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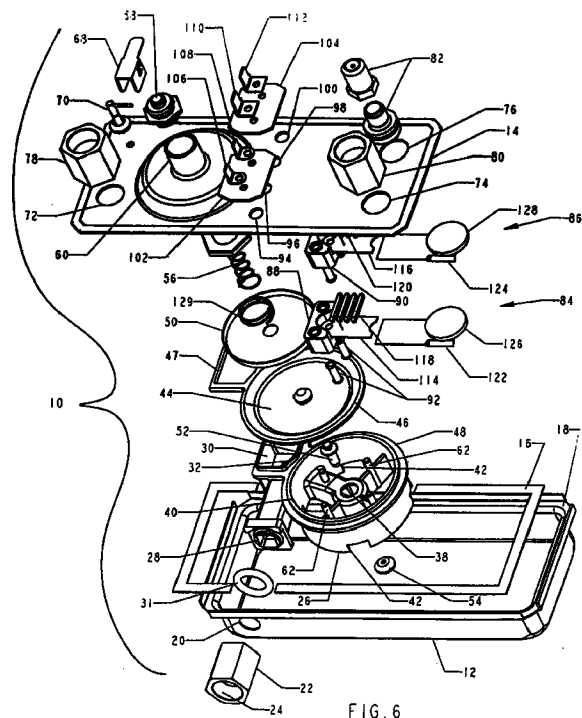
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(54) Combined pressure regulator and valve assembly for controlling fuel gas flow to plural burners

(57) A combination manual shut-off valve, pressure regulator and plural electrically operated burner control valves for gas cooking appliances. The regulator body is received in a housing shell sealed with a cover plate which seals the regulator diaphragm in the valving cavity in the regulator body. The electrically heated bimetal valve operators are attached to the undersurface of the cover for controlling flow to separate outlet ports in the cover. A third outlet in the cover is unvalved. The inlet is formed in the housing shell and is connected to a passage in the regulator block which feeds to the manual shut-off valve which has an actuator extending exteriorly of the cover. The shut-off valve feeds a transfer passage which is connected to the regulator poppet seat for supplying the regulator chamber having a pressure responsive diaphragm. The regulator chamber is open to the interior of the shell to supply the valved outlet ports.



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## Description

### BACKGROUND OF THE INVENTION

The present invention relates to the control of fuel gas flow to a plurality of burners and particularly to fuel gas burners employed for cooking appliances. The present invention relates to controlling fuel gas flow to top burners and oven burners employed in domestic cooking appliances.

Heretofore, in the design and manufacture of household cooking appliances such as cooktops and ranges, it has been the practice to provide a fuel gas pressure regulator in the gas line connection to the appliance with an upstream manual shut off valve for redundancy. In a typical household range or cooktop, individual electrically operated valves have been employed for controlling gas flow to each of the burners in connection with an ignitor for igniting the fuel/air mixture emanating from the burner. However, the complexity of the fuel line arrangement and the number of line connections required to install the shut off valve, regulator and individual burner valves in the appliance has proven to be cumbersome and quite costly in high volume production of household appliances in the competitive marketplace for such appliances.

Thus it has been desired to find a way or means of simplifying the tubing or conduit connections between the various valves and the burners and to reduce the cost of the burner installation in a cooking appliance.

### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a single unitary controller including the functions of manual shut off valve, pressure regulator and electrically operated control valves for controlling flow of fuel gas from a source to plural outlets adapted for connection to individual fuel gas burners.

It is a further object of the present invention to provide a single controller for fuel gas combining the functions of manual shut off valve, pressure regulator and electrically operated individual burner valves and which is simple in construction, easy to assemble during manufacturing and minimal in cost.

The present invention provides a unitary controller including a pressure regulator, manual shut off valve and plural electrically operated control valves for controlling fuel gas flow from an inlet adapted for connection to a source of fuel gas and plural outlets adapted individually for connection to separate fuel gas burners.

