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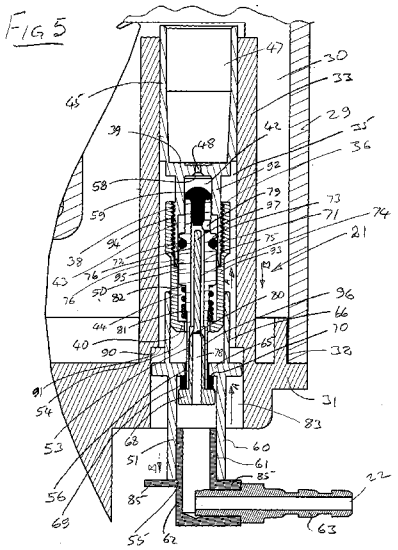
(54) Title: A VALVE AND A GAS POWERED HEATING DEVICE COMPRISING A VALVE



(57) Abstract: A gas powered vaporising device (1) comprising a vaporising chamber (8) for herbal matter to be vaporised which is heated from a combustion chamber (9) within which a gas catalytic combustion element (10) converts fuel gas to heat. Fuel gas is supplied from a reservoir (20) through a downstream fuel gas path (22) to the combustion chamber (9) through a three state valve (21). The valve (21) comprises an inlet port (48) from the fuel gas reservoir (20) and an outlet port (55) to the downstream fuel gas path (22). A vent gas port (56) vents fuel gas from the downstream fuel gas path (22) when the valve (21) is in a third state with the inlet port (48) isolated from the outlet port (55) and the vent gas port (56). In a first state of the valve (21) a first valving member (50) is retained by a second valving member (51) in a communicating state communicating the inlet port (48) to the outlet port (55) and with the vent port (56) isolated from the inlet and outlet ports (48,55). In this first state fuel gas is supplied to the downstream fuel gas path (22). In the second state of the valve (21) the first valving member (50) is urged under the action of a compression spring (81) into an isolating state isolating the inlet port (48) from the outlet port (55) and the vent port (56).

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"A valve and a gas powered heating device comprising a valve"

The present invention relates to a valve, and in particular, though not limited to a valve for selectively delivering fuel gas from a fuel gas reservoir to a converter for converting fuel gas to heat, for example, to a gas catalytic combustion element for converting fuel gas to heat. The invention also relates to a gas powered heating device comprising the valve, for example, a vaporising device for vaporising vaporisable matter such as herbal matter, a soldering iron, a glue gun and the like. The invention also relates to a reservoir for fluid and the valve in communication with the reservoir for selectively delivering fluid from the reservoir.

Portable gas powered heating devices, for example, vaporising devices for vaporising herbal and other vaporisable matter, soldering irons, glue guns and the like in which fuel gas is converted to heat by a gas catalytic combustion element, in general, comprise a combustion chamber within which the gas catalytic combustion element is located. The combustion chamber, in general, is formed within a combustion chamber housing of heat conductive material, typically, brass, aluminium or an alloy of these or other metals. In the case of a soldering iron, a soldering tool tip is provided in heat conducting engagement with the combustion chamber housing, so that heat is transferred from the combustion chamber housing into the soldering tool tip. In the case of a glue gun, a chamber for the glue in which the glue is melted is formed in a housing of heat conductive material, such as, for example, brass, aluminium or an alloy of these, or other metals. The combustion chamber may be formed in the same housing as the glue chamber, or in a separate combustion chamber housing which is in heat conducting engagement with the housing in which the glue chamber is formed in order to transfer heat from the gas catalytic combustion element to glue in the glue chamber.

In the case of portable handheld vaporising devices, a vaporising chamber is provided for accommodating the matter, be it herbal matter or other matter, components of which are to be vaporised. The vaporising chamber typically is formed in a housing which is in heat conductive engagement with the combustion chamber housing, or may be formed as part of the combustion chamber housing.

Heat from the gas catalytic combustion element resulting from conversion of fuel gas to heat by the gas catalytic combustion element is transferred to the vaporisable matter in the vaporising chamber by heat conduction from the combustion chamber. Where such portable handheld vaporising devices are provided to produce an inhalable aerosol of the vaporisable components from the vaporisable matter, a draw tube is provided extending from the vaporising chamber to facilitate drawing of the aerosol from the vaporising chamber.

Typically, such devices comprise a fuel gas reservoir for storing fuel gas, typically in liquid form. The fuel gas is supplied from the fuel gas reservoir through at least a venturi mixer where the fuel gas is mixed with air prior to being delivered into the combustion chamber. In many cases it is necessary to feed the fuel gas from the fuel gas reservoir to the venturi mixer through a pipeline which can be relatively long, for example, in the case of vaporising devices, may be up to 80mm to 100mm in length. In general, an operating valve for selectively delivering fuel gas from the reservoir to the venturi mixer is located adjacent an outlet of the reservoir. This, thus, can result in gas being piped through a pipeline from the operating valve to the venturi mixer or to other components, for example, a thermostatically controlled valve, which can be of relatively long lengths, and can be of lengths up to 80mm to 100mm. This results in a disadvantage in that when the operating valve is operated into the off state, fuel gas remaining in the pipeline downstream of the operating valve continues to be supplied to the combustion chamber, thus resulting in the gas catalytic combustion element continuing to convert fuel gas to heat until the remaining fuel gas in the pipeline downstream of the operating valve has been converted to heat. Depending on the length of the fuel gas path between the operating valve and the combustion chamber, the gas catalytic combustion element may continue to convert fuel gas to heat for many seconds, and in some cases, up to forty-five seconds and longer after the operating valve has been operated into the off state.

This is a serious disadvantage, in that users of such device on seeing the gas catalytic combustion element continuing to convert fuel gas to heat believe that the operating valve is faulty, and typically, operate the operating valve many times

between the on and off state in an attempt to stop conversion of fuel gas to heat by the gas catalytic combustion element. This thus exacerbates the problem since each time the operating valve is operated into the on state, further fuel gas is delivered into the downstream pipeline. On failing to stop fuel gas conversion by the fuel gas catalytic combustion element, users of such devices may become concerned that the device could be dangerous.

There is therefore a need for a gas powered heating device and a vaporising device which overcomes this problem, and in particular, there is a need for a valve for a gas powered heating device or a vaporising device, or indeed, for any other device which addresses this problem.

The invention is directed towards providing a gas powered heating device and a vaporising device, as well as a valve which addresses the problems of such gas powered heating devices and vaporising devices.

According to the invention there is provided a valve comprising an inlet port, an outlet port and a vent port, a valving means adapted to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

Preferably, the valving means is adapted to isolate the vent port from the inlet port and the outlet port in the first state. Advantageously, the valving means is adapted to isolate the vent port from the outlet port in the second state.

Preferably, the valve comprises a valve housing defining a valve chamber, the inlet port communicating with the valve chamber, and the valving means comprising a first valving member in the valve chamber operable between a communicating state communicating the inlet port with the valve chamber when the valving means is in the first state, and an isolating state isolating the inlet port from the valve chamber when the valving means is in the second and third states. Advantageously, the

outlet port communicates with the valve chamber through the first valving member. Preferably, the first valving member is adapted to isolate the vent port from the outlet port when the first valving member is in the communicating state and is being operated between the communicating state and the isolating state.

Preferably, the valving means comprises a second valving member, the outlet port and the vent port being located in the second valving member and communicating with each other through the second valving member, the first and second valving members being co-operable for selectively isolating the vent port from the outlet port when the valving means is in the first and second states. Advantageously, the second valving member is moveable relative to the first valving member between a first relative state with the first and second valving members co-operating to isolate the vent port from the outlet port, and a second relative state with the vent port communicating with the outlet port. Preferably, the second valving member is moveable with the first valving member for maintaining the first and second valving members in the first relative state as the first valving member is being moved between the communicating state and the isolating state. Ideally, the second valving member is moveable relative to the first valving member from the first relative state to the second relative state when the first valving member is in the isolating state to define the third state of the valving means.

Preferably, the second valving member is slideable relative to the first valving member between the first and second relative states. Advantageously, the second valving member is slideable relative to the valve housing.

Preferably, the second valving member is located externally of the valve housing, and the first valving member extends outwardly through the valve housing from the valve chamber to co-operate with the second valving member. Advantageously, the vent port communicates with the outlet port through a venting valve seat formed on one of the first and second valving members, and the other one of the first and second valving members is sealably engageable with the venting valve seat for isolating the vent port from the outlet port when the first and second valving members are in the first relative state.

Advantageously, the first valving member extends into the second valving member through the vent port to co-operate with the second valving member for isolating the vent port from the outlet port. Preferably, the venting valve seat is located on the second valving member, and the first valving member is co-operable with the venting valve seat for isolating the vent port from the outlet port.

Preferably, the first valving member communicates the valve chamber with the outlet port on the outlet port side of the venting valve seat.

Preferably, a passageway extends through the first valving member communicating the valving chamber with the outlet port.

Preferably, an urging means is provided for maintaining the first and second valving members in the first relative state while the first valving member is in the communicating state, and during movement of the first valving member between the communicating state and the isolating state. Advantageously, the urging means acts on the first valving member for urging the first valving member into the isolating state. Ideally, the urging means comprises a spring acting between the valve housing and the first valving member.

Preferably, the second valving member is adapted for operating the first valving member between the isolating state and the communicating state.

