77H of the transformer means 70H. The other side 78H of the secondary winding 77H is interconnected to the other side 79H of the ignition coil 80H by the lead 81H.

The pressure switch 63H is also fluidly interconnected to the conduit section 47H of the conduit means 29H leading from the diverter valve means 40H to the broil burner means 22H.

The operation of the control system 20H when set in its broil position will now be described.

When the selector knob 25H of the control device 24H is set in its broil position, fuel is directed by the control device 24H through the conduit means 62H to the broil pilot burner means 61H and causes the pressure switch 63H to electrically interconnect leads 249 and 250 whereby the ignition coil 80H is energized to ignite the fuel issuing from the broil pilot burner means 61H. The burning fuel at the broil pilot burner means 61H is now detected by the detector 59H and in the manner previously described causes the diverter valve 40H to direct the entire main flow of fuel from the control device 24H through the conduit section 47H to the broil burner 22H to be ignited by the broil pilot burner 61H.

However, as fuel is now being directed by the diverter valve 40H into the conduit section 47H, the branch conduit 249 directs a portion of the fuel in the

conduit section **47H** to the pressure switch **63H** to disconnect the lead **249** from the lead **250** and thereby deenergize the ignition coil **80H** even though fuel flowing through the conduit **62H** is being directed by the branch conduit **248** to the pressure switch **63H**.

Therefore, it can be seen that the ignition means for the broil pilot burner means **61H** of the system **20H** will be terminated when fuel flows to the broil burner **22H**.

Accordingly, not only does this invention provide improved control systems for a double burner oven or the like, but also this invention provides improved parts and improved methods for such double burner ovens or the like.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. In combination, a bake burner, a broil burner, a source of fuel, a conduit means leading to said bake burner and to said broil burner, a control device for interconnecting said source of fuel to said conduit means, a diverter valve means in said conduit means intermediate said control device and said burners and having two outlets, said diverter valve means having valve member means which in one condition thereof maintains one of said outlets in an open condition thereof and the other of said outlets in a closed condition thereof and when in another condition thereof maintains said one outlet in a closed condition thereof and said other outlet in an open condition thereof, said control device having a selector means for selecting a a broiling operation or a baking operation, said control device tending to cause said diverter valve means to direct fuel issuing into said conduit means from said control device out of said one outlet only to said bake burner when said selector means is set for a baking operation and tending to cause said diverter valve means to direct fuel issuing into said conduit means from said control device out of said other outlet only to said broil burner when said selector means is set for a broiling operation, said diverter valve means always first terminating and thereafter preventing any fuel flow to said bake burner before permitting any fuel flow to said broil burner when said selector means is set for a broiling operation, a broil pilot burner means for said broil burner, and means responsive only to said broil pilot burner means and being operatively interconnected to said valve member means of said diverter valve means to cause said valve member means to be in said other condition thereof to tend to direct fuel only to said broil burner when a certain flame means exists at said broil pilot burner means and to be in said one condition thereof to tend to direct fuel only to said bake burner when said certain flame ceases to exist at said broil pilot burner means.

2. A combination as set forth in claim **1** wherein said control device includes thermostatic means for tending to maintain a temperature effect of said bake burner at a temperature effect selected by said selector means for a baking operation.

3. A combination as set forth in claim **1** wherein said control device includes thermostatic means for tending to maintain a temperature effect of said broil burner at a temperature effect selected by said selector means for a broiling operation.

4. A combination as set forth in claim **3** wherein said selector means can select a temperature effect to be maintained by said broil burner from a relatively high temperature effect to a relatively low temperature effect.

5. A combination as set forth in claim **1** and including a safety valve means in said conduit means intermediate said control device and said diverter valve means.

6. A combination as set forth in claim **5** and including a bake pilot burner means for said bake burner, and means operatively interconnected to said safety valve means to open said safety valve means to permit fuel issuing from said control device into said conduit means to pass to said diverter valve means only when a certain flame means exists at said bake pilot burner means and to close said safety valve means to prevent fuel issuing from said control device into said conduit means from passing to said diverter valve means when said certain flame means ceases to exist at said bake pilot burner means.

7. A combination as set forth in claim **6** wherein said control device has means for directing fuel to said bake pilot burner means to create said certain flame means.

8. A combination as set forth in claim **7** wherein said last-named means of said control device is thermostatically operated in response to the temperature effect produced by said bake burner when said selector means is set for a baking operation.

9. A combination as set forth in claim **7** wherein said last-named means of said control device is thermostatically operated in response to the temperature effect produced by said broil burner when said selector means is set for a broiling operation.

10. A combination as set forth in claim **7** wherein said last-named means of said control device is only adapted to direct fuel to said bake pilot burner means to create said certain flame means when said selector means is set for either a baking operation or a broiling operation.

11. A combination as set forth in claim **1** wherein said control device has means for directing fuel to said broil pilot burner means to create said certain flame means when said selector means is set for a broiling operation.

12. A combination as set forth in claim **11** and including ignition means for igniting the fuel issuing from said broil pilot burner means.

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