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Gas fired appliance.

The present specification discloses a gas-fired appliance comprising a burner arrangement (37,39) for the combustion of gas with a valve arrangement (43) located in a gas flow line to said burner arrangement (37,39). To thus adjust the burner arrangement (37,39) a person must approach the appliance and manually adjust the valve arrangement (43).

The present invention provides a receiver (51) in the appliance, the receiver (51) being adapted to control the opening and/or closing of the valve arrangement (43) in response to signals received from a transmitter (53) operable at a position remote from the appliance. Thus the burner arrangement (37,39) can be controlled at a distance. This is especially useful for the aged and infirm, particularly with regard to gas fires. The present invention also provides a valve (1) which is opened by a surge current which then reduces to a value sufficient only to hold the valve (1) open against the force of a spring (21).

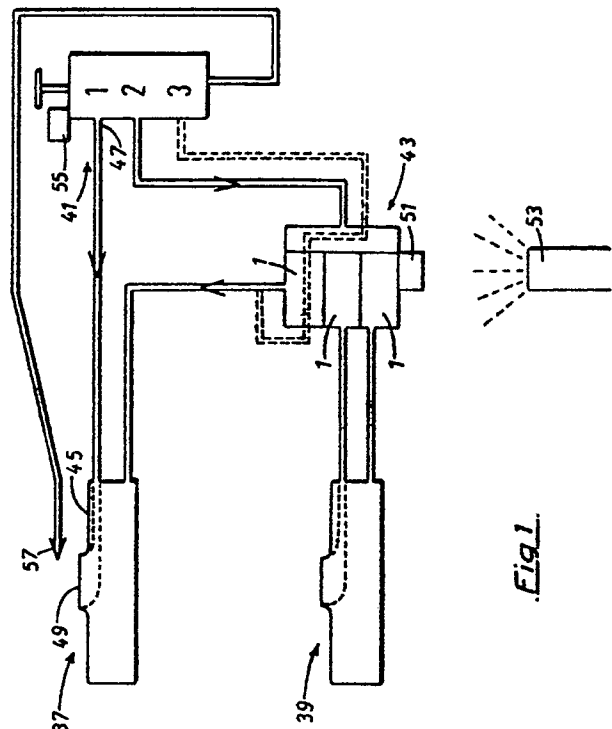


Fig. 1.

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GAS FIRED APPLIANCE.

The present invention relates to a gas-fired appliance such as a gas fire or gas cooker.

In particular the present invention relates to a gas-fired appliance wherein the flow of gas or gas/air mix to a burner is controlled by a valve. Conventionally such valves are manually operable requiring someone to approach the appliance and manually adjust the or each such valve. With, for example, gas fires, this usually means that someone has to get up out of his/her seat, approach the fire, perform the valve adjustment and return to his/her seat. Whilst this may not be generally considered to be too much of a hardship, it can be a somewhat difficult operation in the case of the aged and/or infirm.

The aim of the present invention is therefore to enable a gas-fired appliance to be remotely controllable, thus simplifying control of the appliance.

According to the present invention there is provided a gas-fired appliance comprising a burner for the combustion of gas, a valve in a gas flow line to said burner, a receiver arranged to control opening and/or closing of said valve, and a transmitter operable at a position remote from the appliance to actuate said receiver.

The transmitter can thus be pointed at the appliance from a remote location and by activating different controls, different signals, e.g. electromagnetic wave signals, can be transmitted to the receiver, and evaluated by the receiver, the receiver then operating the valve or valves according to the signal received.

In one preferred form of the present invention the appliance is a gas fire having three electromagnetic valves, connected to an electromagnetic wave, e.g. infra red, receiver. The valves are arranged to control the gas feed to two duplex gas burners of the fire, i.e. a main aerated gas burner and a neat gas burner for producing the wispy yellow flames for added realism in a solid fuel effect fire. The fire is initially controllable by a manually operable gas tap with three possible positions besides the 'off' position. When this gas tap is operated it activates an igniter as well as allowing gas to flow. Alternatively, an igniter which is operable independently of the gas tap may be provided. In position "1", gas flows to one region of the duplex main gas burner, thus allowing for operation even if the electricity supply to the valve arrangements has, for some reason, been terminated. In position "2", gas additionally flows to the three valve arrangements which, if opened by the remote transmitter, can allow gas to flow to the other area of the duplex main gas burner, and to either or both areas of the duplex neat gas burner.

In position "3" the valve arrangement which controls gas feed to the said other region of the duplex main gas burner is bypassed, thereby allowing for complete main burner operation should the electricity supply fail. Position "3" may, of course, be omitted, and the assembly of valve arrangements may be modified to include more or less than the above-described three valve arrangements.