Advantageously, the inlet port communicates with the valve chamber through an inlet valve seat, and the first valving member is co-operable with the inlet valve seat for isolating the inlet port from the outlet port and the vent port.

Preferably, the first valving member comprises a first sealing element sealably engageable with the inlet valve seat. Advantageously, the first valving member comprises a second sealing element sealably engageable with the venting valve seat.

Preferably, a third sealing element is provided co-operating with the first valving member and the valve housing for defining with the valve housing and the first valving member the valving chamber. Advantageously, the third sealing element is adapted for sealably and slideably engaging the valve housing. Ideally, the third sealing element is located on and extends circumferentially around the first valving member.

Preferably, the first valving member is slideable in the valve chamber between the isolating state and the communicating state.

Advantageously, an actuator element is provided for operating the second valving member between the first and second relative states, and for operating the second valving member to urge the first valving member from the isolating state to the communicating state.

The invention also provides a gas powered heating device comprising a fuel gas reservoir for storing fuel gas in liquid form, a converting means for converting fuel gas to heat, and a valve according to the invention selectively communicating the converting means with the fuel gas reservoir, the inlet port of the valve communicating with the fuel gas reservoir through an upstream fuel gas path, the outlet port of the valve communicating with the converting means through a downstream fuel gas path, and the vent port being vented to atmosphere.

Preferably, the outlet port of the valve is connected to the converting means through an elongated pipeline.

The invention also provides a gas powered heating device comprising a fuel gas reservoir for storing fuel gas in liquid form, a converting means for converting fuel gas to heat, and a valve for selectively communicating the converting means with the fuel gas reservoir, the valve comprising an inlet port communicating with the fuel gas reservoir through an upstream fuel gas path, an outlet port communicating with the converting means through a downstream fuel gas path for delivering fuel gas to the converting means, a vent port vented to atmosphere, and a valving means adapted

to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

In one embodiment of the invention the converting means is connected to the outlet port of the valve through an elongated pipeline. Preferably, the converting means is connected to the outlet port of the valve through a venturi mixer to produce a fuel gas/air mixture for delivery to the converting means.

Advantageously, the converting means comprises a gas catalytic combustion element located in a combustion chamber formed in a combustion chamber housing. Preferably, the combustion chamber is connected to the outlet port of the valve through a thermostatically controlled valve responsive to the temperature of the combustion chamber housing.

In one embodiment of the invention the gas powered heating device is configured as a soldering iron.

In another embodiment of the invention the gas powered heating device is configured as a glue gun.

In a further embodiment of the invention the gas powered heating device is configured as a vaporising device for vaporising vaporisable components of vaporisable matter.

In another embodiment of the invention the gas powered heating device is configured as a vaporising device for vaporising vaporisable components of herbal matter.

Preferably, a vaporising chamber is provided for accommodating the vaporisable matter for vaporising thereof, the vaporising chamber being heated by the converting means.

Advantageously, an outer housing is provided for housing the fuel gas reservoir, the valve and the converting means.

In one embodiment of the invention the device is adapted to a portable handheld device.

Further the invention provides a device for vaporising vaporisable matter, the device comprising a combustion chamber housing defining a combustion chamber, a gas catalytic combustion element located in the combustion chamber for converting fuel gas to heat for heating the combustion chamber housing, a vaporising chamber housing defining a vaporising chamber for the vaporisable matter, the vaporising chamber housing being in heat transfer relationship with the combustion chamber housing for transfer of heat thereto from the combustion chamber housing for heating the vaporisable matter in the vaporising chamber, a fuel gas reservoir for storing fuel gas in liquid form, a valve according to the invention for selectively communicating the combustion chamber with the fuel gas reservoir, the valve comprising the inlet port of the valve communicating with the fuel gas reservoir through an upstream fuel gas path, the outlet port of the valve communicating with the combustion chamber through a downstream fuel gas path, and the vent port of the valve being vented to atmosphere.

Additionally the invention provides a device for vaporising vaporisable matter, the device comprising a combustion chamber housing defining a combustion chamber, a gas catalytic combustion element located in the combustion chamber for converting fuel gas to heat for heating the combustion chamber housing, a vaporising chamber housing defining a vaporising chamber for the vaporisable matter, the vaporising chamber housing being in heat transfer relationship with the combustion chamber housing for transfer of heat thereto from the combustion chamber housing for heating the vaporisable matter in the vaporising chamber, a fuel gas reservoir for storing fuel gas in liquid form, a valve comprising an inlet port communicating with the fuel gas reservoir through an upstream fuel gas path, an outlet port communicating with the combustion chamber through a downstream fuel gas path

for delivering fuel gas to the gas catalytic combustion element, a vent port vented to atmosphere, and a valving means adapted to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

Preferably, the downstream fuel gas path comprises an elongated pipeline.

Advantageously, the device is adapted to be a portable handheld device.

The invention also provides a reservoir for a fluid, and a valve according to the invention in communication with the reservoir for selectively delivering fluid from the reservoir.

The advantages of the invention are many. A particularly important advantage of the valve according to the invention is achieved by virtue of the fact that once the valving means has been operated into the second state to isolate the outlet port from the inlet port, further operation of the valving means to the third state communicates the outlet port with the vent port while the inlet port is isolated from the outlet port and the vent port, thereby permitting the outlet port to be vented to atmosphere through the vent port. Thus, where the valve is used in conjunction with a gas powered heating device, any gas remaining in a pipeline between the outlet port of the valve and a burner or gas catalytic combustion element of the gas powered heating device is vented to atmosphere through the vent port once the valving means has been operated into the third state. This, thus, in the case of a gas powered heating device immediately terminates conversion of fuel gas to heat in the case of a gas catalytic combustion element, and extinguishes a flame in the case of conversion of fuel gas to heat by flame combustion.

A further advantage of the valve according to the invention is the fact that the valve lends itself to compact construction, and also, can be produced with the minimum number of components. A further advantage of the valve according to the invention is that it is particularly suitable for mounting in an outlet port of a reservoir, for

example, a fuel gas reservoir of the type adapted to store fuel gas in liquid form.

The advantages of the gas powered heating device and gas powered vaporising device according to the invention are that conversion of fuel gas to heat is substantially immediately terminated on the valve being operated into the third state from the first state through the second state.

The invention will be more clearly understood from the following description of a preferred embodiment thereof, which is given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a gas powered vaporising device according to the invention for vaporising vaporisable components of herbal matter to produce an inhalable aerosol,

Fig. 2 is a cross-sectional side elevational view of a portion of the gas powered vaporising device of Fig. 1,

Fig. 3 is a side elevational view of the vaporising device of Fig. 1 with a portion of the device removed,

Fig. 4 is a view similar to Fig. 3 of the vaporising device of Fig. 1 with a portion of the device in a different state to that of Fig. 3,

Fig. 5 is a cross-sectional side elevational view of a valve also according to the invention of the vaporising device of Fig. 1 with the valve illustrated in a first state,

Fig. 6 is a view similar to Fig. 5 of the valve of Fig. 5 in a second state, and

Fig. 7 is a view similar to Fig. 5 of the valve of Fig. 5 in a third state.

Referring to the drawings, there is illustrated a portable, handheld gas powered

vaporising device according to the invention, indicated generally by the reference numeral 1, for vaporising vaporisable components of herbal or other matter to produce an aerosol suitable for inhaling. The vaporising device 1 is substantially similar to the vaporising device disclosed in PCT Published Application Specification No. WO 2006/082571 of the present applicant with reference to Figs. 1 to 18 of the published PCT Application specification. Accordingly, only those parts of the vaporising device 1 which are relevant to the present invention will be described in detail.

The vaporising device 1 comprises an outer housing 3 formed by two half shells of plastics material which together define a hollow interior region 5. A body member 7 of heat conductive metal is located in the hollow interior region 5. Typically, the body member is of brass, aluminium or an alloy of these or other metals. A vaporising chamber 8 for accommodating the herbal or other matter to be vaporised is formed in the body member 7, and a combustion chamber 9 is also formed in the body member 7. A gas catalytic combustion element 10 is located in the combustion chamber 9 for converting fuel gas to heat. Heat from the gas catalytic combustion element 10 is radiated into the body member 7, and transferred by conduction from the combustion chamber 9 to the vaporising chamber 8 for heating the vaporisable matter to the vaporising temperature of the components of the matter to be vaporised. Exhaust gases are exhausted from the combustion chamber 9 through exhaust gas ports 12 from an exhaust gas chamber 14 which communicates with the combustion chamber 9. A hollow plug member 15 is engageable in the vaporising chamber 8 to close the vaporising chamber 8. A draw tube 17 extending from the plug member 15 terminates in a mouthpiece 18 and communicates with the vaporising chamber 8 so that an aerosol of the vaporised components produced in the vaporising chamber 8 may be drawn from the vaporising chamber 8 through the draw tube 17 and inhaled.

A fuel gas reservoir 20 located in the hollow interior region 5 of the outer housing 3 stores fuel gas in liquid form, and fuel gas from the reservoir 20 is selectively supplied to the gas catalytic combustion element 10 in the combustion chamber 9 through a valve 21 also according to the invention and in turn through a downstream

fuel gas path 22. The downstream fuel gas path 22 comprises a pipeline 23 which communicates the valve 21 with the combustion chamber 9 through a safety cut-out valve 25, a thermostatically controlled valve 26 and a venturi mixer 27, all of which lie sequentially in the fuel gas path 22 from the valve 21 to the combustion chamber 9, see Fig. 5. These elements in the fuel gas path 22 are described in detail in PCT published Application Specification No. WO 2006/082571.