The controller of the present invention has a housing shell with an inlet adapted for connection to a source of fuel gas with a regulator body received in the shell and having a passage sealed over the shell inlet with a manual shut off valve disposed in the passage which communicates with a valving chamber to which flow is controlled by a regulator poppet connected to a pres-

sure responsive diaphragm for regulating fuel flow to the valving chamber. The valving chamber and pressure responsive member are sealed by the housing shell cover, and, the valving chamber has an outlet communicating with the interior of the housing shell. Plural electrically operated valve actuators are attached to the undersurface of the cover plate and are each operative upon electrical energization to move a poppet with respect to an individual outlet port of controller for permitting fuel gas flow to a selected burner.

The present invention thus provides a single controller combining the functions of a manual shut off valve, pressure regulator and a plurality of electrically operated individual burner control valves in an arrangement which is simple in construction, easy to assemble and low in manufacturing cost.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the controller of the present invention;

FIG. 2 is an axonometric view of the assembled controller of FIG. 1;

FIG. 3 is a section view taken along section indicating line 3-3 of FIG. 1;

FIG. 4 is a section view taken along section indicating line 4-4 of FIG. 1;

FIG. 5 is a section view taken along section indicating line 5-5 of FIG. 1; and,

FIG. 6 is an exploded view of the controller of FIG. 1.

### DETAILED DESCRIPTION

Referring to FIGS. 1, 2 and 6, the controller assembly indicated generally at 10 has a housing shell 12 which is covered by a cover plate 14 which is sealed by a resilient gasket or resilient seal 16 received in a cupped flange 18 formed about the periphery of the shell 12; and, the cover 14 is retained by folding over the edges of the flange 18 as shown in dashed outline in FIGS. 3, 4 and 5.

An inlet port 20 is formed in the side wall of shell 12; and, is a suitable inlet fitting 22 attached to the exterior thereof by any suitable expedient, as for example welding or brazing and which may have internal threads 24 for connection to a fuel gas supply conduit (not shown).

A pressure regulator body 26 is received in the interior of shell 12 and has an inlet 28 formed therein which has an annular resilient seal 31 disposed over the inlet for sealing same about the port 20 on the inner surface of the wall of shell 12.

Referring to FIGS. 1 and 5, the inlet 28 communicates with a first valving chamber 30 formed in the body 26 which has an outlet port 32 formed in the bottom thereof which communicates with a transfer passage 34 formed in the bottom of the body 26.

The transfer passage 34 communicates with a sec-

ond or regulator port 38 formed in the bottom of a record or regulator valving chamber or cavity 40 which has a plurality of outlets 42 which communicate with the interior of the shell 12.

Referring to FIGS. 3, 4 and 5, a pressure responsive diaphragm 44 is disposed to close the cavity 40 and form the upper wall thereof. The diaphragm has a peripheral bead or rim 46 sealed about the upper rim or periphery 48 of the cavity 40 by being compressed by the undersurface of the cover plate 14.

Attached to the upper surface of the diaphragm 44 is a backing plate 50 to which is centrally attached and sealed through the diaphragm a valve operating rod 52 which extends downwardly through the regulator valve port 38 into the transfer passage 34 and has attached to the lower end thereof a resilient poppet 54. Upon upward movement of the diaphragm 44 by a sufficient amount the poppet 54 is operable to seat on the rim of port 38 and block flow from transfer passage 34 to cavity 40. A preload spring 129 has one lower end registered against the backing plate 50 with its upper end registered against the cover 14. A conversion spring 56 has one lower end registered against the backing plate 50. The threaded fitting 58 as shown in FIG. 5, is covered with a protective cover 59.

In operation, plug 58 is adjusted to provide the desired compressed length of the spring 129 provides a preload which is established sufficient to move the diaphragm downwardly to cause poppet 54 to be unseated at a desired pressure in cavity 40. Thereafter, variations in the pressure and chamber 40 will cause the diaphragm to either decrease the opening between the poppet 54 and port 38 with increasing pressure, or with decreasing pressure, allow the diaphragm to drop under the urging of spring 129. The maximum opening of the poppet 54 with respect to port 38 is limited by stops 62 provided in the chamber 40 against which the undersurface of the diaphragm is registered when the pressure in chamber 40 drops below a predetermined minimum.

Referring to FIG. 5, the manual shut off valve poppet 64 is attached to the end of an operating rod 66 which extends upwardly through an aperture in the cover 14 and has the upper end thereof pivotally connected to a lift type tab actuator 68 by a pin 70.