The present invention also provides a valve especially for use in positively controlling gas flow through a feed pipe or manifold. Known valves of this type usually take the form of solenoid valves having a large bulky winding to which a required operational current is applied. The large bulk of the valve necessitates the location of the major part of the valve outside the gas feed pipe or manifold, and thus a valve closure member located within the feed pipe or manifold has to be connected to the solenoid part of the valve through the wall of the pipe or manifold. Thus appropriate seals or flexible diaphragm arrangements are required to prevent gas leakage. However, such seals and/or diaphragms can deteriorate with age and use, resulting in an undesired and possibly dangerous gas leakage. Further, such bulky valve constructions are not readily suitable for installation within the usually limited space available within certain gas appliances, e.g. gas fires, especially if a number of such valves are required.

Whilst it may be considered possible to miniaturise an electromagnetic valve, for location actually within a gas feed pipe or manifold, with electrical connections in the wall of the pipe or manifold there is clearly a danger when using the required electrical current to both open and hold the valve open against the force of the biasing spring, as should there be a fault, a spark may be generated and an explosion might occur.

The aim of this further aspect of the present invention is to provide a miniaturised valve arrangement which can be more safely used within a gas feed pipe or manifold, the valve arrangement being suitable for use, for example, in a gas fire.

According to the present invention there is provided a valve arrangement for use in a gas appliance, comprising a valve closure member and an electrical winding, the electrical winding being connected in an electrical circuit which, when completed, produces a surge current which passes through the winding for a period of time and is sufficient to produce a field which moves the closure member against a spring from a first position to a second position, the current then reducing after the elapse of said period of time, to a value which produces a field still sufficient to hold the

closure member in said second position against the force of said spring.

In a preferred embodiment of the present invention the valve closure member closes said valve arrangement when in said first position and opens the valve when moved to said second position. The opposite arrangement can of course be used. By reducing the current after said elapse of said period of time to merely be sufficient to hold the valve of the preferred embodiment open, the danger of sparking and explosion in the event of a fault is removed. Also by keeping said period of time to a minimum, e.g. an instantaneous surge, the fear of ignition in the event of an electrical fault in the valve is reduced.

As will be appreciated, the spring must necessarily have a certain minimum spring rate to be sure of positive closure, and thus the field and therefore winding size, have to be sufficient to overcome the spring rate and open the valve. To improve the efficiency of the valve by minimising the current necessary to hold the valve open, the winding is preferably provided on a U-shaped core with a keep/armature attached to the closure member and arranged to engage both arms of the U-shaped core when the valve is opened, so that the core and keep form a perfect magnetic loop.

In the preferred embodiment, the said electrical circuit comprises a capacitor connected across part of a potential divider, the potential divider being connected to a D.C. supply of electricity via a switch. The winding is itself connected in series with the capacitor and potential divider so that when the switch is closed the capacitor effectively short circuits said part of the potential divider to thus provide the said surge current in the winding. The field produced by the surge current in the winding moves the valve closure member to open the valve and as the capacitor charges so the effective resistance of the capacitor increases. The current through the winding is thus reduced to a value (milliamperes) dictated by the overall resistance of the potential divider but is sufficient to maintain the perfect magnetic loop, i.e. to hold the valve open. Alternative electrical and electronic circuitry may, of course, be substituted, as desired.

The valve arrangement of this further aspect of the present invention can be easily miniaturised and is especially suitable for use in a gas fire wherein a restricted amount of space is available within the fire casing.

The present invention will now be further described by way of example, with reference to the accompanying drawings, in which:-

Fig.1 schematically illustrates the gas feed system of one embodiment of a gas fire constructed according to the present invention;

Fig.2 is a fragmentary view of the gas fire of Fig.1;

Fig.3 is an electrical circuit diagram of a remote control handset for use with the fire of Figs. 1 and 2;

Fig.4 is an electrical circuit diagram of a receiver suitable for use in the fire of Figs. 1 and 2, with the handset of Fig.3,

Fig.5 is a part-sectional view of the valve assembly incorporated in the fire of Fig.2;

Fig.6 is a partially cutaway perspective view of one embodiment of a preferred form of valve suitable for use in the fire of Figs. 1 and 2, two valves being shown in a manifold in different operational positions; and

Fig.7 is one embodiment of electrical circuit suitable for use with the valve of Fig.6.

One preferred embodiment of gas fire constructed according to the present invention is illustrated schematically in Fig.1 of the accompanying drawings. This gas fire comprises two duplex gas burners 37,39 with a main, manually operable, control 41 and a valve assembly 43 comprising three valve arrangements.

