United States Patent

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[54] **UNITARY CONTROL DEVICE**
10 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **137/495**
[51] **Int. Cl.** **G05d 27/00,** F16k 31/165
[50] **Field of Search** 137/495, 500, 494; 251/35

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ABSTRACT: A unitary control device for main and pilot burner apparatus having a differential pressure operated diaphragm valve operated by an internal bleed line which is subject to pressure regulation and to on-off control by a dual valve permitting a bypass bleed flow to assure closure of the main diaphragm valve. The control device casing houses conventional manual and safety valves adjacent its inlet port and includes an impurity collector in its inlet chamber as being arranged so that all the connections for operating components of the control device are located on the same wall of the casing.

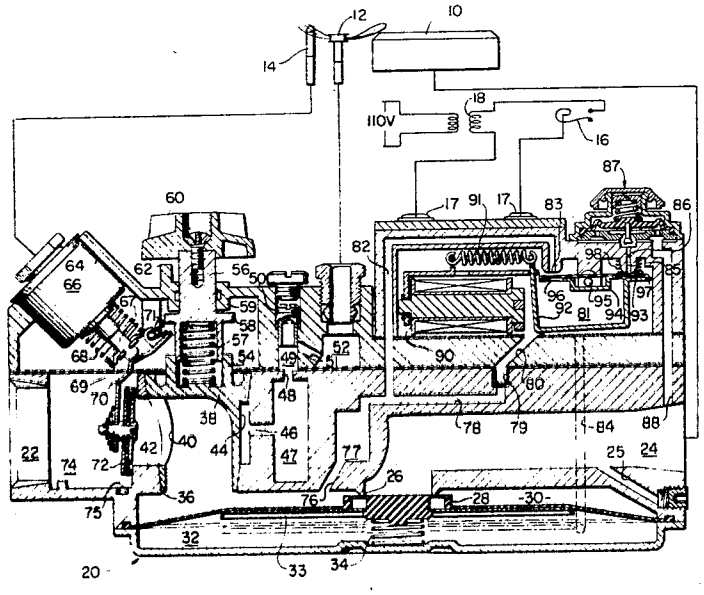


FIG. 1

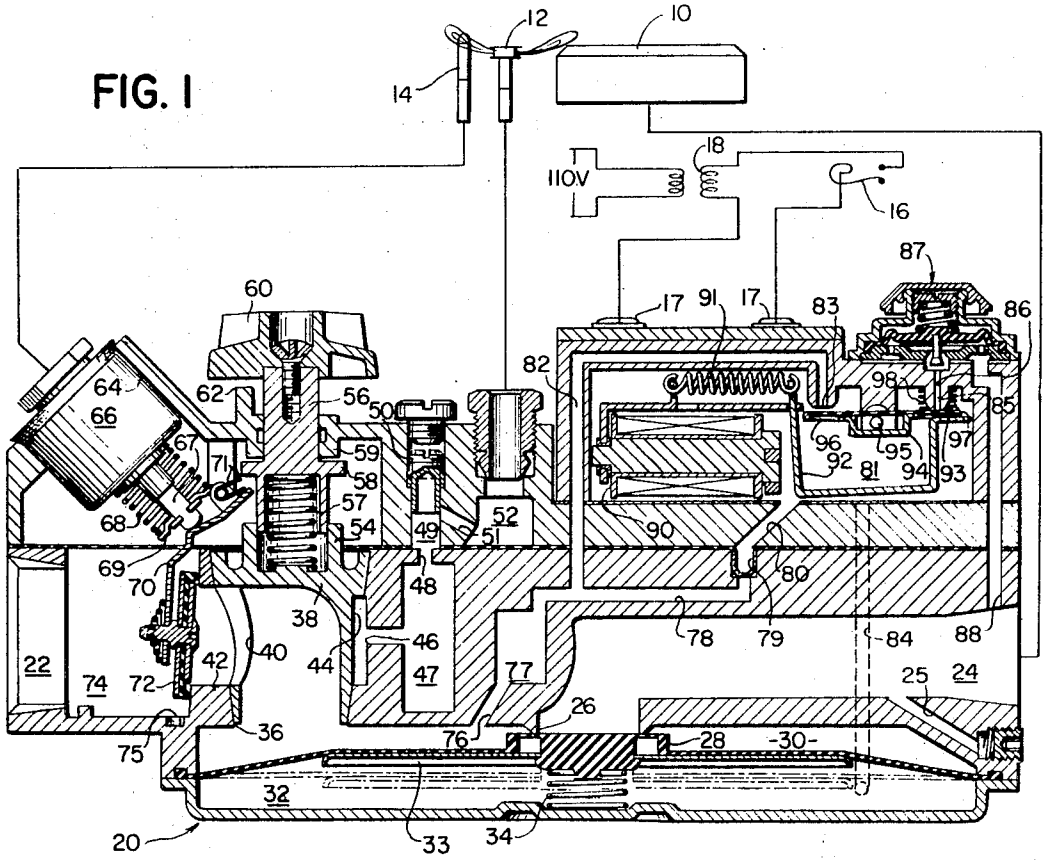


FIG. 2

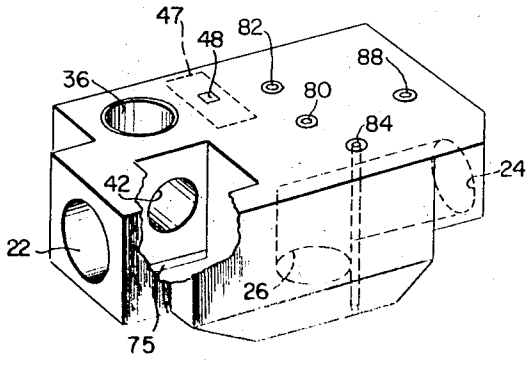
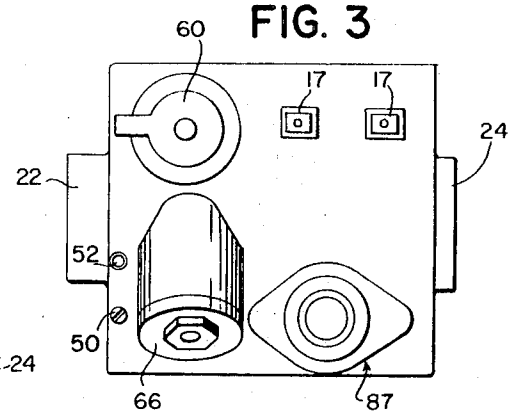