In operation, when actuator 68 is lifted to the position shown in dashed outline in FIG. 2, the poppet 64 is lifted from contact with the rim of port 32 and the valve is in the open position. When the actuator is pivoted to the position shown in solid outline in FIG. 2, the poppet 64 is lowered to seat against the rim of port 32 and the shut off valve is in the closed or "OFF" position as shown in FIG. 5.

Referring to FIGS. 1, 2 and 6, the cover plate 14 has at least two and preferably three spaced outlet ports 72, 74, 76 formed therein attached to each of which is attached to an outlet fitting denoted respectively 78, 80, 82, which are secured by any suitable expedient such as welding or brazing. In the presently preferred prac-

tice, outlet fitting 78 is adapted for connection to a conduit supplying one or more top burners such as to a top burner manifold. Outlet 80 is preferably connected to an oven "Broil" burner; whereas, outlet 82 is adapted for connection to a conduit supplying an oven "Bake" burner.

Referring to FIG. 6, a portion of diaphragm rim 46 extends outwardly as denoted by reference numeral 47 and is configured to seal over the top of the body cap 30 by virtue of the pressure of the undersurface of cover plate 14.

Referring to FIGS. 3 and 6, a pair of electrically operated valve actuators indicated generally at 84, 86 are disposed on the undersurface of cover plate 14 for providing a valving function of the outlet ports 74, 76. Valve actuators 84, 86 include a mounting block respectively 88, 90 which in the present practice are formed of insulating material such as a ceramic. The blocks 88, 90 are attached to the cover 14 by conductive rivets such as denoted typically by reference numeral 92 which pass through correspondingly disposed apertures respectively 94, 96 and 98, 100 formed in the cover plate 14. The rivets extend upwardly through insulator pads respectively 102, 104 provided on the exterior of cover plate 14 and through electrical connector terminals 106, 108 and 110, 112 situated on the pads 102, 104. It will be understood that each of the rivets is riveted over one of the connector terminals 106, 108, 110, 112 for retaining the assembly of the block, pad and terminals onto the cover plate 14.

Each of the blocks 88, 90 has attached thereto a bimetal arm respectively 114, 116 about which is wrapped a wire heating coil 118, 120 which has its ends connected respectively to one of the rivets 92 mounting the blocks to the cover plate. Thus, the coil 118 has its ends electrically connected respectively to the terminals 106, 108 and coil 120 has its ends connected to terminals 110, 112.

Each of the bimetal arms 114, 116 has an extension mounted to the end thereof denoted respectively 122, 124 which extensions may also be of bimetal construction and oppositely disposed with respect to arms 114, 116 for ambient temperature compensation in a manner well known in the art.

Each of the extensions 122, 124 has attached to the free end thereof a resilient elastomeric poppet denoted respectively by reference numerals 126, 128. It will be understood that the valve actuators 84, 86 are so disposed that poppet 126 closes against the undersurface of port 74 in the cover; and, poppet 128 closes against the undersurface of port 76 in the cover plate.

In the de-energized state, that is with no current flowing through coils 118, 120, the poppets 126, 128 are biased to a closed position against their respective outlet ports. Upon energization of either of the coils 118, 120, the corresponding poppet is moved away from the outlet port and permitting flow through one of the ports 74, 76.

It will be understood that the outlet port 72 in the cover plate is continuously open with respect to the interior of shell 12; and, opening of the manual shut off valve poppet 64 results in fuel gas flow through port 72. Typically, port 72 is adapted to be connected to a manifold for top burners each of which has its own shut off valve.

The present invention thus provides a unique and novel combination manual shut-off valve pressure regulator and plural electrically operated valves for controlling flow to selected fuel gas burners.

The present invention provides a simplified construction for the combination controller wherein the pressure regulator is partially formed by the cover plate; and, the outlets and valve operators are connected to the cover plate as a sub-assembly simplifying manufacturing and providing for minimal cost.

Although the present invention has hereinabove been described with respect to the illustrated embodiments, it will be understood that the invention is capable of modification and variation and is limited only by the following claims.