Duplex gas burner 37 burns aerated gas and is a main gas burner for the fire, having one region 49 connected to a first gas outlet 47 of the main control 41, corresponding to position '1' of the control 41. The other region 45 of burner 37, is connected to one of the three valve arrangements of the valve assembly 43, the other two valve arrangements of the valve assembly 43 being connected to different regions of the other burner 39 which is a neat gas burner. The valve assembly 43 can be fed with gas from position "2" of the main control 41, and the respective circuits of the said valve arrangements are connected with an infra red receiver 51 adapted to receive control signals from a portable remote control transmitter 53. Alternatively a transmitter and receiver using other electromagnetic waves can be substituted. A further position "3" is provided on the main control 41, this position providing a gas feed, when selected, which bypasses said one valve arrangement and feeds the said other region 45 of the main burner 37.

In operation the main control 41 is first moved from the 'off' position to position "1" wherein a piezo or other igniter 55 is activated to light the gas/air mix issuing from said one region 49 of the main burner 37. The igniter can be integral with the main control 41 or independently operable. A standard type of flame failure device 57 controls the main control 41 and monitors the flames from said one region 49 of this main burner 37. If position "2" of the main control 41 is selected, gas is additionally fed to the valve assembly 43 and by

operating the remote transmitter 53, the remainder of the main burner 37 and one or other, or both regions, of the neat gas burner 39 can be ignited and switched off, as desired. In position "3", the valve assembly 43 is bypassed so that gas is additionally fed to the other region 45 of the main gas burner 37. Positions "1" and "3" thus allow the fire to be operational in respect of the main burner 37 even if the electricity supply to the valve assembly 43 should fail.

The gas fire schematically shown in Fig.1 is shown in Fig.2 with several sections of its normal casing removed, in order that parts of the fire relevant to the invention can be seen.

As evidenced from Fig.2, said other duplex burner 39 is a flame effect duplex burner with flame effect tubes. The main manually operable control 41 takes the form of a valve arrangement 79 connected to a multi-position control knob (not shown) at the top of the appliance by a rod 42.

Fig.5 shows the valve assembly 43 in the form of a metal block 58 with outlet ports 59, 60, 61 respectively, as well as a bypass outlet port 62 communicating with port 59. An inlet passage, not shown, can be selectively communicated with the ports 59, 60 and 61 by valve arrangements 1, each valve 1 having a core 5 with a winding 7, the core 5 being contained in a housing 3 associated with the block 58. When the core 5 is energised it draws an armature 15 of the valve 1 towards it against a valve member biasing spring 21 and the valve 1 opens. The valve is controlled by an electrical circuit operation such that an initially high impulse current (inrush current) of, for example, 0.5A is produced to effect initial valve opening. Thereafter a much lower current, for example, 40mA, is maintained to keep the valve just open. Any suitable circuit can be used to produce these currents as required. However, a preferred form of circuit is described hereinafter with reference to Fig.7.

Each housing 3 is electrically connected to a receiver 51 (Fig.1) disposed at the opposite side of the fire from the valve assembly 43. This receives signals from the battery powered remote control handset 53 which can thus control the receiver 51 and thus the valve assembly 43, as mentioned hereinbefore.

Fig.3 shows the electrical circuit of a suitable handset. There is shown four push button switch controls corresponding to an off position 64 and three different, first, second and third valve assembly operating positions 65, 66, 67 respectively. Depression of a selected push button is processed by a micro-processor 68 to produce a particular signal from the handset by means of three light emitting diodes 69, 70, 71 respectively. The switches not only initiate the selected signal when their

associated button is pushed, but also switch on the power via a transistor (TR2). Thus a separate power-on switch is avoided. As an alternative to having a number of push button controls, a single button with sequential logic may be used.

Fig.4 shows the electrical circuit of the receiver 63, this being mains powered, but having a step-down transformer 72. The signal from the transmitter (handset) is received by a diode 73 and after processing by micro-processors 74, 75 and 76 respectively, an electrical signal is sent via a bank of resistors 77 to the valve assembly 57 so that, as will be described, opening of the valves can be controlled. Alternative circuits (not shown) can utilise capacitors in parallel or even no capacitors.

In position 1, the control knob trips the gas igniter 55 (or the igniter is independently operated) and gas flows from a gas inlet pipe 78 to a gas control valve 79 and then through a pipe 80 to the inner section of the main burner 37 where the gas is lit. If the knob is turned to position '2' gas flows to the valve assembly 43 via pipe 81, but with all the valves thereof closed, the inner main burner section alone remains lit until the handset 53 is operated by pressing one of push buttons 1, 2 or 3 off, to thus open one or more valves of the valve assembly. In position '3', with all the valves still closed, gas can flow via pipe 81 to pipe 82, to bypass the control valves, and thence to the main burner outer sections where it is lit, so that in position '3' of the control knob, the main burner is fully on.