FIG. 3



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FIG. 4

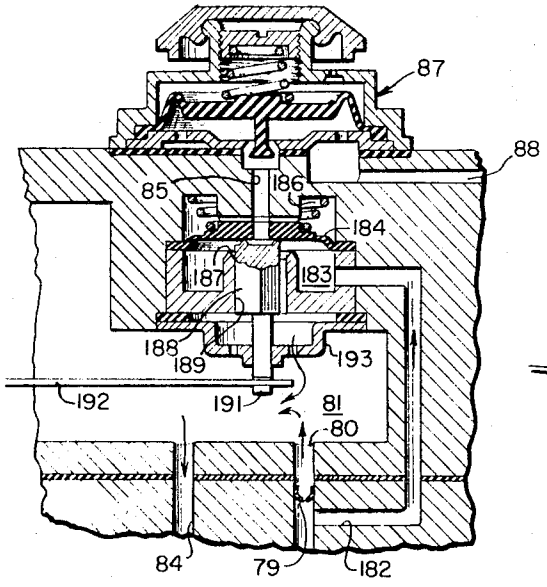


FIG. 5

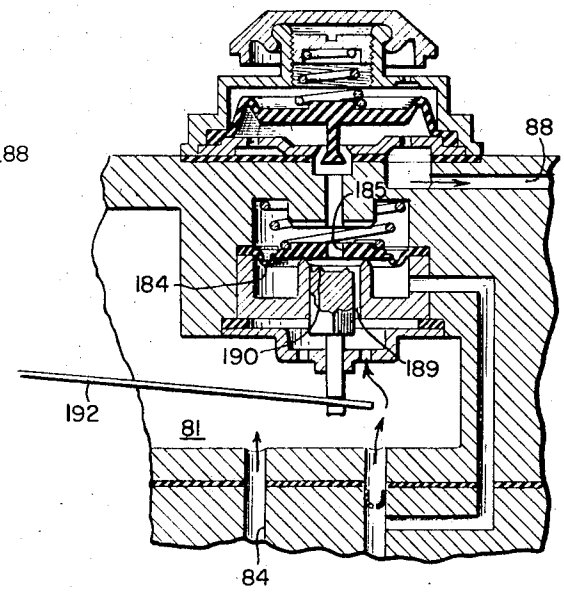


FIG. 6

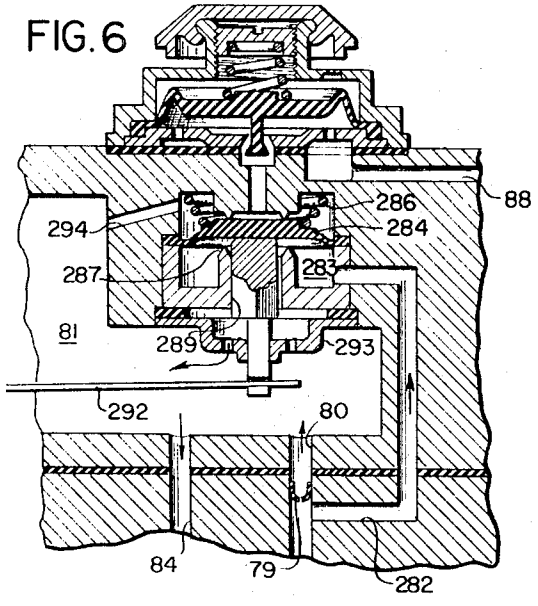
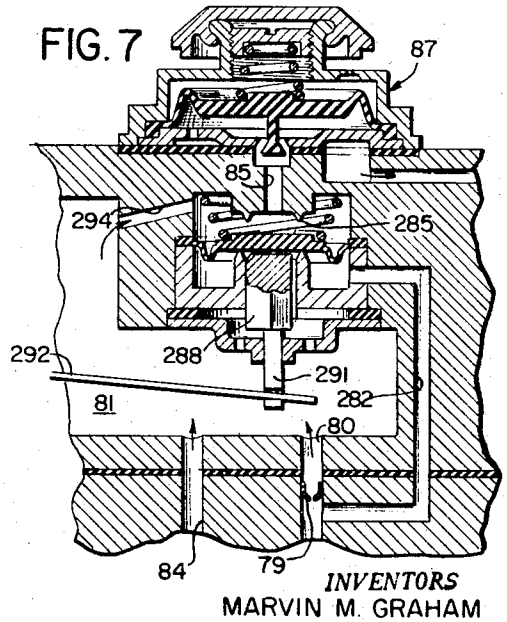


FIG. 7



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UNITARY CONTROL DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This is a divisional application of copending application Ser. No. 658,000 filed Aug. 2, 1967.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a flow control system for controlling and regulating the pressure of fuel flows to main and pilot burner apparatus, and in particular to such a system wherein the main flow of fuel is modulated between preselected limits by varying the branched flow of a pilot fuel.

2. Description of the Prior Art

The prior art, as exemplified by U.S. Pat. Nos. 3,227,370 and 3,235,180, is cognizant of the general arrangement of a combination control having differential pressure operated diaphragm valve for main flow control and regulation with an internal bleed line for operating the diaphragm valve in response to a thermostatic on-off control and a pressure regulator in the bleed line. The multiplicity of operating components utilized with such combination control devices present a problem in assembly and servicing because the numerous connections for such components are not readily located or easily available to the mechanic or repairman.

SUMMARY OF THE INVENTION

In practicing the present invention, a unitary control device casing houses all the operating components for controlling and regulating the pressure of fuel flow to burner apparatus with all the connections for such components being located on one wall of the casing. Adjacent its inlet port, the casing is provided with a groove that collects impurities from the fuel flow. A main diaphragm valve is operated by a bleed line which includes a bypass bleed flow to assure closure of the main diaphragm valve and a dual on-off control valve for the primary bleed line and the pressure regulator therein.