#### Claims

1. A controller for fuel gas flow to multiple burners comprising:

(a) a housing structure including a hollow shell and a cover closing said hollow and attached thereto in fluid pressure sealing engagement;

(b) a fuel gas inlet port formed in one of said shell and said cover;

(c) a pressure regulator body disposed in said hollow and having a valving cavity formed therein and a passage communicating said cavity with said inlet port and an outlet communicating with the hollow of said shell;

(d) a manually operated valve disposed in said passage and operable, upon user actuation to block flow from said inlet to said valving cavity, said valve having an actuator extending externally of said housing means;

(e) a first and second gas outlet port formed in said housing means;

(f) a pressure responsive member disposed in said regulator body cavity and operable in response to changes in the pressure in said valving cavity to move a regulator valve member for controlling flow through said body outlet port to said hollow of said shell, said pressure regulator including means biasing said pressure responsive member in one direction;

(g) a first and second burner supply outlet port formed in said housing means; and,

(h) an electrically actuated valve member disposed adjacent each of said first and second outlet ports and operable for, upon electrical

energization and deenergization to individually open and close said outlet ports.

2. The controller defined in claim 1, wherein said cover effects a sealed closure for said regulator body cavity.

3. The controller defined in claim 1, wherein said pressure responsive member includes a diaphragm with a backing plate; and, said biasing means includes a spring having one reaction end registered against said cover and the opposite reaction end registered against said backing plate.

4. The controller defined in claim 1, wherein said inlet port is formed in said shell and said first and second outlets are formed in said cover.

5. The controller defined in claim 1, wherein said electrically actuated valve member includes an elastomeric poppet mounted on a bimetal arm.

6. The controller defined in claim 1, wherein said manually operated valve and said electrically actuated valve members are mounted on said cover as a sub-assembly.

7. An assembly for controlling fuel gas flow to multiple burners comprising:

(a) a housing shell having an open cavity therein and a cover sealed thereover closing said cavity;

(b) a fuel gas inlet port formed in said shell;

(c) a regulator body having an inlet passage communicating with a valving chamber formed therein, said body disposed in said shell cavity and having the inlet passage thereof communicating with said shell inlet port, said valving chamber including an outlet port communicating with said shell cavity and pressure responsive member operably connected to move a moveable valve member with respect to said outlet port for controlling fuel flow through said chamber outlet part, wherein said cover means is operative to seal said pressure responsive member about said valving chamber;

(d) first and second spaced fuel gas outlet ports formed in said cover;

(e) first and second electrically operated valve means disposed in said shell cavity and operable upon individual electrical energization to control flow respectively in said first and second outlet port.

8. The assembly defined in claim 7, further comprising a manual shut-off valve disposed in said regulator body passage, said shut-off valve having a user

moveable actuator extending externally through said cover.

9. The assembly defined in claim 7, further comprising a manually actuated shut-off valve disposed in said regulator body passage with an actuator member extending through said cover; and, wherein said first and second electrically operated valves are mounted on the underside of said cover.

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10. The assembly defined in claim 7, wherein said pressure responsive member comprises a flexible diaphragm sealed about the periphery thereof on said regulator body valving chamber by said cover.

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11. The assembly defined in claim 7, further comprising means biasing said pressure responsive member in a direction to effect opening of said regulator valve member with respect to said regulator body outlet port.

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12. The assembly defined in claim 7, wherein said pressure responsive means comprises a flexible diaphragm; and, portions of said diaphragm provides a seal between said regulator body inlet passage and said cover.

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13. The assembly defined in claim 7, wherein said first and second electrically operated valve means are mounted on the inside of said cover with electrical connector terminals therefor extending exteriorly of said cover for external electrical connection thereto.