Referring now in particular to Figs. 5 to 7, the reservoir 20 comprises a housing 29 which defines a hollow interior region 30 for the fuel gas which is pressurised and stored in liquid form. An end cap 31 is sealably engageable in an open mouth 32 of the housing 29 to sealably close the hollow interior region 30. A tubular housing 33 extends from the end cap 31 into the hollow interior region 30 and a bore 35 of circular transverse cross-section extending through the tubular housing 33 communicates with the hollow interior region 30 of the reservoir 20. The valve 21 is located in the bore 35 of the tubular housing 33 and comprises a valve housing 36. The valve housing 36 comprises a cylindrical side wall 38 which extends between an upstream end wall 39 and a downstream end wall 40, which together define a valve chamber 42 of circular transverse cross-section having an upstream portion 43 and a downstream portion 44. A tubular extension element 45 extends in an upstream direction from the upstream end wall 39 of the valve housing 36 and sealably engages the bore 35 of the tubular housing 33 to both seal the bore 35 and to anchor the valve housing 36 in the bore 35. An inlet port 48 of the valve 21 is formed in the upstream end wall 39 and communicates the upstream portion 43 of the valve chamber 42 with the hollow interior region 30 of the reservoir 20 through an upstream fuel gas path which is formed by an upstream bore 47 in the tubular extension element 45.

A valving means comprises a first valving member 50 and a second valving member 51 which co-operate with each other to operate the valve 21 in three states as will be described below. The first valving member 50 is slideably mounted in the valve chamber 42. A portion 53 of the first valving member 50 extends through an opening 54 in the downstream end wall 40 of the valve housing 36 to co-operate with the second valving member 51 for operating the valve 21, as will be described

below. An outlet port 55 of the valve 21 is formed adjacent a downstream end of the second valving member 51, and a vent port 56 of the valve 21 is formed in the second valving member 51.

The valve 21 is operable in three states, namely, a first state illustrated in Fig. 5, a second state illustrated in Fig. 6 and a third state illustrated in Fig. 7. In the first state illustrated in Fig. 5 the outlet port 55 communicates with the inlet port 48 with the vent port 56 isolated from both the inlet port 48 and the outlet port 55. In the first state fuel gas is supplied through the valve 21 from the reservoir 20 to the combustion chamber 9. In the second state illustrated in Fig. 6 the inlet port 48 is isolated from the outlet port 55 and the vent port 56, and the vent port 56 is isolated from the outlet port 55 for isolating the supply of fuel gas from the reservoir 20 to the combustion chamber 9. In the third state illustrated in Fig. 7 the inlet port 48 is isolated from the outlet port 55 and the vent port 56, but the vent port 56 is communicating with the outlet port 55 for venting fuel gas in the downstream fuel gas path 22 through the outlet port 55 and the vent port 56 to atmosphere once the inlet port 48 has been isolated from the outlet port 55 and the vent port 56, thereby preventing further conversion of fuel gas to heat by the gas catalytic combustion element 10.

Turning now in more detail to the valve 21, and still referring to Figs. 5 to 7, an inlet valve seat 58 is formed in the upstream end wall 39 within the valve chamber 42 around the inlet port 48. The first valving member 50 is of circular transverse cross-section and comprises a first valving element 59 of a resilient plastics material which is sealably engageable with the inlet valve seat 58 for sealably closing the inlet port 48. The second valving member 51 comprises a first hollow cylindrical portion 60 which defines a socket 61 which in turn terminates in the outlet port 55. A pipe connector 62 is sealably engaged in the socket 61 and terminates in a hollow spigot 63 which is engageable with the pipeline 23 for communicating the pipeline 23 with the outlet port 55. The first hollow cylindrical portion 60 of the second valving member 51 terminates at its upstream end in a transversely extending intermediate member 65 through which the vent port 56 of circular transverse cross-section extends. A second hollow cylindrical portion 66 of the second valving member 51

extends upstream from the intermediate member 65 to slideably engage the valve housing 36.

The portion 53 of the first valving member 50 which extends from the valve housing 36 is of circular transverse cross-section and extends through the vent port 56 and terminates in an annular abutment member 68. A second annular valving element 69 of resilient plastics material is carried on the portion 53 of the first valving member 50 and is retained on the portion 53 of the first valving member 50 by the abutment member 68. A venting valve seat 70 is formed in the intermediate member 65 on the downstream side thereof around the vent port 56 and is sealably engageable with the second valving element 69 and with the abutment member 68 for sealably closing the vent port 56.

A third sealing element 71, in this embodiment of the invention an O-ring seal 72 is located in a groove 73 of the first valving member 50 within the valve chamber 42 and extends around the first valving member 50 and is sealably and slideably engageable with the cylindrical side wall 38 of the valve housing 36 and defines with the valve housing 36 and the first valving member 50 the upstream portion 43 of the valve chamber 42. The third sealing element 71 sealably isolates the upstream portion 43 of the valve chamber 42 from the downstream portion 44 thereof.

A passageway 74 extends through the first valving member 50 and communicates the upstream portion 43 of the valve chamber 42 with the socket 61 of the second valving member 51, and in turn the outlet port 55 on the downstream side of the abutment member 68 of the first valving member 50. The passageway 74 is formed by a central longitudinally extending elongated upstream bore 75 which extends centrally through an upstream portion 76 of the first valving member 50. A downstream bore 78 of the passageway 74 extends centrally and longitudinally through the portion 53 of the first valving member 50. The upstream bore 75 communicates with the upstream portion 43 of the valve chamber 42 through a transversely extending bore 79 which extends transversely through the first valving member 50. The upstream bore 75 and the downstream bore 78 communicate through a connecting bore 80 in the portion 53 of the first valving member 52. The

downstream bore 78 terminates in the abutment member 68 on the downstream side of the abutment member 68, and in turn on the downstream side of the venting valve seat 70 and the second sealing element 69.

An urging means comprising a compression spring 81 located in the downstream portion 44 of the valve chamber 42 and extending around the first valving member 50 acts between the downstream end wall 40 and a shoulder 82 extending around the first valving member 50. The compression spring 81 acts on the shoulder 82 for urging the first valving member 50 in the direction of the arrow A from a communicating state illustrated in Fig. 5 with the first valving element 59 spaced apart from the inlet valve seat 58 of the inlet port 48 for communicating the outlet port 55 with the inlet port 48, to an isolating state illustrated in Figs. 6 and 7 with the first valving element 59 sealably engaged with the inlet valve seat 58 of the inlet port 48 for isolating the inlet port from both the outlet port 55 and the vent port 56.

The second valving member 51 is slideable on the valve housing 36 and in a portion 83 of the bore 35 and is slideable relative to the first valving member 50 between a first relative state illustrated in Figs. 5 and 6 with the first and second valving members 50 and 51 co-operating with each other with the second valving element 69 sealably engaged between the abutment member 68 and the venting valve seat 70 of the vent port 56 for isolating the vent port 56 from the outlet port 55 and the inlet port 48, and a second relative state illustrated in Fig. 7 with the second valving element 69 spaced apart from the venting valve seat 70 so that the vent port 56 communicates with the outlet port 55 to vent the downstream fuel gas path through the outlet port 55 and the vent port 56.

The diameter of the vent port 56 and the diameter of the portion 53 of the first valving member 50 which extends through the vent port 56 are such as to permit the flow of fuel gas through the vent port 56 when the first and second valving members 50 and 51 are in the second relative state. Additionally, the internal diameter of the second cylindrical portion 66 of the second valving member 51 and the external diameter of the valve housing 36 within the second cylindrical portion 66 of the second valving member 51 are such as to permit the flow of vented fuel gas from the

vent port 56 to flow into the bore 35 of the tubular housing 33. The outer diameter of the intermediate member 65 of the second valving member 51 and the diameter of the portion 83 of the bore 35 in the tubular housing 33 are such as to permit the flow of vented fuel gas between the intermediate member 65 of the second valving member 51 and the tubular housing 33 so that fuel gas vented from the downstream fuel gas path 22 through the vent port 56 is vented to atmosphere through the portion 83 of the bore 35 of the tubular housing 33.

An actuator element comprising an L-shaped operating element 84 is engageable with a pair of engagement members 85 extending from the pipe connector 62 which is securely engaged in the socket 61 formed in the second valving member 51 for operating the second valving member 51 relative to the first valving member 50 between the first and second relative states, and for further operating the second valving member 51 for in turn operating the first valving member 50 between the isolating state and the communicating state. The operating element 84 is located within the outer housing 3 and is slideably mounted on a post 77 extending from the housing 29 of the reservoir 20. One limb 88 of the operating element 84, which is slideably mounted on the post 77, engages the engagement members 85, and another limb 89 of the operating element 84 is engaged by a thumb operated button switch 86. The thumb operated button switch 86 is slideable in a groove 87 in the outer housing 3 for operating the operating element 84 for in turn operating the first and second valving members 50 and 51. The thumb operated button switch 86 is slideable in the directions of the arrows C and D for in turn urging the operating element 84 in corresponding respective directions, so that by urging the thumb operated button switch 86 in the direction of the arrow C, the second valving member 51 is urged in the direction of the arrow B. Urging the thumb operated button switch 86 in the direction of the arrow D either allows the second valving member 51 to be urged in the direction of the arrow A under the action of the compression spring 81 acting on the first valving member 50 when the first and second valving members 50 and 51 are in the first relative state, or urges the second valving member 51 in the direction of the arrow A from the first relative state to the second relative state when the first valving member 50 is in the isolating state. In Fig. 3 the operating element 54 is illustrated with the valve 21 in the third state, and

in Fig. 4 the operating element 84 is illustrated with the valve 21 in the first state.