An object of this invention is to provide a valve body with an impurity collector in its inlet chamber.

The present invention has another object in that a fuel valve arrangement increases a bleed flow to effect closure of a main diaphragm valve in a unitary control device.

A further object of the present invention is to facilitate assembly and servicing of the operating components of a combination control device. Other objects and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a schematic diagram of burner control apparatus embodying the present invention with the control device shown in a schematic sectional view;

FIG. 2 is a top perspective view of a detail shown schematically in FIG. 1;

FIG. 3 is a broken top plan view of the control device shown schematically in FIG. 1;

FIG. 4 is a partial section of a modified detail of FIG. 1;

FIG. 5 is a partial section similar to FIG. 4 but showing the components in another operating position;

FIG. 6 is a partial section of another modified detail of FIG. 1; and

FIG. 7 is a partial section similar to FIG. 6 but showing the components in another operating position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While the present invention is applicable to various types of temperature controls for heating and/or cooling apparatus, it will be described in connection with burner apparatus of the heating type. Such apparatus, as shown in FIG. 1, includes a main burner **10**, a pilot burner **12** located in igniting proximity to the main burner **10**, and a thermocouple **14** disposed in the flame of the pilot burner **12**; the main burner **10** is part of a

furnace (not shown) supplying heat to a particular area which includes any suitable type of temperature responsive element. In the form illustrated the temperature responsive element is a bimetal switch **16** serially connected to the terminals **17** of an electric actuator and to the secondary winding of a transformer **18**, which is connected to any suitable power supply, such as a 110 volt source.