With the control knob in position '2' the handset can be used to operate the valve assembly 43. Push button 1 corresponds to all the valves closed, i.e. as control knob position 1. Push button 2 opens the one of the two lower valves of assembly which feeds gas to the inner section of the neat gas or flicker burner 39. As shown in Fig.1 pipe 83 connects the lowest valve assembly outlet to the burner 39 and pipe 84 connects the middle valve assembly outlet to the burner 39. Accordingly, in this state one of the three valves is open and the inner two burners of the flicker burner are lit, as well as the inner section of the main burner which remains lit.

Push button 3 closes the valve opened by push button 2 and opens the uppermost of the three valves. Gas is thus supplied via pipe 85 to the valve assembly and thence to pipe 82 and to the main burner outer sections. Thus the main burner is fully on in this state.

Finally push button 4 opens all the (solenoid) valves of the assembly 57 so that the main burner and the flicker burner are both fully on, gas flowing from the gas valve 79 to pipes 80, 81 and 85, with flow out of the valve assembly along pipes 82, 83 and 84.

Instead of switching the fire manually on and off by means of the control knob, thus providing a safety valve, the fire could further be adapted so that it could be switched on and off by remote control. Alternatively the control knob could be replaced by touch pad control or switches.

Each solenoid valve 1 is an on/off operation and not a variable flow control. The gas controlled flow control is instead carried out at the gas jets.

Gas-fired appliances other than a fire could be arranged to be remotely controlled, for example a gas cooker.

A preferred form of valve arrangement for use in the present invention is illustrated in the accompanying drawings in Figs. 6 and 7. The preferred valve 1 of the valve arrangement is shown in Fig.6 and the preferred electrical circuit is shown in Fig.7.

The valves 1 of Fig.6 each comprise a generally cylindrical housing 3 within which a U-shaped core 5 is fixedly mounted with a winding 7 provided on each arm of the U-shaped core 5. The winding 7 is connected to electrical connections 9 in an axial end region 11 of the housing 3, which is, as illustrated, securely and sealingly mounted in the wall of a gas feed manifold 13. An armature or keep 15 in the form of a metal disc is axially movably located within the housing 3 on one end of a rod 17 which extends out through the other axial end of the housing 3. The other end of rod 17 is connected to a disc-like valve closure member 19 which is biased by a coil spring 21 located between the closure member 19 and said other axial end of the housing 3, to a closed position wherein it engages a valve seat 23 at the mouth of a gas feed branch 25 leading off the manifold 13.

The preferred electrical circuit of Fig.7 is connected with the electrical connections 9 and 13 of the electromagnetic valve 1 and comprises a potential divider 27 formed by two electrical resistances 29,31, with a capacitor 33 connected across one of said electrical resistances 29. The valve winding 7 is connected in series with the capacitor 33, the potential divider 27 and a D.C. supply of electricity, preferably converted from a mains electricity supply, with a switch 35 provided between the potential divider 27 and the supply.

In use with the switch 35 in the open position, the valve closure member 19 is biased against the seat 23 by spring 21, thus closing branch 25. However, when the switch 35 is closed, reactance of the capacitor 33 will be high as it will have been fully discharged by resistance 29. A large current will therefore initially flow through the capacitor 33 and resistor 31, this being the required surge current for opening the valve; the resistance and capacitor parameters being preselected to produce a surge current which is of sufficient value to pro-

duce a magnetic field which draws the keep 15 against the force of the spring 21, into engagement with the free ends of the U-shaped core 5 to thus form a perfect magnetic loop. The valve is thus opened. However, this current will decay away as the capacitor charges and the resistance 31 will eventually pass merely a holding current as determined by the overall resistance of the resistances 29,31; the resistance values being preselected such that the reduced current is sufficient to positively hold the valve open. By virtue of the perfect magnetic loop, this reduced current is minimised to a value at which sparking is impossible in the event of a winding fault occurring. This also results in an electricity saving. Further, the resistance and capacitor parameters of the circuit are selected such that the surge current, whilst being of sufficient size to produce an adequate magnetic field, is also virtually instantaneous in charging the capacitor. In this way the possibility of a spark being produced by a fault, which is sufficient to possibly cause ignition of the gas in the manifold 13, is negated.