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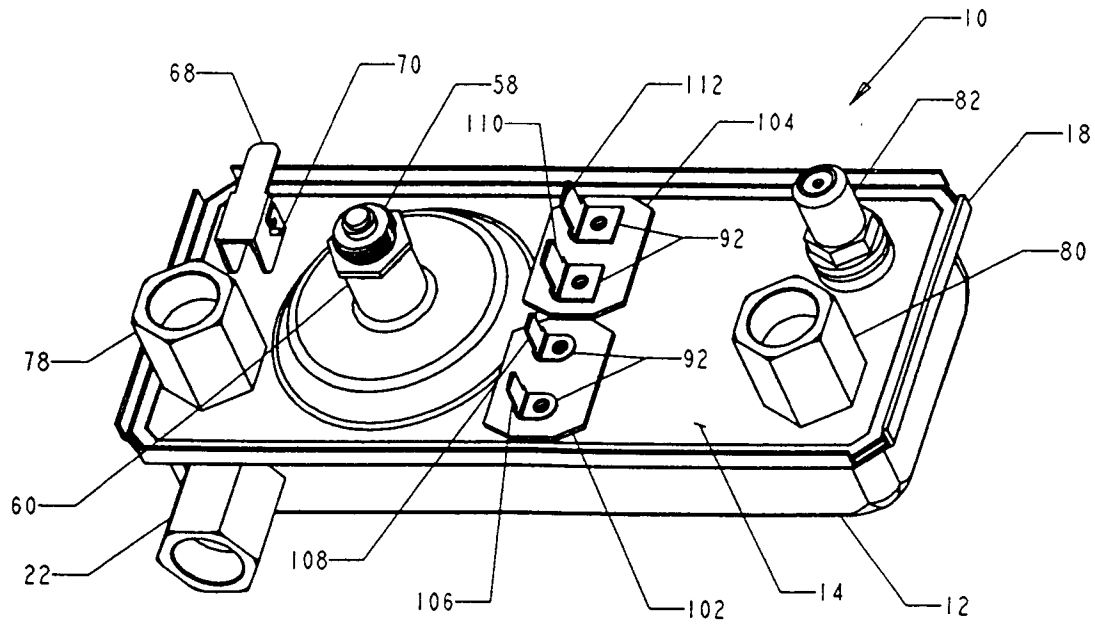
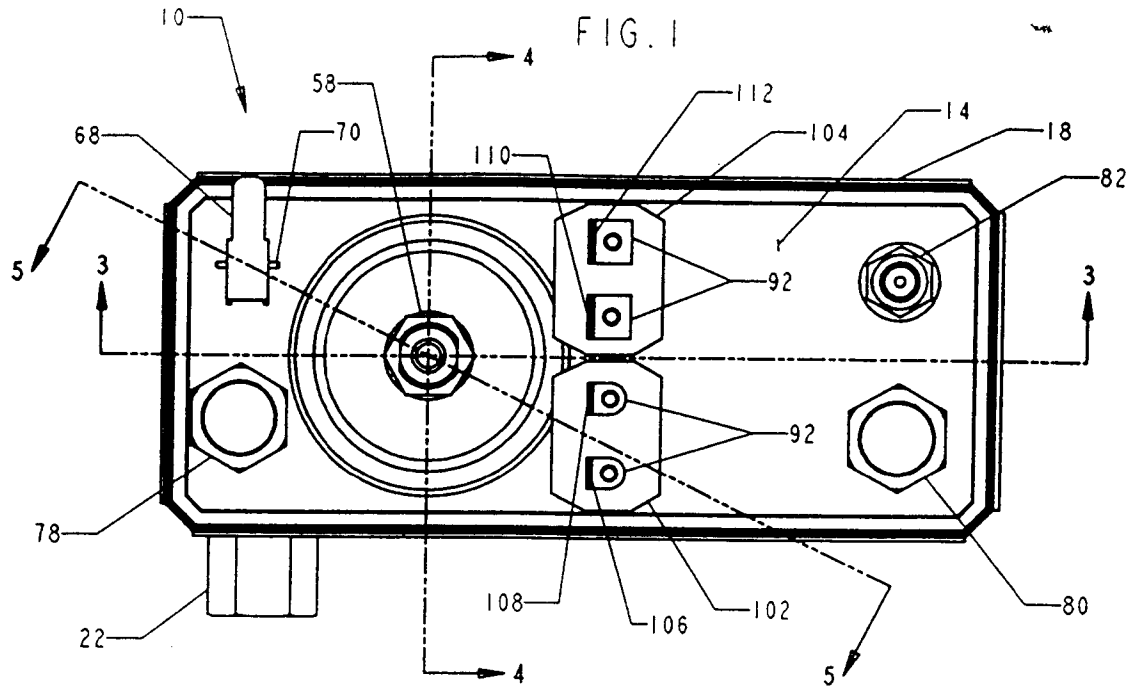