The flows of fuel to the main and pilot burners **10** and **12** are controlled by a combination control device embodied in a hollowed casing indicated generally at **20**, having an inlet port **22** on one end connected to a suitable fuel supply such as a gas source (not shown) and a main outlet port **24** on an opposite end connected to the main burner **10** by a suitable conduit. Adjacent the outlet port **24**, the casing **20** is provided with a sealed pressure tap connection **25** which may be unsealed and connected to a pressure gage for testing and/or measuring the outlet flow of the fuel; however, the connection **25** is not an operative part of the control apparatus and may be eliminated if so desired. The inlet and outlet ports **22** and **24** are disposed on a common axis with a valve seat **26** intermediately located therebetween. A flow through the valve seat **26** is controlled by a flexible diaphragm defining a main valve member **28**. The periphery of the diaphragm valve **28** is clamped between adjacent sections of the casing **20**, which are secured together as by capscrews (not shown). The main diaphragm valve **28** separates a hollow cavity of the casing into an inlet pressure chamber **30** and an operating pressure chamber **32**. A backup plate **33** is secured to the undersurface of diaphragm **28** and a coil spring **34** is mounted in compression between the bottom casing wall of the operating pressure chamber **32** and the backup plate **33** whereby the diaphragm valve **28** is biased toward engagement with the valve seat **26**.

The inlet pressure chamber **30** communicates with the inlet **22** by means of a tapered conical bore **36** which defines a seat for a rotatable plug valve **38** having a similarly tapered conical configuration. The central portion of plug valve **38** is hollowed out and has an open bottom wall communicating with the inlet pressure chamber **30**. Intermediate its ends, the tapered wall of plug valve **38** has an inlet bore **40** for registry with an inlet passage **42** in the casing **20**. An arcuate groove **44** in the wall of plug valve **38** establishes communication between the inlet passage **42** and a pilot flow passage **46** which leads to pilot flow filter cavity **47** in the casing **20**. The filter cavity **47** has an outlet **48** leading to a passage **49** wherein the pilot flow is adjustably set by a screw type sleeve valve **50** for delivery to a passage **51** which leads to a pilot outlet **52** that is connected to the pilot burner **12** by a suitable conduit.

The large end of the plug valve **38** includes a hollow stem **54** in which an operating shaft **56** is keyed for relative axial movement and for unitary rotary movement therebetween. The shaft **56** also has a hollow portion seating a coil spring **57** that is mounted in compression between the stem **54** and shaft **56**. An annular shoulder **58** on the shaft **56** engages an internal annular wall **59** in the casing **20** to define the limit of axial movement of the shaft **56** by the coil spring **57**; the shaft **56** protrudes through the casing **20** and has a manual operating dial or knob **60** fixed on the end thereof. The undersurface of the dial **60** is partially recessed to receive a stop element **62** on the casing **20** whereby the dial **60** may only be fully depressed when it is in its "pilot" position; when the dial **60** is rotated to its "off" or "on" position, the stop element **62** prevents full depression of the dial **60** for a purpose to be described more fully hereinafter.

Adjacent the manual dial **60**, the casing **20** is apertured at **64** in which a magnet housing **66** is fixedly supported. As is well known in the art, a thermoelectric magnet in the housing **66** is electrically connected to the thermocouple **14** to constitute a safety-holding device; i.e., the thermoelectric voltage generated by the thermocouple **14** in response to a flame at the pilot burner **12**, is not sufficient to attract the armature **67** against the bias of its coil spring **68** but it is sufficient to hold the armature against the magnet. The coil spring **68** surrounds the protruding portion of the armature **67** and is mounted in

compression between a wall of the housing **66** and a retainer washer **69** secured to the free end of armature **67**. An intermediate portion of a lever **70** is engageable by the free end of armature **67**; a mounting ear adjacent one end of lever **70** is pivoted to a projection on an internal wall of casing **20** with a torsion spring **71** biasing the lever **70** to its valve open position when the magnet **66** is energized. Adjacent the spring **71**, the free end of lever **70** is disposed in the path of axial movement of the annular shoulder **58** on the shaft **56** whereby depression thereof by the dial **60** causes the lever **70** to pivot clockwise about its pivotal axis. The opposite end of lever **70** carries a safety valve member **72** which seats against the wall surrounding the inlet passage **42**.