There are of course various alternative electrical and electronic circuits which could be used to provide a suitable surge current for operation, with this current reducing to hold the valve open. However, the illustrated circuit is considered to be the simplest possibility.

The above valve arrangement can be used to advantage in various gas appliances. One particularly advantageous usage is the gas fire of Fig.2, wherein the free space within the fire casing is limited, the valve arrangement of the present invention e.g., as described hereabove, lending itself to miniaturisation.

Claims

1. A gas-fired appliance comprising a burner arrangement (37,39) for the combustion of gas, a valve arrangement (43) in a gas flow line to said burner arrangement (37,39), characterised by a receiver (51) arranged to control the opening and/or closing of the valve arrangement (43), and a transmitter (53) operable at a position remote from the appliance to actuate said receiver (51).

2. An appliance as claimed in claim 1, wherein the transmitter (53) has a number of control buttons (65,66,67) and is adapted to transmit electromagnetic signals, the signals transmitted being dependent upon the control button (65,66,67) selected and manually actuated.

3. An appliance as claimed in claim 2, wherein the receiver (51) is adapted to be actuated by electromagnetic signals from the transmitter (53),

the receiver (51) being electrically connected with three electromagnetically controllable valves (1) forming said valve arrangement (43).

4. An appliance as claimed in claim 3, wherein one valve (1) controls the gas supply to part (45) of one duplex burner (37) and the other two valves (1) control the gas supply to two different regions of a further duplex burner (39).

5. An appliance as claimed in claim 4, wherein a manually controllable bypass (40) is provided across said one valve (1).

6. An appliance as claimed in claim 1 or claim 2, wherein the valve arrangement (43) comprises a valve closure member (19) and an electrical winding (7), the electrical winding (7) being connected in an electrical circuit which, when completed, produces a surge current which passes through the winding (7) for a period of time and is sufficient to produce an electrical field which moves the closure member (19) against a spring (21) from a first position to a second position, the current then reducing after the elapse of said period of time, to a value which produces an electrical field still sufficient to hold the closure member (19) in said second position against the force of said spring (21).

7. An appliance as claimed in claim 6, wherein the valve closure member (19) closes said valve arrangement when in said first position.

8. An appliance as claimed in claim 6 or 7, wherein the electrical circuit comprises an electrical capacitor (33) connected across part of a potential divider (27), the potential divider (27) being connected to a D.C. supply of electricity via a switch (35), the winding (7) itself being connected in series with the capacitor (33) and potential divider (27).

9. An appliance as claimed in any one of claims 6 to 8, wherein the winding (7) is provided on a U-shaped core (5), an armature (15) connected to the valve closure member (19) being arranged to engage both arms of the U-shaped core (5) when the winding (7) is energised.

10. A valve arrangement for use in a gas appliance, comprising a valve closure member (19) and an electrical winding (7), the electrical winding (7) being connected in an electrical circuit which, when completed, produces a surge current which passes through the winding (7) for a period of time and is sufficient to produce an electrical field which moves the closure member (19) against a spring (21) from a first position to a second position, the current then reducing after the elapse of said period of time, to a value which produces an electrical field still sufficient to hold the closure member (19) in said second position against the force of said spring (21).

11. An arrangement as claimed in claim 10, wherein the valve closure member (19) closes said valve arrangement (43) when in said first position.

12. An arrangement as claimed in claim 10 or 11, wherein the electrical circuit comprises an electrical capacitor (33) connected across part of a potential divider (27), the potential divider (27) being connected to a D.C. supply of electricity via a switch (35), the winding (7) itself being connected in series with the capacitor (33) and potential divider (27).

13. An arrangement as claimed in any one of claims 10 to 12, wherein the winding (7) is provided on a U-shaped core (50), an armature (15) connected to the valve closure member (19) being arranged to engage both arms of the U-shaped core (5) when the winding (7) is energised.