The abutment member 68 of the portion 53 of the first valving member 50 and the second sealing element 69 co-operate with the intermediate member 65 of the second valving member 51 so that the first valving member 50 is moveable by the second valving member 51 in the direction of the arrow B from the isolating state illustrated in Figs. 6 and 7 to the communicating state illustrated in Fig. 5. A shoulder 90 in the bore 35 of the tubular housing 33 forms an abutment surface 91 which is engageable with the intermediate member 65 of the second valving member 51 for limiting movement of the second valving member 51 in the direction of the arrow A from the first relative state to the second relative state.

Accordingly, the valve 21 is in the third state illustrated in Fig. 7 when the first valving member 50 is in the isolating state isolating the inlet port 48 from the outlet port 55 and the vent port 56, and the first and second valving members 50 and 51 are in the second relative state and the intermediate member 65 of the second valving member 51 is substantially abutting the shoulder 90 in the bore 35 with the outlet port 55 communicating with the vent port 56. In the third state the valve 21 isolates the downstream fuel gas path 22 from the inlet port 48 and vents the downstream fuel gas path 22 to atmosphere through the outlet port 55 and the vent port 56. To operate the valve 21 in the first state, the second valving member 51 is urged in the direction of the arrow B from the second relative state to the first relative state to isolate the vent port 56 from the outlet port 55 and from the inlet port 48, with the first valving member 51 still in the isolating state. This is the second state of the valve 21. Further urging of the second valving member 51 in the direction of the arrow B retains the first and second valving members 50 and 51 in the first relative state, and urges the first valving member 50 against the action of the compression spring 81 from the isolating state to the communicating state, thereby communicating the inlet and outlet ports through the passageway 74 in the first valving member 50. With the first valving member 50 in the communicating state and the first and second valving members 50 and 51 still in the first relative state, the inlet port 48 and the outlet port 55 are isolated from the vent port 56. This is the first state of the valve 21 for delivering fuel gas through the downstream fuel gas path 22 from the reservoir 20 to

the combustion chamber 9.

The first valving member 50 cannot be urged from the isolating state by the second valving member 51 until the first and second valving members 50 and 51 are in the first relative state with the vent port 56 isolated from the inlet and outlet ports 48 and 55, respectively, thereby avoiding any danger of fuel gas being vented to atmosphere from the reservoir 20. The action of the compression spring 81 on the first valving member 50 ensures that the first and second valving members 50 and 51 remain in the first relative state while the first valving member 50 is in the communicating state.

When it is desired to operate the valve 21 from the first state to the third state, the second valving member 51 is urged in the direction of the arrow A in order to return the first valving member 50 from the communicating state illustrated in Fig. 5 to the isolating state illustrated in Figs. 6 and 7. While the first valving member 50 is being returned from the communicating state to the isolating state, the spring action of the compression spring 81 acting on the first valving member 50 retains the first and second valving members 50 and 51 in the first relative state with the vent port 56 isolated from both the outlet port 55 and the inlet port 48. When the first valving member 50 returns to the isolating state isolating the inlet port 48 from the outlet port 55 and the vent port 56, and with the first and second valving members 50 and 51 still in the first relative state, the valve 21 is in the second state. On further movement of the second valving member 51 in the direction of the arrow A, the compression spring 81 no longer acts to retain the first and second valving members 50 and 51 in the first relative state, and therefore further movement of the second valving member 51 in the direction of the arrow A results in the second valving member 51 being urged relative to the first valving member 50 from the first relative state to the second relative state with the vent port 56 communicating with the outlet port 55 and the valve 21 in the third state.

In this embodiment of the invention the valve housing 36 is formed in two parts, namely, an upstream part 92 and a downstream part 93 which are secured together by screw threads 94. The extension element 45 extends upstream from the

upstream part 92. The first valving member 50 is also formed in two parts, namely, an upstream part 95 and a downstream part 96. The downstream part 96 is engaged in the upstream bore 75 which extends through the upstream part 95 of the first valving member 50 and is secured therein by being a press fit in the upstream bore 75. A spigot 97 extends from the downstream part 96 into the upstream bore 75 to the transverse bore 79 in order to reduce the transverse cross-sectional area of the upstream bore 75 to minimise the volume of liquid fuel gas collecting in the upstream bore 75.

The valve housing 36 and the first and second valving members 50 and 51 may be of any suitable material. In this embodiment of the invention the upstream and downstream parts 92 and 93 of the valve housing 36 are of brass. The upstream and downstream parts 95 and 96 of the first valving member 50 are of brass, while the second valving member 51 is of brass.

In use, with the reservoir 20 charged and pressurised with fuel gas in liquid form and with the vaporising chamber 8 charged with herbal matter or other matter to be vaporised, and with the valve 21 in the third state isolating the downstream fuel gas path 22 from the reservoir 20 and venting the downstream fuel gas path 22 to atmosphere, the vaporising device 1 is ready for use. When it is desired to operate the vaporising device 1 to produce the aerosol, the valve 21 is operated from the third state to the first state through the second state by urging the thumb operated button switch 86 in the direction of the arrow C. The thumb operated button switch 86 retains the valve 21 in the first state with fuel gas being delivered to the gas catalytic combustion element 10 from the reservoir 20. After the gas catalytic combustion element 10 has been raised to its ignition temperature, the gas catalytic combustion element 10 commences to convert the fuel gas to heat. With the gas catalytic combustion element 10 converting fuel gas to heat, the herbal matter or other matter to be vaporised in the vaporising chamber 9 is rapidly brought to its vaporising temperature. By drawing on the mouthpiece 18 of the draw tube 17 an aerosol of the vaporised components of the vaporisable matter which is produced in the vaporising chamber 8 is drawn from the vaporising chamber 8 for inhaling thereof. The raising of the gas catalytic combustion element 10 to its ignition

temperature, however, this aspect of the vaporising device is described in PCT published Application No. PCT/IE 2006/082571. The thumb operated button switch 86 retains the valve 21 in the first state for so long as the vaporising device 1 is to be operated to vaporise the vaporisable matter.

When it is desired to deactivate the vaporising device 1, the thumb operated button switch 86 is moved in the direction of the arrow D to in turn operate the valve 21 from the first state through the second state and into the third state, with the downstream fuel gas path 22 isolated from the reservoir and vented to atmosphere.

While the valve housing 36 has been described as being formed in two parts, it will be readily apparent to those skilled in the art that the valve housing may be formed by a single integral part. It will also be appreciated that the first valving member instead of being formed in two parts may also be formed as a one-part element.

Needless to say, while the valve 21 according to the invention has been described as being located in a tubular housing extending into the reservoir, this is not essential, the valve 21 may be located in any other suitable location in the vaporising device.

While the first and second valving members and the valve housing have been described as being of circular transverse cross-section, the valving members and the valve housing may be of any other suitable or desirable cross-section.

While the valve 21 has been described for use in a vaporising device, it will be readily apparent to those skilled in the art that the valve may be used in many other applications besides in a vaporising device. It will also be appreciated that while in this embodiment of the invention the gas powered heating device has been described as being a vaporising device, the gas powered heating device may be any other device, for example, a soldering iron, a glue gun and the like.

Needless to say, while the valve according to the invention has been described as controlling the flow of fuel gas from a reservoir to a gas catalytic combustion element

located in a combustion chamber, it will be readily apparent to those skilled in the art that the valve according to the invention may be used for controlling the flow of any fluid from any source to any destination, particularly where it is desired to vent the components on the downstream side of the valve to atmosphere when the components on the downstream side of the valve are isolated from the source of the fluid by the valve.

It will also be appreciated that other suitable urging means besides a compression spring may be provided for urging the first valving member into the isolating state, and the urging means, be it a compression spring or otherwise, may be provided in any other suitable location besides being located within the valve chamber and acting between the valve housing and the first valving member.

Claims

1. A valve comprising an inlet port, an outlet port and a vent port, a valving means adapted to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

2. A valve as claimed in Claim 1 in which the valving means is adapted to isolate the vent port from the inlet port and the outlet port in the first state.

3. A valve as claimed in Claim 1 or 2 in which the valving means is adapted to isolate the vent port from the outlet port in the second state.

4. A valve as claimed in any preceding claim in which the valve comprises a valve housing defining a valve chamber, the inlet port communicating with the valve chamber, and the valving means comprising a first valving member in the valve chamber operable between a communicating state communicating the inlet port with the valve chamber when the valving means is in the first state, and an isolating state isolating the inlet port from the valve chamber when the valving means is in the second and third states.

5. A valve as claimed in Claim 4 in which the outlet port communicates with the valve chamber through the first valving member.

6. A valve as claimed in Claim 5 in which the first valving member is adapted to isolate the vent port from the outlet port when the first valving member is in the communicating state and is being operated between the communicating state and the isolating state.