Between the inlet port **22** and inlet passage **42**, the casing **20** is hollowed out to define an inlet chamber **74** that houses the electromagnetic safety device including elements **66** through **72**. Adjacent the inlet passage **42**, the bottom wall of inlet chamber **74** is recessed to form a groove **75** having a length greater than the diameter or size of the opening **42**. The groove **75** acts as an impurity catcher whereby dirt, dust, scale, etc. that may be entrained in the incoming gas flow, will settle in the collector groove **75** and will not enter the valve body to interfere with any of the valve closures therein. Even through the inlet port **22** may be provided with a filter screen, the inlet pressure of the gas is such that some impurities are carried through the filter screen; of course, it is not feasible to reduce the inlet pressure because such pressure is predesigned to accommodate a particular B.t.u. input at the main burner **10**. As is shown in FIG. **2**, the inlet port is transverse to the inlet passage **42** so that incoming gas impinges on a wall of the inlet chamber **74** and the flow path has a change of direction before entering the inlet passage **42**. Such impingement will further enhance sedimentation of impurities and facilitate movement and settling of impure particles into the filtering groove **75**. It should also be noted that the filtering groove **75** is located directly below the inlet passage **42**, i.e., adjacent the outlet for the inlet chamber **74** so as to be in the most efficient position in acting as an impurity collector for the entire inlet chamber **74**. In addition, the impurity collector groove **75** is so located as to permit easy cleaning with access thereto being had through the inlet port **22** and/or through the opening **64** upon removal of the magnet housing **66**.

Downstream of the manual plug valve **38** and upstream of the main valve seat **26**, the casing **20** has a bleed line conduit **76** leading from the inlet pressure chamber **30** to a bleed line filter cavity **77** which communicates with a pair of branch bleed lines. The first branch bleed line includes a bleed passage **78**, a flow restrictor **79** and a bleed passage **80** communicating with a valve chamber **81**. The second branch bleed line has a bleed passage **82** terminating in an inlet valve seat **83** that communicates with the valve chamber **81**. An open bleed line passage **84** from the valve chamber **81** extends to the underside of the main diaphragm **28** into communication with the operating pressure chamber **32**.

A controlled bleed line passage from the bleed valve chamber **81** includes an outlet valve seat **85**, a bleed passage **86**, a bleed line pressure regulator **87**, and an bleed passage **88** establishing communication between the outlet side of the regulator **87** and the main outlet port **24**. The pressure regulator may be of any conventional type such as is best illustrated in the larger view of FIG. **4** and includes a regulating valve regulating the bleed line flow from passage **86** into a regulating chamber which communicates with the bleed line outlet passage **88**. A movable wall of the regulating chamber is defined by a flexible diaphragm having one side attached to the regulating valve and its opposite side being subject to atmospheric pressure by a suitable vent in the regulating housing. A coil spring biases such opposite side of the flexible diaphragm and the biasing force is adjustable by a setscrew upon removal of a snap-off cover member on the top of the regulator housing.

For control of the two valve seats **83** and **85**, the bleed valve chamber **81** houses actuating mechanism which may be of any suitable type such as an hydraulic actuator, an electrical actuator, etc. In the form illustrated in FIG. **1**, an electrical actuator is utilized and includes an electromagnetic device **90** having a core fixedly supported to a casing wall in the chamber **81** and an electrical coil wound thereon and electrically connected by lead wires (not shown) to the terminal posts **17** for connection in the space thermostat circuit. The supporting frame for the electromagnetic device **90** has an attaching ear for a coil spring **91** and a fulcrum for a generally U-shaped armature **92**; the coil spring **91** is mounted in tension between such attaching ear and one end of the armature **92**. The opposite end of armature **92** has a flange **93** defining an operative connection for a dual valve plate **94**. The valve plate **94** is pivoted intermediate its ends to a pivot pin **95** carried by the casing wall between the bleed valve seats **83** and **85**. The top of valve plate **94** is covered with resilient material so that one end defines a valve member **96** cooperating with the bleed inlet valve seat **83** and the opposite end defines a valve member **97** cooperating with the bleed outlet valve seat **85**. A coil spring **98** is mounted in compression between an internal casing wall and the valve member **97** to bias the valve plate **94** clockwise about its pivot **95**.