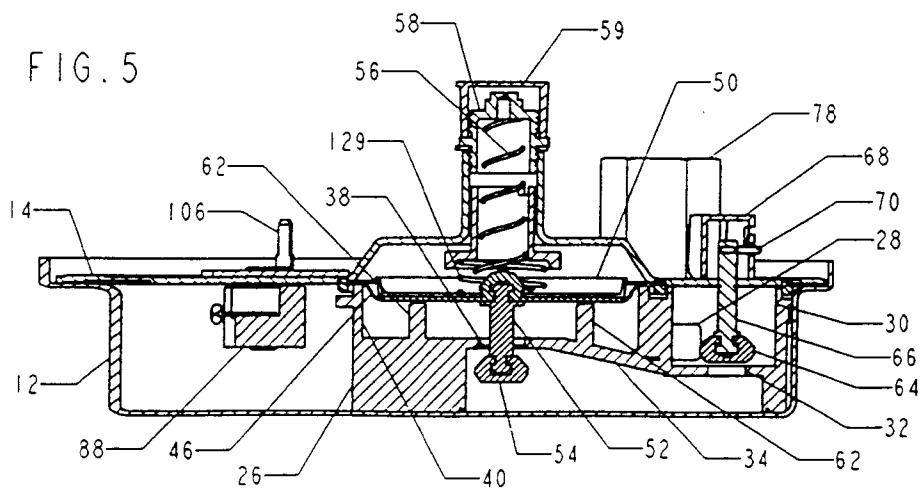
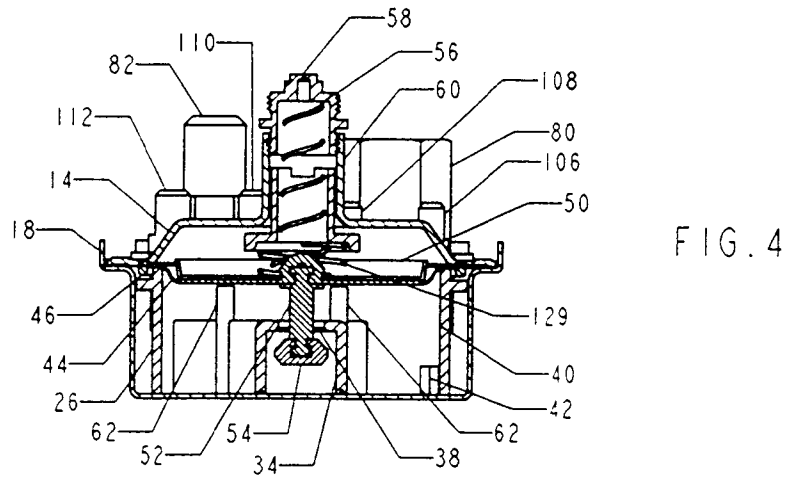
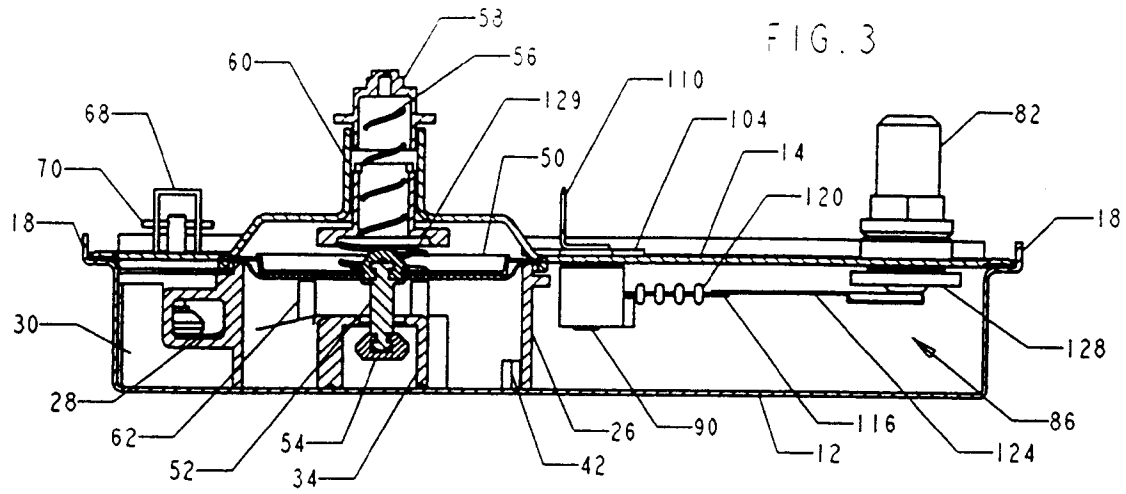