7. A valve as claimed in Claim 4 or 5 in which the valving means comprises a second valving member, the outlet port and the vent port being located in the second valving member and communicating with each other through the second valving member, the first and second valving members being co-operable for selectively

isolating the vent port from the outlet port when the valving means is in the first and second states.

8. A valve as claimed in Claim 7 in which the second valving member is moveable relative to the first valving member between a first relative state with the first and second valving members co-operating to isolate the vent port from the outlet port, and a second relative state with the vent port communicating with the outlet port.

9. A valve as claimed in Claim 8 in which the second valving member is moveable with the first valving member for maintaining the first and second valving members in the first relative state as the first valving member is being moved between the communicating state and the isolating state.

10. A valve as claimed in Claim 8 or 9 in which the second valving member is moveable relative to the first valving member from the first relative state to the second relative state when the first valving member is in the isolating state to define the third state of the valving means.

11. A valve as claimed in any of Claims 8 to 10 in which the second valving member is slideable relative to the first valving member between the first and second relative states.

12. A valve as claimed in any of Claims 7 to 11 in which the second valving member is slideable relative to the valve housing.

13. A valve as claimed in any of Claims 7 to 12 in which the second valving member is located externally of the valve housing, and the first valving member extends outwardly through the valve housing from the valve chamber to co-operate with the second valving member.

14. A valve as claimed in any of Claims 7 to 12 in which the vent port communicates with the outlet port through a venting valve seat formed on one of the

first and second valving members, and the other one of the first and second valving members is sealably engageable with the venting valve seat for isolating the vent port from the outlet port when the first and second valving members are in the first relative state.

15. A valve as claimed in Claim 14 in which the first valving member extends into the second valving member through the vent port to co-operate with the second valving member for isolating the vent port from the outlet port.

16. A valve as claimed in Claim 14 or 15 in which the venting valve seat is located on the second valving member, and the first valving member is co-operable with the venting valve seat for isolating the vent port from the outlet port.

17. A valve as claimed in any of Claims 14 to 16 in which the first valving member communicates the valve chamber with the outlet port on the outlet port side of the venting valve seat.

18. A valve as claimed in any of Claims 8 to 17 in which a passageway extends through the first valving member communicating the valving chamber with the outlet port.

19. A valve as claimed in any of Claims 8 to 17 in which an urging means is provided for maintaining the first and second valving members in the first relative state while the first valving member is in the communicating state, and during movement of the first valving member between the communicating state and the isolating state.

20. A valve as claimed in Claim 19 in which the urging means acts on the first valving member for urging the first valving member into the isolating state.

21. A valve as claimed in Claim 19 or 20 in which the urging means comprises a spring acting between the valve housing and the first valving member.

22. A valve as claimed in any of Claims 7 to 21 in which the second valving member is adapted for operating the first valving member between the isolating state and the communicating state.

23. A valve as claimed in any of Claims 4 to 22 in which the inlet port communicates with the valve chamber through an inlet valve seat, and the first valving member is co-operable with the inlet valve seat for isolating the inlet port from the outlet port and the vent port.

24. A valve as claimed in any of Claims 4 to 23 in which the first valving member comprises a first sealing element sealably engageable with the inlet valve seat.

25. A valve as claimed in any of Claims 4 to 24 in which the first valving member comprises a second sealing element sealably engageable with the venting valve seat.

26. A valve as claimed in any of Claims 4 to 25 in which a third sealing element is provided co-operating with the first valving member and the valve housing for defining with the valve housing and the first valving member the valving chamber.

27. A valve as claimed in Claim 26 in which the third sealing element is adapted for sealably and slideably engaging the valve housing.

28. A valve as claimed in Claim 26 or 27 in which the third sealing element is located on and extends circumferentially around the first valving member.

29. A valve as claimed in any of Claims 4 to 28 in which the first valving member is slideable in the valve chamber between the isolating state and the communicating state.

30. A valve as claimed in any of Claims 7 to 29 in which an actuator element is provided for operating the second valving member between the first and second relative states, and for operating the second valving member to urge the first valving

member from the isolating state to the communicating state.

31. A gas powered heating device comprising a fuel gas reservoir for storing fuel gas in liquid form, a converting means for converting fuel gas to heat, and a valve as claimed in any of Claims 1 to 30 selectively communicating the converting means with the fuel gas reservoir, the inlet port of the valve communicating with the fuel gas reservoir through an upstream fuel gas path, the outlet port of the valve communicating with the converting means through a downstream fuel gas path, and the vent port being vented to atmosphere.

32. A gas powered heating device as claimed in Claim 31 in which the outlet port of the valve is connected to the converting means through an elongated pipeline.

33. A gas powered heating device comprising a fuel gas reservoir for storing fuel gas in liquid form, a converting means for converting fuel gas to heat, and a valve for selectively communicating the converting means with the fuel gas reservoir, the valve comprising an inlet port communicating with the fuel gas reservoir through an upstream fuel gas path, an outlet port communicating with the converting means through a downstream fuel gas path for delivering fuel gas to the converting means, a vent port vented to atmosphere, and a valving means adapted to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

34. A gas powered heating device as claimed in Claim 33 in which the valving means is adapted to isolate the vent port from the inlet port and the outlet port in the first state with the converting means communicating with the fuel gas reservoir through the valve.

35. A gas powered heating device as claimed in Claim 33 or 34 in which the valving means is adapted to isolate the vent port from the outlet port in the second state.

36. A gas powered heating device as claimed in any of Claims 33 to 35 in which the valve comprises a valve housing defining a valve chamber, the inlet port communicating with the valve chamber, and the valving means comprising a first valving member in the valve chamber operable between a communicating state communicating the inlet port with the valve chamber when the valving means is in the first state, and an isolating state isolating the inlet port from the valve chamber when the valving means is in the second and third states.

37. A gas powered heating device as claimed in Claim 36 in which the outlet port communicates with the valve chamber through the first valving member.

38. A gas powered heating device as claimed in Claim 37 in which the first valving member is adapted to isolate the vent port from the outlet port when the first valving member is in the communicating state and is being operated between the communicating state and the isolating state.

39. A gas powered heating device as claimed in Claim 37 or 38 in which the valving means comprises a second valving member, the outlet port and the vent port being located in the second valving member and communicating with each other through the second valving member, the first and second valving members being co-operable for selectively isolating the vent port from the outlet port when the valving means is in the first and second states.

40. A gas powered heating device as claimed in Claim 39 in which the second valving member is moveable relative to the first valving member between a first relative state with the first and second valving members co-operating to isolate the vent port from the outlet port, and a second relative state with the vent port communicating with the outlet port.

41. A gas powered heating device as claimed in Claim 40 in which the second valving member is moveable with the first valving member for maintaining the first and second valving members in the first relative state as the first valving member is

being moved between the communicating state and the isolating state.

42. A gas powered heating device as claimed in Claim 40 or 41 in which the second valving member is moveable relative to the first valving member into the second relative state when the first valving member is in the isolating state to define the third state of the valving means.

43. A gas powered heating device as claimed in any of Claims 40 to 42 in which the second valving member is slideable relative to the first valving member between the first and second relative states.

44. A gas powered heating device as claimed in any of Claims 39 to 43 in which the second valving member is slideable relative to the valve housing.

45. A gas powered heating device as claimed in any of Claims 39 to 44 in which the second valving member is located externally of the valve housing, and the first valving member extends outwardly through the valve housing from the valve chamber to co-operate with the second valving member.

46. A gas powered heating device as claimed in any of Claims 39 to 45 in which the vent port communicates with the outlet port through a venting valve seat formed on one of the first and second valving members, and the other one of the first and second valving members is sealably engageable with the venting valve seat for isolating the vent port from the outlet port when the first and second valving members are in the first relative state.

47. A gas powered heating device as claimed in Claim 46 in which the first valving member extends into the second valving member through the vent port to co-operate with the second valving member for isolating the vent port from the outlet port.

48. A gas powered heating device as claimed in Claim 46 or 47 in which the venting valve seat is located on the second valving member, and the first valving

member is co-operable with the venting valve seat for isolating the vent port from the outlet port.

49. A gas powered heating device as claimed in any of Claims 46 to 48 in which the first valving member communicates the valve chamber with the outlet port on the outlet port side of the venting valve seat.

50. A gas powered heating device as claimed in any of Claims 40 to 49 in which a passageway extends through the first valving member communicating the valving chamber with the outlet port.

51. A gas powered heating device as claimed in any of Claims 40 to 49 in which an urging means is provided for maintaining the first and second valving members in the first relative state while the first valving member is in the communicating state, and during movement of the first valving member between the communicating state and the isolating state.

52. A gas powered heating device as claimed in Claim 51 in which the urging means acts on the first valving member for urging the first valving member into the isolating state.

53. A gas powered heating device as claimed in Claim 51 or 52 in which the urging means comprises a spring acting between the valve housing and the first valving member.

54. A gas powered heating device as claimed in any of Claims 39 to 53 in which the second valving member is adapted for operating the first valving member between the isolating state and the communicating state.

55. A gas powered heating device as claimed in any of Claims 36 to 54 in which the inlet port communicates with the valve chamber through an inlet valve seat, and the first valving member is co-operable with the inlet valve seat for isolating the inlet port from the outlet port and the vent port.

56. A gas powered heating device as claimed in any of Claims 36 to 55 in which the first valving member comprises a first sealing element sealably engageable with the inlet valve seat.

57. A gas powered heating device as claimed in any of Claims 36 to 57 in which the first valving member comprises a second sealing element sealably engageable with the venting valve seat.