The casing **20** and its components are shown schematically arranged in FIG. **1** in order to facilitate their descriptions and to illustrate in a clear manner the external connections for the components. The valve casing **20** may be integrally cast or molded but ease of assembly is enhanced by utilizing separate casing sections having suitable gaskets therebetween and secured together as an integral unit by suitable fastening means such as capscrews (not shown). However, whether the casing **20** is integrally cast or formed from a plurality of mating sections, the arrangement described above possesses the particular advantage that the connections for all the operating components are located on the top wall of the casing **20**. For instance, the thermocouple cable connector for the safety-holding magnet **66**, the manual-operating dial **60**, the pilot flow adjustment means **50**, the pilot flow outlet **52**, the terminal posts **17**, and the pressure regulator **87** are all located on the top of the casing **20** as shown in FIGS. **1** and **3**. This arrangement has a particular advantage in that once the casing **10** is operatively connected in the system, all the connections for the operating components are disposed on one wall of such casing. Thus, the installation mechanic and/or the serviceman is not confronted with the problems of locating the various connections and then making such connections in an area that is necessarily confined because the casing **10** is located as close to the heating appliance as is possible. Even after the casing **20** has been installed, it may be necessary for a repairman to replace one of the operating components, such as the thermocouple cable connector to magnet **66**, or to adjust the pilot flow restrictor **50** or the pressure regulator **87**, in which event, such replacement and/or adjustments are easily accomplished since their connections are all located on the same wall of the casing **10**. While the description and drawing refers to the top wall as being the one which defines the locations of such connections, other walls of casing **20** may be used; it is only necessary that all the connections for the operating components be located on one and the same wall.

In the following description of a sequence of operation of the control apparatus, it should be noted that the flame shown at pilot burner **12** is merely to illustrate its relationship to the main burner **10** and the thermocouple **14**. Thus in FIG. **1**, the plug valve dial **60** is in its "on" position but for some reason the pilot burner flame was extinguished causing deenergization of the holding magnet **66** and closure of the safety valve **72** to define a 100 percent shutoff condition of all fuel flow through the casing **20**. In order to commence operation of the system, the plug valve dial **60** is first rotated to its "pilot" position wherein the plug valve inlet **40** is out of registry with the inlet passage but the pilot flow groove **44** establishes communication between the inlet passage **42** and the pilot flow passage **46**. When in its "pilot" position, the plug valve dial **60** may be depressed because its partial recess is aligned with the

stop element 62. Upon axial depression of the plug valve dial 60 and its shaft 56 against the bias of coil spring 57, the reset shoulder 58 engages the free end of lever 70 and pivots the same clockwise as view in FIG. 1; this clockwise movement causes lever 70 to move armature 67 against the pole faces of the holding magnet 66 and simultaneously moves the safety valve 72 to an open position. A pilot flow of fuel now proceeds from the inlet chamber 74 through the inlet passage 42, the plug valve groove 44, the pilot flow passage 46, the filter cavity 47, the cavity outlet 48, the passage 49, the sleeve valve 50, the passage 51 and the pilot flow outlet 52 to the pilot burner 12 where it is ignited by any suitable means, such as a match.

As soon as the thermocouple 14 generates sufficient voltage to energize the holding magnet 66, the plug valve dial 60 may be released whereupon it will axially return to normal axial position. The corresponding upward movement of the reset shoulder 58 is not followed by the free end of lever 70 because the torsion spring 71 retains the lever 70 and safety valve 72 in an open position relative to the inlet passage 42.

The plug valve dial 60 is now rotated to its "on" position wherein the plug valve inlet 40 is in registry with the inlet passage 42. During each rotation, the plug valve groove 44 maintains registry with the inlet passage 42 because its arcuate length is sufficient to provide an overlap for movement between "pilot" and "on" positions of the plug valve 38; thus the flame at the pilot burner 12 continues since there is no interruption of the pilot flow of fuel. As is shown in FIG. 1, the "on" position of the plug valve 38 permits a main flow of fuel to the inlet pressure chamber 30.

A bleed flow proceeds from the inlet pressure chamber 30 through the bleed line conduit 76, the bleed line filter cavity 77 and both branch bleed lines 78—79—80 and 82—83 into the bleed valve chamber 81, thence through the always opened bleed line passage 84 to the operating pressure chamber 32. With such an arrangement the inlet pressure chamber 30 and the operating pressure chamber are subject to inlet pressure and there is no pressure differential between opposite side of the main diaphragm valve 28 which is accordingly biased to its closed position on the main valve seat 26 by the coil spring 34. Closure of the main valve seat 26 prevents any flow to the main burner 10 so it is apparent that the space thermostat 16 is in a satisfied or opened condition as shown in FIG. 1.