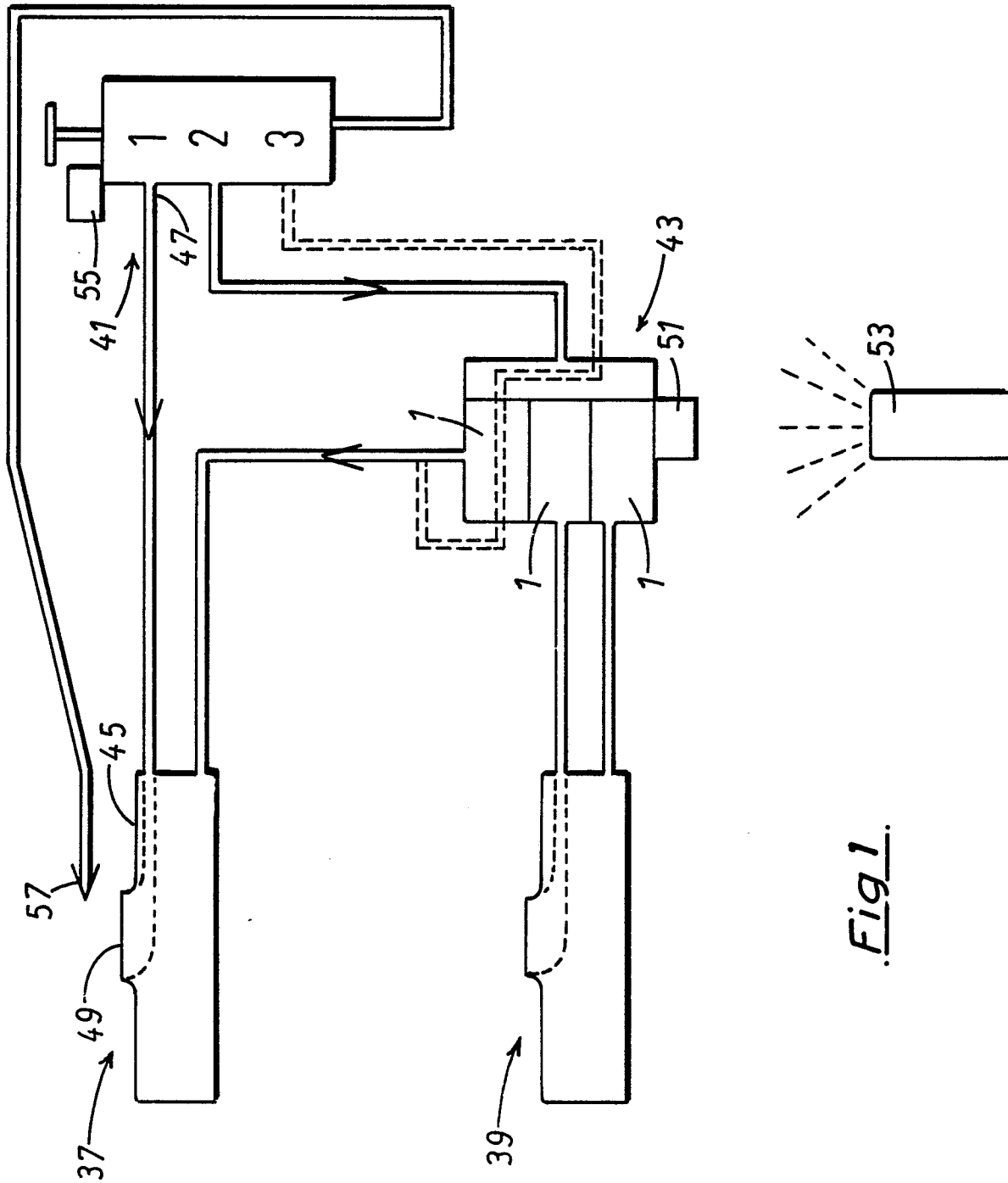


Fig 1.