58. A gas powered heating device as claimed in any of Claims 36 to 57 in which a third sealing element is provided co-operating with the first valving member and the valve housing for defining with the valve housing and the first valving member the valving chamber.

59. A gas powered heating device as claimed in Claim 58 in which the third sealing element is adapted for sealably and slideably engaging the valve housing.

60. A gas powered heating device as claimed in Claim 58 or 59 in which the third sealing element is located on and extending circumferentially around the first valving member.

61. A gas powered heating device as claimed in any of Claims 36 to 60 in which the first valving member is slideable in the valve chamber between the isolating state and the communicating state.

62. A gas powered heating device as claimed in any of Claims 39 to 61 in which an actuator element is provided for operating the second valving member between the first and second relative states, and for urging the second valving member to urge the first valving member from the isolating state to the communicating state.

63. A gas powered heating device as claimed in any of Claims 33 to 62 in which the converting means is connected to the outlet port of the valve through an elongated pipeline.

64. A gas powered heating device as claimed in any of Claims 33 to 63 in which the converting means is connected to the outlet port of the valve through a venturi mixer to produce a fuel gas/air mixture for delivery to the converting means.

65. A gas powered heating device as claimed in any of Claims 33 to 64 in which the converting means comprises a gas catalytic combustion element located in a combustion chamber formed in a combustion chamber housing.

66. A gas powered heating device as claimed in Claim 65 in which the combustion chamber is connected to the outlet port of the valve through a thermostatically controlled valve responsive to the temperature of the combustion chamber housing.

67. A gas powered heating device as claimed in any of Claims 33 to 66 in which the gas powered heating device is configured as a soldering iron.

68. A gas powered heating device as claimed in any of Claims 33 to 66 in which the gas powered heating device is configured as a glue gun.

69. A gas powered heating device as claimed in any of Claims 33 to 66 in which the gas powered heating device is configured as a vaporising device for vaporising vaporisable components of vaporisable matter.

70. A gas powered heating device as claimed in any of Claims 33 to 66 in which the gas powered heating device is configured as a vaporising device for vaporising vaporisable components of herbal matter.

71. A gas powered heating device as claimed in Claim 69 or 70 in which a vaporising chamber is provided for accommodating the vaporisable matter for vaporising thereof, the vaporising chamber being heated by the converting means.

72. A gas powered heating device as claimed in any of Claims 33 to 71 in which

an outer housing is provided for housing the fuel gas reservoir, the valve and the converting means.

73. A gas powered heating device as claimed in any of Claims 33 to 72 in which the device is adapted to a portable handheld device.

74. A device for vaporising vaporisable matter, the device comprising a combustion chamber housing defining a combustion chamber, a gas catalytic combustion element located in the combustion chamber for converting fuel gas to heat for heating the combustion chamber housing, a vaporising chamber housing defining a vaporising chamber for the vaporisable matter, the vaporising chamber housing being in heat transfer relationship with the combustion chamber housing for transfer of heat thereto from the combustion chamber housing for heating the vaporisable matter in the vaporising chamber, a fuel gas reservoir for storing fuel gas in liquid form, a valve as claimed in any of Claims 1 to 30 for selectively communicating the combustion chamber with the fuel gas reservoir, the inlet port of the valve communicating with the fuel gas reservoir through an upstream fuel gas path, the outlet port of the valve communicating with the combustion chamber through a downstream fuel gas path, and the vent port of the valve being vented to atmosphere.

75. A device for vaporising vaporisable matter, the device comprising a combustion chamber housing defining a combustion chamber, a gas catalytic combustion element located in the combustion chamber for converting fuel gas to heat for heating the combustion chamber housing, a vaporising chamber housing defining a vaporising chamber for the vaporisable matter, the vaporising chamber housing being in heat transfer relationship with the combustion chamber housing for transfer of heat thereto from the combustion chamber housing for heating the vaporisable matter in the vaporising chamber, a fuel gas reservoir for storing fuel gas in liquid form, a valve comprising an inlet port communicating with the fuel gas reservoir through an upstream fuel gas path, an outlet port communicating with the combustion chamber through a downstream fuel gas path for delivering fuel gas to the gas catalytic combustion element, a vent port vented to atmosphere, and a

valving means adapted to operate in three states, a first state communicating the outlet port with the inlet port, a second state isolating the outlet port and the vent port from the inlet port, and a third state isolating the inlet port from the outlet port and the vent port with the outlet port communicating with the vent port.

76. A vaporising device as claimed in Claim 75 in which the downstream fuel gas path comprises an elongated pipeline.

77. A vaporising device as claimed in Claim 75 or 76 in which the device is adapted to be a portable handheld device.

78. A reservoir for a fluid, and a valve as claimed in any of Claims 1 to 30 in communication with the reservoir for selectively delivering fluid from the reservoir.