When the space thermostat 16 becomes unsatisfied or closes, the energizing circuit for the electromagnet 90 is completed whereby the armature 92 is pivoted clockwise (as viewed in FIG. 1) against the bias of tension spring 91. The armature flange 93 then releases the adjacent end of the valve plate 94 which is pivoted clockwise about the pin 95 by the action of the coil spring 98 whereupon the bleed line valve seat 83 is closed and valve seat 85 is opened. Closure of the valve seat 83 cuts off the unrestricted bleed flow from the bleed passage 82 into the bleed valve chamber 81 but the restricted bleed flow from the bleed passage 80 is permitted. With the valve seat 85 opened, the bleed valve chamber 81 is vented to the outlet 24 in a path traced through the bleed passage 86, the bleed line pressure regulation 87 and the outlet bleed passage 88; at the same time the operating pressure chamber 32 is depressurized by being bled to the lower pressure chamber 81 since the bleed line passage 84 is always in communication with the bleed valve chamber 81. Depressurization of the operating pressure chamber 32 causes the main diaphragm valve 32 to move to an open position because the pressure differential on the top side thereof from the higher pressure of the inlet pressure chamber 30. The main diaphragm valve 28 now assumes its regulating position to regulate the pressure of the fluid flow to the main burner 10. The setting of the bleed line pressure regulator 87 defines the rate of flow to the bleed line outlet sensing port 88, so that the regulating position of the main diaphragm valve 28 may also be adjusted by adjusting the bleed line regulator 87.

The above arrangement assures minimum pressure deviation at outlet 24 under variations in inlet pressure and throughput so that straight line pressure regulation is obtained through the response of the main valve 28 to the small-sensing regulator 87 in the internal bleed line.

When the temperature requirements of the space being temperature controlled are satisfied, the space thermostat 16 opens the energizing circuit for the electromagnet 90 causing the armature lever 92 and valve plate 94 to pivot counterclockwise (as viewed in FIG. 1) whereby the bleed valve seat 85 is closed and the bleed valve seat 83 is opened. At this time, there is no bleed flow out of the bleed valve chamber 81 and the bleed flows from both the restricted passage 80 and the unrestricted or bypass passage 82 into the bleed valve chamber 81 proceed through the bleed passage 84 into the operating pressure chamber 32 which is again pressurized causing closure of the main diaphragm valve 28 so there is no fuel flow to the main burner 10. This arrangement has the particular advantage of insuring the off position of the main valve 28 because of the opened unrestricted bleed passage 82. Even if the orifice 79 should not function properly, as by being clogged in spite of the many filtering devices upstream thereof, the bypass bleed passage 82 will provide the necessary bleed flow to pressurize the operating pressure chamber 32. In addition to providing positive main valve closure independently of the bleed line restricting orifice 79, the unrestricted bleed line passage 82 assures that such closure will be at a rapid rate. Since the bleed valve members 96 and 97 are located on the same valve plate 94, simultaneous actuation occurs so that closure of the outlet bleed passage 86 results from deenergization of the electromagnet 90.

The main burner 10 will be cycled thermostatically in accordance with the temperature demand sensed by the thermal sensor 16. In the event the flame at the pilot burner 12 should be extinguished for any reason, the thermocouple 14 will cool and the electromagnetic coil of the holding device 66 will be deenergized causing release of the armature 67. Because the coil spring 68 exerts a greater force than the torsion spring 71, the armature 67 will cause counterclockwise movement of the lever 70 and closure of the safety valve 72, which results in the cut off of all fuel flow to the main and pilot burners 10 and 12. To reestablish the flame at the pilot burner 12, the igniting procedure outlined above must be repeated, i.e., the dial 60 must be rotated to its "pilot" position before it can be depressed to a reset position.

In the following description of the two modifications of the bleed line controls, the same reference numerals are utilized for those parts already described in connection with FIGS. 1—3 while new reference numerals in the 100 series are utilized for FIGS. 4 and 5, and new reference numerals in the 200 series are utilized for FIGS. 6 and 7. Accordingly, in FIGS. 4 and 5, the unrestricted bleed passage 182 leads into an annular passage 183 one wall of which is defined by a flexible diaphragm 184 having a central port 185. A compression coil spring 186 on one side of the diaphragm 184 biases the same toward a fixed annular valve seat 187. A poppet valve member 188 reciprocates through a cylindrical bore 189 having the annular valve seat 187 on one end; the poppet valve 188 is of noncircular cross section so that a bleed flow is permitted between the poppet valve 188 and the cylindrical bore 189. One end of the poppet valve 188 has an annular valve seat 190 which is of a larger diameter than the central port 185 to cut off bleed flow thereto. The other end of poppet valve 188 has a valve stem 191 coupled to the actuated arm 192 of any suitable type of bleed line operators. The valve stem 191 reciprocally extends through a guide plate 193 having a plurality of bleed flow apertures to establish communication between the bleed valve chamber 81 and the cylindrical bore 189.

The operation of the bleed line valves in the modification of FIGS. 4 and 5 accomplishes the same results as described above in connection with FIG. 1 and will not be repeated for the sake of brevity. The center-ported type of bleed line control has the particular advantage that one valve member must close before the other opens; this is desirable with relatively slow operation mechanisms such as heat motor bimetal operators.