FIG. 2



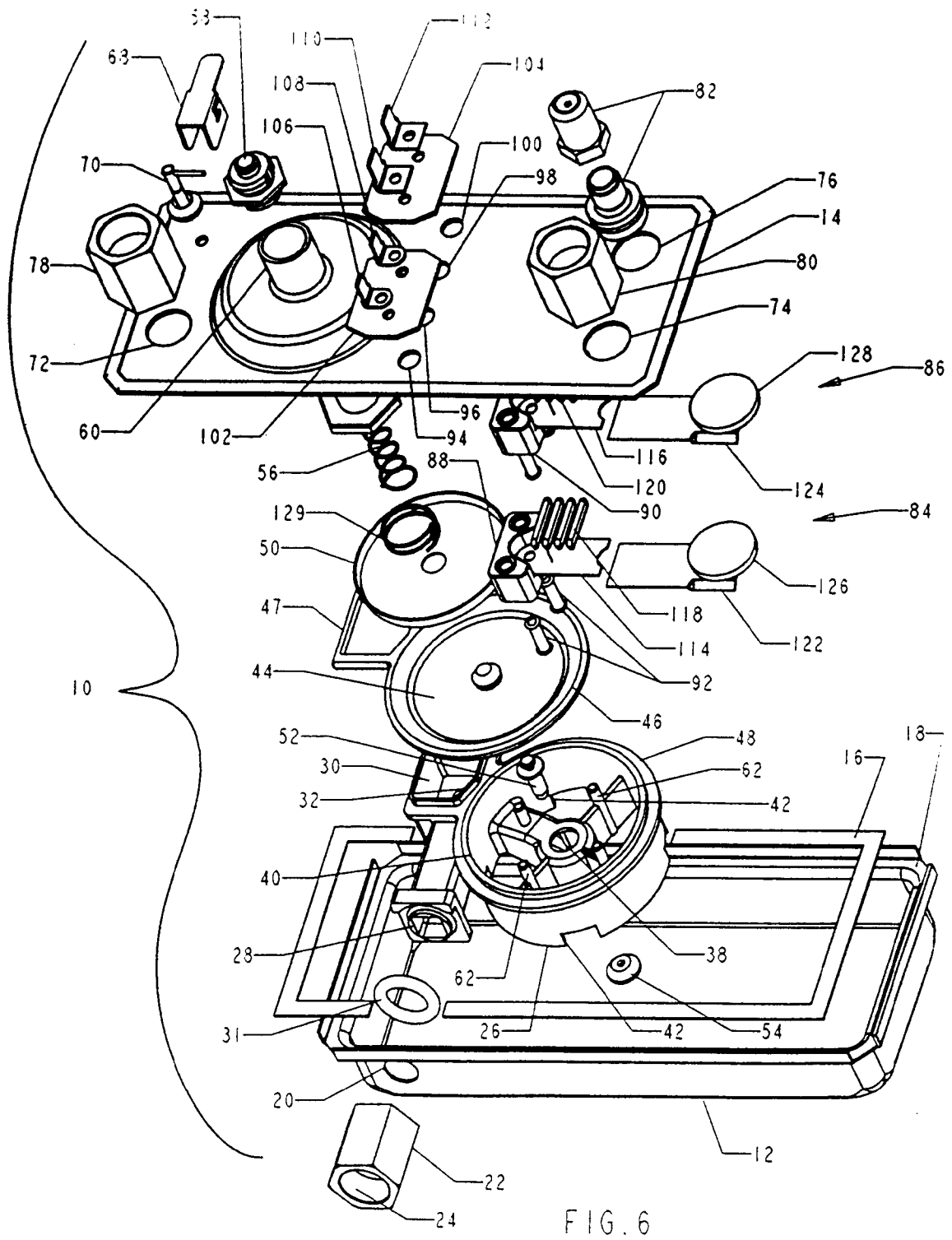


FIG. 6