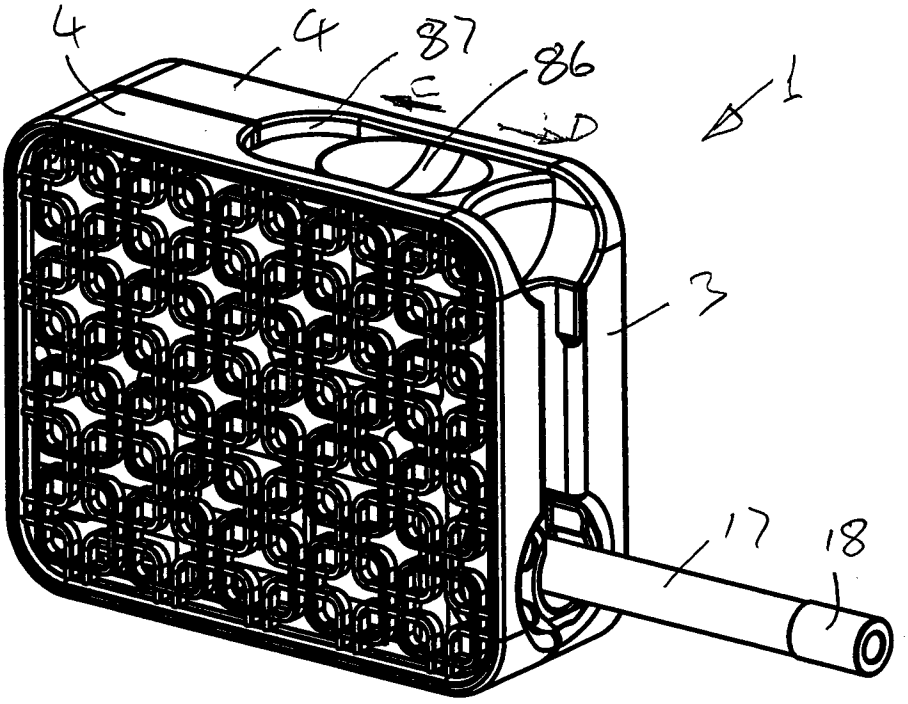

FIG 1

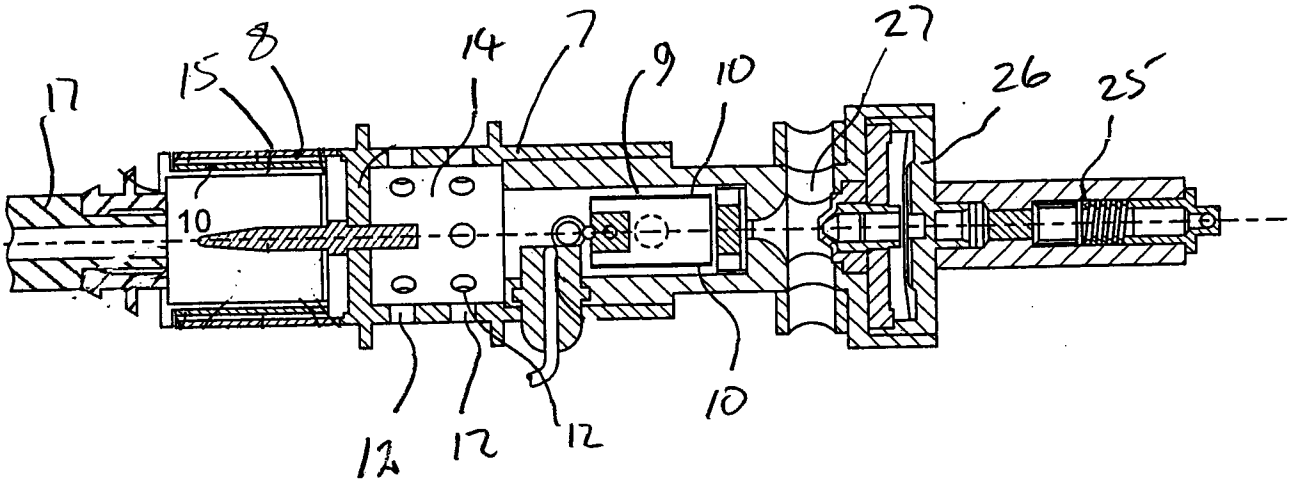

FIG 2

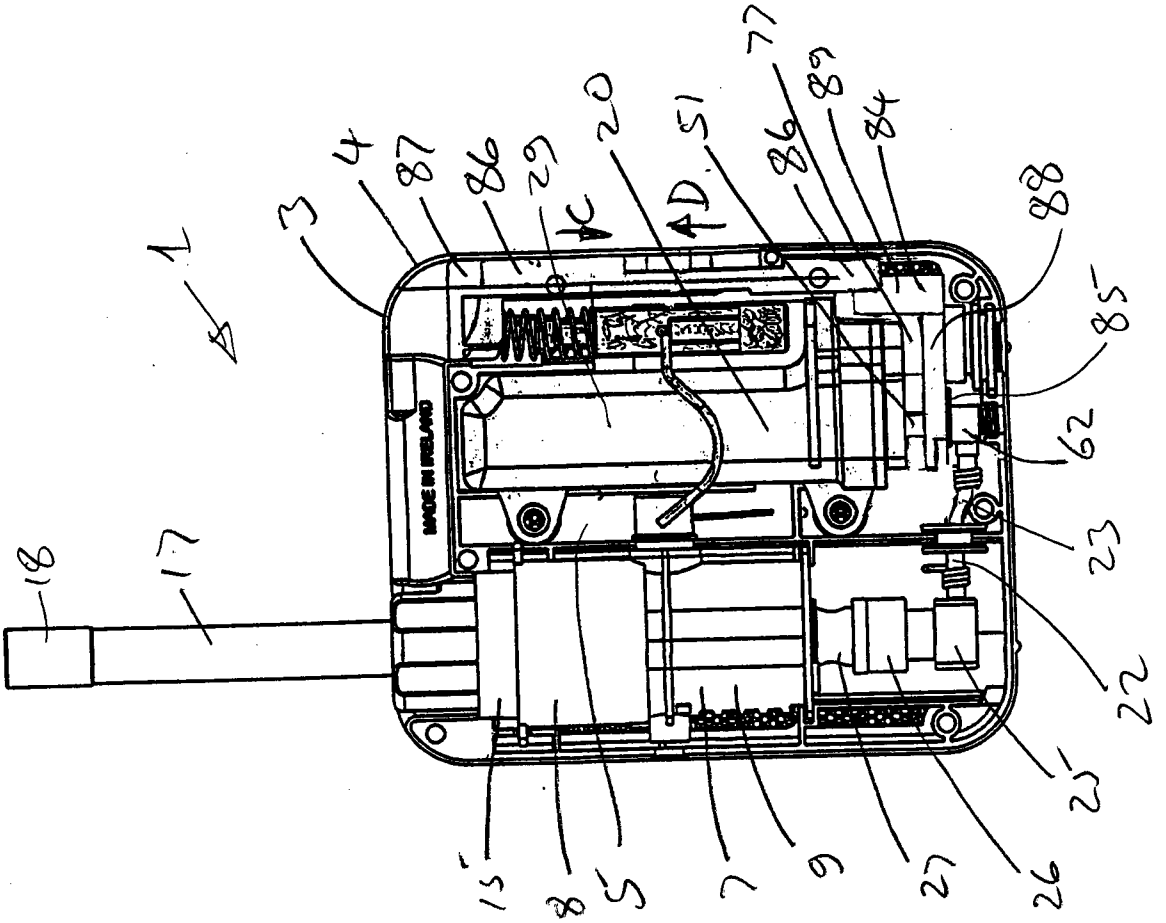
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FIG 4

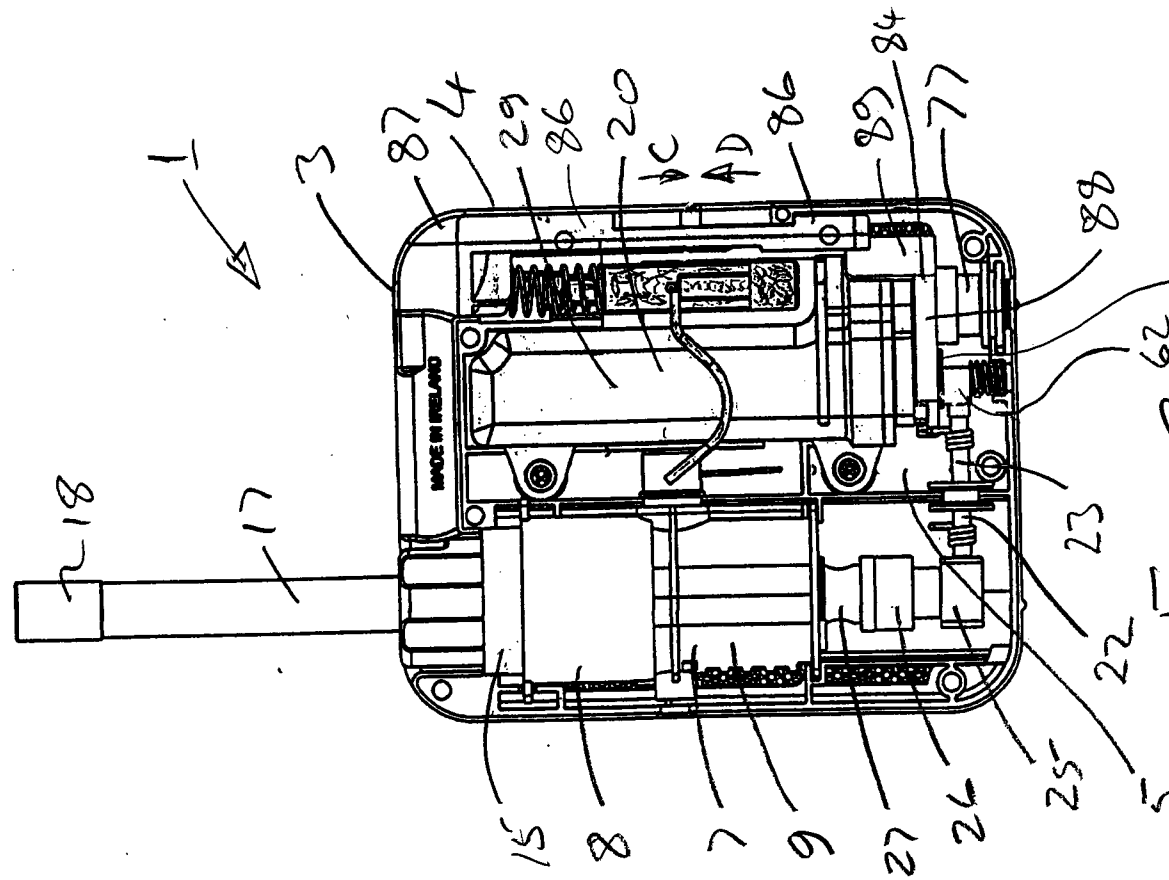
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FIG 3

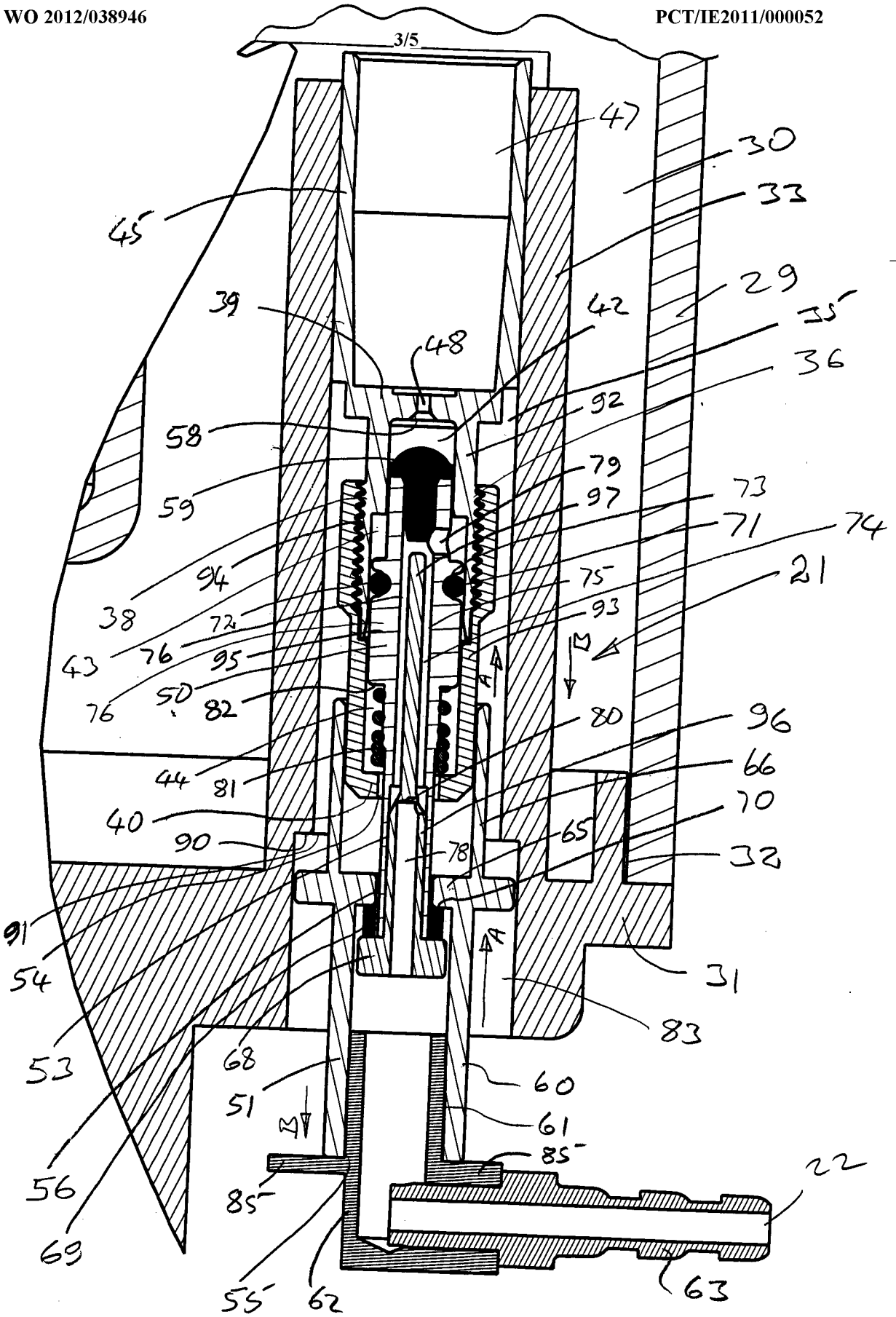
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FIG 5