FIG. 4 represents the "off" condition of the main burner 10 inasmuch as the actuated arm 192 is in its deenergized position. The unrestricted bleed flow is thus traced from the passage 182 through the passage 183, the valve seat 187, the cylindrical bore 189 and the apertured guide plate 193 into the bleed valve chamber 81, whence the operating pressure chamber 32 is pressurized. When the actuated arm 192 is energized, it pulls the poppet valve member 188 downward as viewed in FIG. 5 whereby the unrestricted bleed flow is cut off and the bleed valve chamber 81 is bled through the apertured guide plate 193, the cylindrical bore 189, the opened diaphragm port 185, the bleed passage 85 and the regulator 87 to the bleed outlet passage 88.

In the modification of FIGS. 6 and 7, the unrestricted bleed passage 282 into an annular passage 283, one wall of which is defined by a flexible diaphragm 284. One side of the diaphragm 284 cooperates with a valve seat 285 leading to the bleed passage 85 and is biased therefrom by a compression coil spring 286; the other side of diaphragm 284 is thus biased toward a fixed annular valve seat 287. A noncircular poppet member 288 reciprocates through a cylindrical bore 289 having the annular valve seat 287 on one end; the other end of the poppet 288 has a stem 291 coupled to the actuated arm 292 of any suitable type of biased line operators. The stem 291 reciprocally extends through a guide plate 293 having a plurality of apertures to establish communication between the bleed valve chamber 81 and the cylindrical bore 289. A passage 294 from the bleed valve chamber 81 to the topside of diaphragm 284 permits the bleeding of the chamber 81 when the actuator arm 292 is energized as is illustrated in FIG. 7. The remaining elements in FIGS. 6 and 7 function in the same manner as FIGS. 4 and 5 so their operation will not be repeated for the sake of brevity.

Inasmuch as the present invention is subject to many modifications, variations and changes in detail, it is intended that all matter contained in the foregoing description of the preferred embodiments or shown on the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a fluid flow control system, the combination comprising

a casing having inlet and outlet means and main valve means for controlling a fluid flow therebetween,

diaphragm means for moving said main valve means and cooperating with a wall portion of said casing to define an operating pressure chamber,

bleed flow means having inlet and outlet portions and an intermediate portion communicating with said operating pressure chamber to cause actuation of said diaphragm means,

said inlet portion of said bleed flow means including a pair of branch bleed lines communicating with said intermediate portion,

one of said branch bleed lines defining an unrestricted bleed passage and the other defining a restricted flow passage, and

automatically operated bleed valve means controlling said unrestricted bleed passage whereby said operating pressure chamber is assured of a supply of pressure fluid for actuation of said diaphragm valve means.

2. The invention as recited in claim 1 wherein said automatically operated bleed valve means comprises dual bleed valves, one of said bleed valves controlling a bleed flow from said unrestricted bleed passage into said intermediate portion and the other controlling a bleed flow from said intermediate portion to said outlet portion.

3. The invention as recited in claim 2 wherein said outlet portion includes a pressure regulator.

4. The invention as recited in claim 1 wherein said automatically operated bleed valve means comprises a valve seat for said unrestricted bleed passage and a valve seat for said outlet portion, both of said valve seats communicating with said intermediate portion, and dual valve means alternately controlling said valve seats whereby a bleed flow to said outlet portion is cut off when an unrestricted bleed flow to said intermediate portion is permitted.

5. The invention as recited in claim 4 wherein said restricted flow passage is always open to said intermediate portion to provide a restricted bleed flow therethrough when the valve seat of said outlet portion is opened by said dual valve means.

6. The invention as recited in claim 5 wherein said dual valve means includes a pivoted valve plate having a valve face on each end for alternate cooperation with the valve seats.

7. The invention as recited in claim 4 wherein said dual valve means includes a centrally ported diaphragm and a poppet valve member cooperating therewith, and wherein the valve seat for said outlet portion is disposed on said poppet valve member to close the central port of said diaphragm, and the valve seat for said unrestricted bleed passage is disposed on a cylindrical wall through which said poppet valve member is movably guided.

8. The invention as recited in claim 4 wherein said dual valve means includes a diaphragm movable between said two valve seats.

9. The invention as recited in claim 8 wherein said diaphragm is movable by a poppet member for alternate engagement of said two valve seats.

10. The invention as recited in claim 4 wherein said casing has an inlet chamber adjacent said inlet means, said inlet chamber having a recessed groove in a bottom wall thereof to collect impurities from the fluid flow whereby clogging of the restricted bleed passage is minimized.