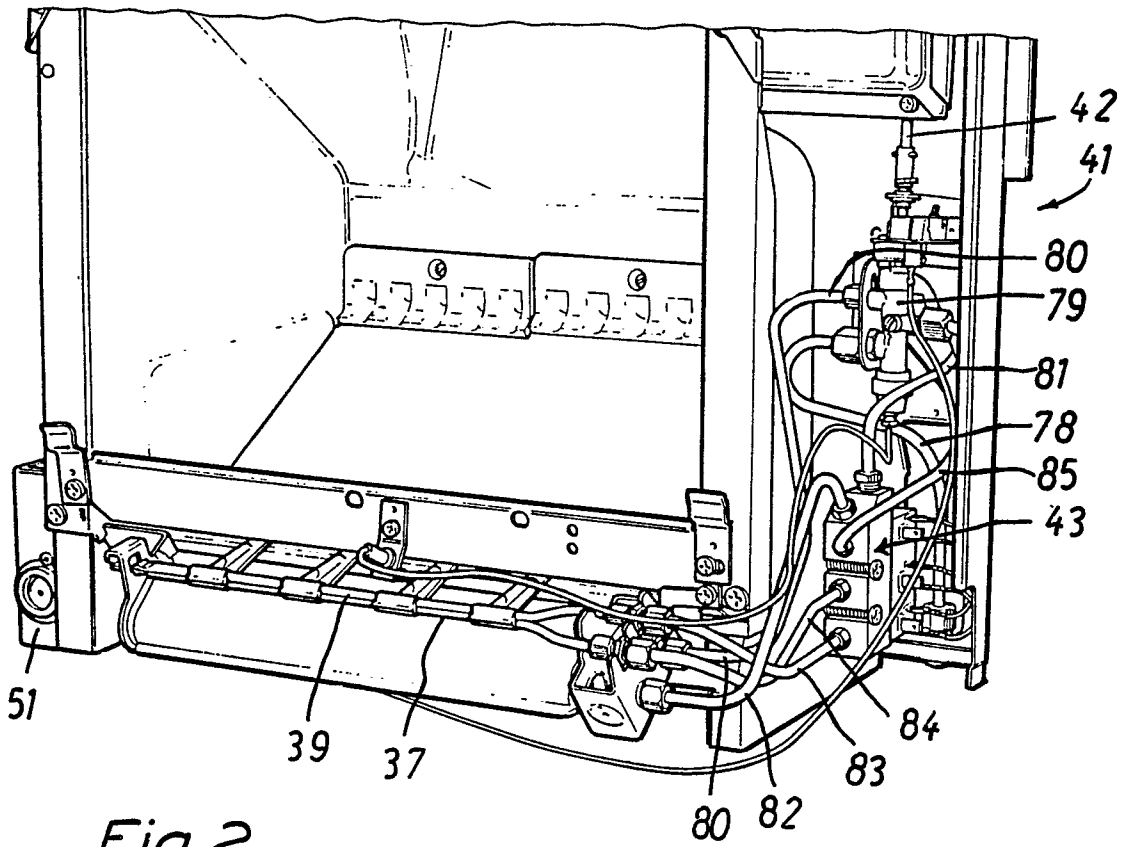


Fig 2

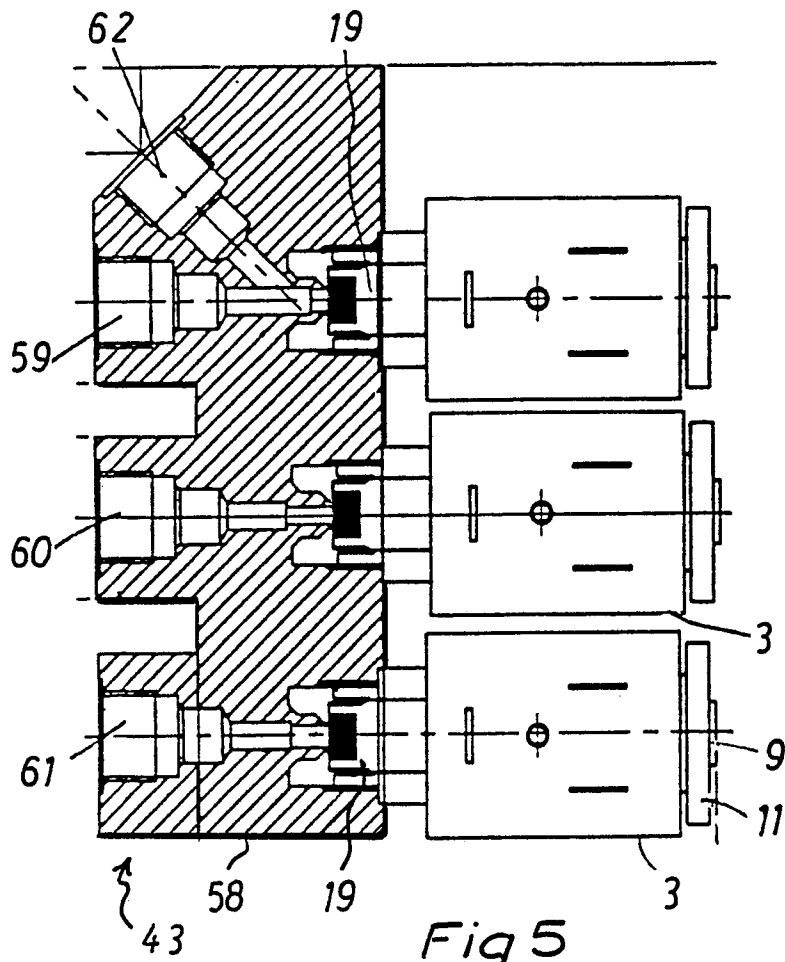


Fig 5