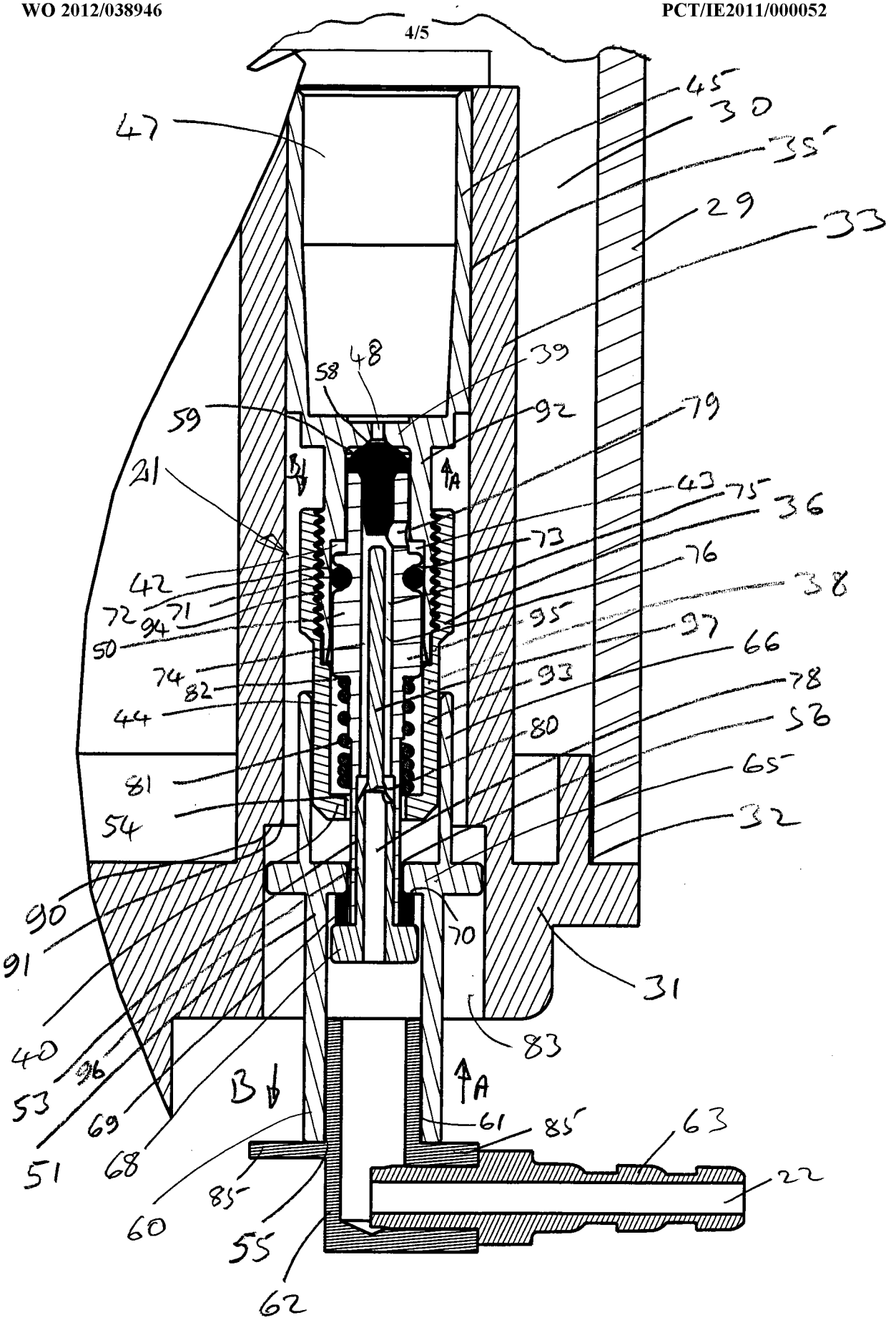
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FIG 6

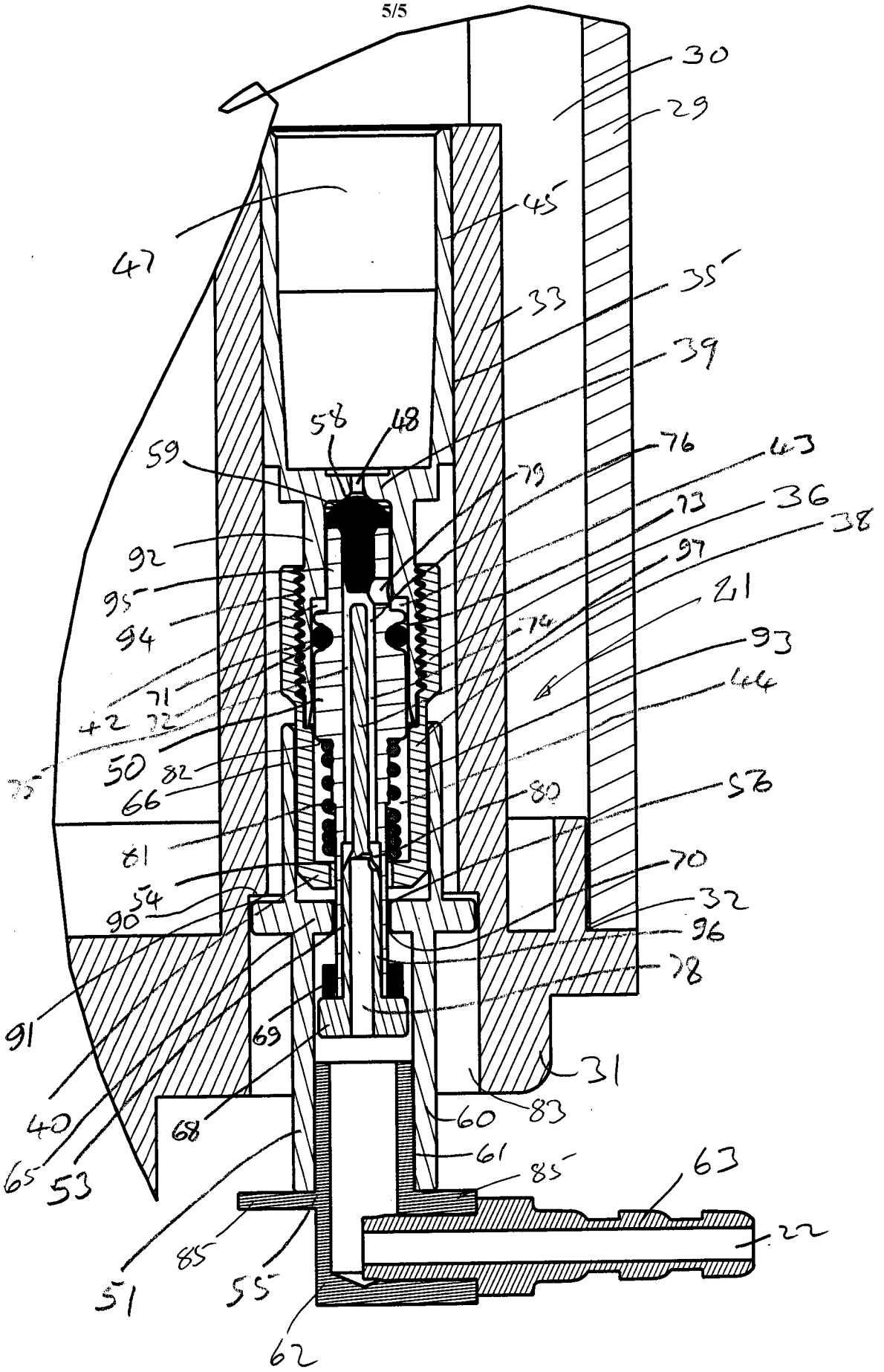
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FIG 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2011/000052

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16K11/18
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/092401 A1 (DAYCO ENSA SL [ES]; CASTANO GONZALES CARLOS MANUEL [ES]) 8 September 2006 (2006-09-08) figures 4a,4b,4c	1-78
X	DE 27 27 185 A1 (BABCOCK AG) 21 December 1978 (1978-12-21) figure 2	1-78
X	US 3 050 344 A (KERSHNER OSBORN A) 21 August 1962 (1962-08-21) figure 2	1-78
X	EP 1 653 132 A1 (SIEMENS AG [DE]) 3 May 2006 (2006-05-03) figures 1-12	1-78

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 November 2011	02/12/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bilo, Eric

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IE2011/000052

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