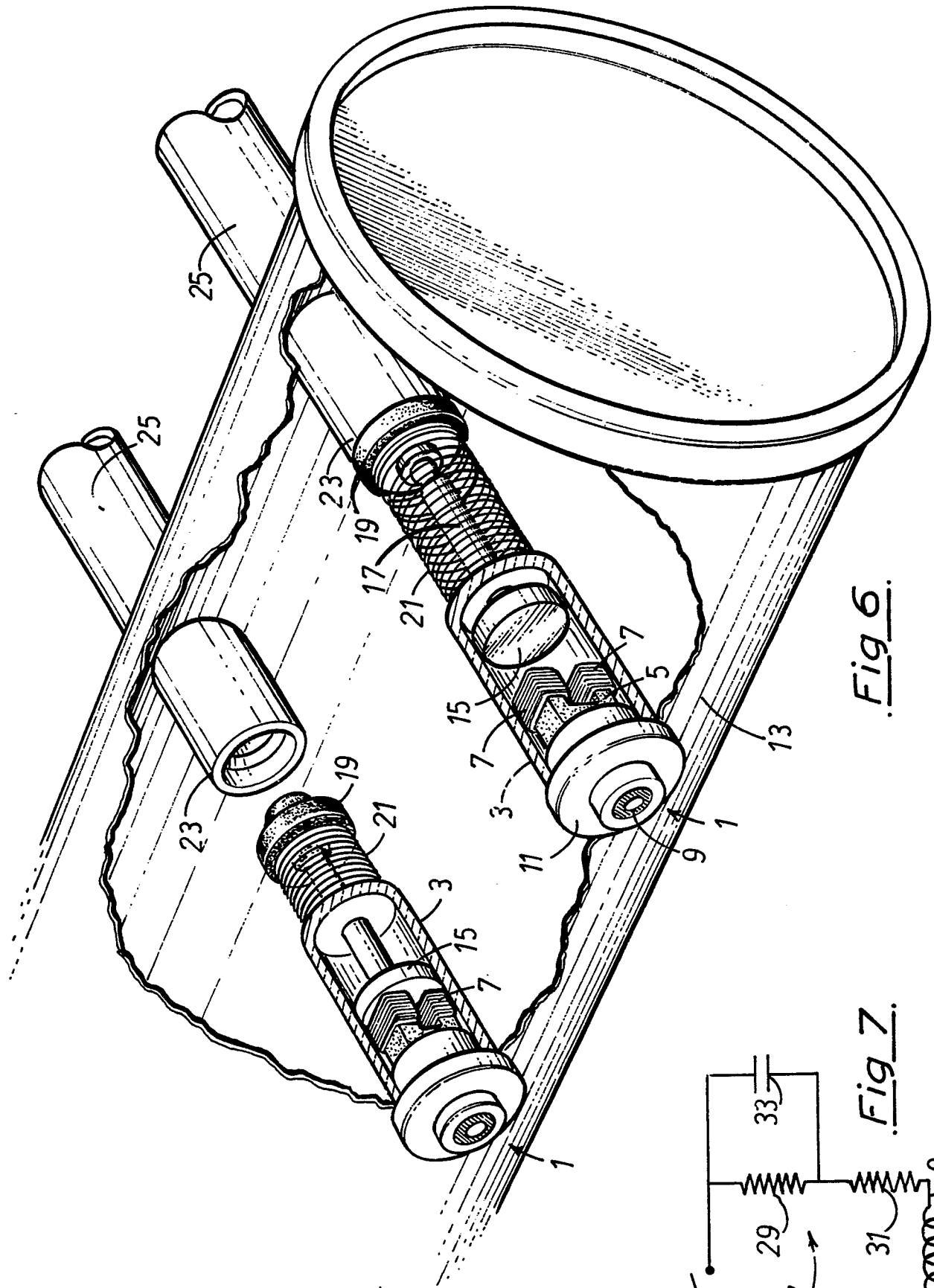


Fig. 6.

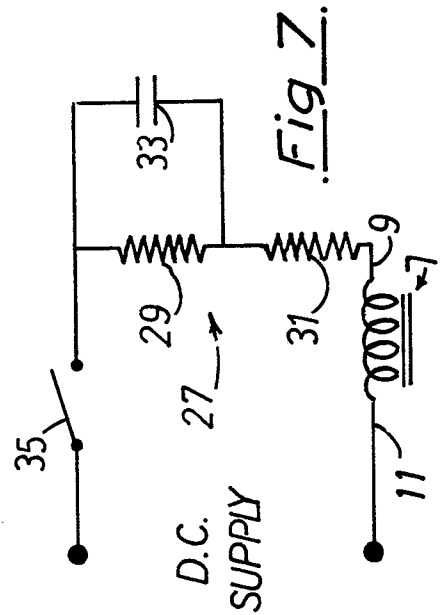


Fig. 7.