(CONVENTION. By one or more persons and/or a Company.) Form 4

COMMONWEALTH OF AUSTRALIA

*Patents Act 1952-1969*

# CONVENTION APPLICATION FOR A PATENT

(1) Here insert (in full) Name or Names of Applicant or Applicants, followed by Address (es).

We (1) SULZER BROTHERS LIMITED

of CH-8401 Winterthur, Switzerland

(2) Here insert Title of Invention.

hereby apply for the grant of a Patent for an invention entitled: (2)

A DEVICE FOR FILLING A GASEOUS FUEL CONTAINER

(3) Here insert number(s) of basic application(s)

which is described in the accompanying complete specification. This application is a Convention application and is based on the application numbered (3)

02810/87-0 and 00582/88-0

(4) Here insert Name of basic Country or Countries, and basic date or dates

for a patent or similar protection made in (4) Switzerland

on 23rd July 1987 and 17th February 1988

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 13-9-90

MP01370 22/07 My/Our address for service is Messrs. Edwd. Waters & Sons, Patent Attorneys, 50 Queen Street, Melbourne, Victoria, Australia.

DATED this 21st day of July 19 88

(5) Signature (s) of Applicant (s) or Seal of Company and Signatures of its Officers as prescribed by its Articles of Association.

(5) SULZER BROTHERS LIMITED

by

Ian A. Scott

Registered Patent Attorney

To:

THE COMMISSIONER OF PATENTS.

(CONVENTION: Company.) P.6125/Tg/td Form 8

COMMONWEALTH OF AUSTRALIA

*Patents Act* 1952-1969

# DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

(1) Here insert (in full) Name of Company.

In support of the Convention Application made by(1) SULZER BROTHERS LIMITED

(hereinafter referred to as the applicant) for a Patent

(2) Here insert title of Invention.

for an invention entitled:(2) A DEVICE FOR FILLING A GASEOUS-FUEL CONTAINER

(3) Here insert full Name and Address, of Company official authorized to make declaration.

XX,(3) We, Adolf Trieblnig and Mr. Dr. Ernst Wenig

of CH-8401 Winterthur, Switzerland

c/o Sulzer Brothers Limited

do solemnly and sincerely declare as follows:

1. ~~I~~ We are ~~xxxx~~ authorised by the applicant for the patent to make this declaration on its behalf.

2. The basic application~~s~~ as defined by Section 141 of the Act ~~was~~ WERE made in(4) Switzerland

on the 23th day of July 19 87, by SULZER BROTHERS LIMITED

on the 17th day of February 19 88, by SULZER BROTHERS LIMITED

(4) Here insert basic Country or Countries followed by date or dates and basic Applicant or Applicants.

(5) Here insert (in full) Name and Address of Actual Inventor or Inventors.

| | |
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| Bürglistrasse 49 | Anton-Graff-Strasse 40 |
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| CH-8305 Dietlikon | CH-8383 Kollbrunn |

XX ~~is~~/are the actual inventor~~s~~ of the invention and the facts upon which the applicant is entitled to make the application are as follow:

The applicant is the assignee of the said inventors.

4. The basic application~~s~~ referred to in paragraph 2 of this Declaration ~~was~~ XXXX WERE the first application ~~s~~ made in a Convention country in respect of the invention the subject of the application.

DECLARED at 8401 Winterthur, Switzerland

this 22nd day of June 1988

(6) Signature.

(6) Sulzer Brothers Limited

ppa. Dr. E. Wenig i.V. A. Trieblnig

To: THE COMMISSIONER OF PATENTS.

Edwd. Waters & Sons, Melbourne.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-19288/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 604344

(54) Title
A DEVICE FOR FILLING A GASEOUS-FUEL CONTAINER

International Patent Classification(s)
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(21) Application No. : 19288/88 (22) Application Date : 22.07.88

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(57) Claim

1. A device for filling a gaseous fuel container, comprising a compressor for compressing the gaseous fuel and adapted to be connected on the suction side, via a suction line comprising an inlet shut-off valve to a source of gaseous fuel, more particularly a natural gas line and adapted to be connected at the pressure side to the gaseous-fuel container to be filled, via a supply line comprising a pressure-limiting valve adjustable to a predetermined maximum pressure of the compressed gaseous fuel, characterised in that the supply line comprises a discharge valve the discharge valve and the inlet valve of the suction line are connected to at least one control device adapted to be influenced in dependence on control signals from a temperature sensor detecting the environmental temperature at the place where the device is installed and a pressure sensor detecting the pressure supplied by the compressor, at least the pressure-limiting valve and the discharge valve are disposed with the control device in a casing sealed from the immediate environment and connected to a discharge line leading from the place where the device is disposed, and the portion of the suction line

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connected to the source of gaseous fuel comprises a pressure-difference sensor detecting the difference between the gaseous-fuel pressure in the portion and the pressure in the casing and connected to the control device.

COMMONWEALTH OF AUSTRALIA 604344

Form 10

PATENTS ACT 1952-69

# COMPLETE SPECIFICATION

(ORIGINAL)

Class Int. Class

Application Number: 19288/88
Lodged: 22.7.88

Complete Specification Lodged:
Accepted:
Published:

Priority :

Related Art :

This document contains the amendments made under Section 49 and is correct for printing.

Name of Applicant : SULZER BROTHERS LIMITED

Address of Applicant : CH-8400 Winterthur, Switzerland

Actual Inventor: HEINZ BAUMANN, HEINZ MUTTER, KURT SCHREIBER and PETER THURIG

Address for Service : **EDWD. WATERS & SONS, 50 QUEEN STREET, MELBOURNE, AUSTRALIA, 3000.**

Complete Specification for the invention entitled:

A DEVICE FOR FILLING A GASEOUS-FUEL CONTAINER

The following statement is a full description of this invention, including the best method of performing it known to : us

# A DEVICE FOR FILLING A GASEOUS-FUEL CONTAINER

The invention relates to a device for filling a gaseous fuel container, comprising a compressor for compressing the gaseous fuel and adapted to be connected on the suction side, via a suctionline comprising an inlet shut-off valve, to a source of gaseous fuel, more particularly a natural gas line, and adapted to be connected at the pressure side to the gaseous-fuel container to be filled, via a supply line comprising a pressure-limiting valve adjustable to a predetermined maximum pressure of the compressed gaseous fuel.

In devices of this kind, e.g., installations for filling vehicles driven by gaseous fuel, the fuel, e.g., natural gas delivered at a pressure of e.g., 10 mbar, is compressed to a filling pressure of e.g., 200 bar when filling the gas container. The problem in such cases, particularly in areas or under operating conditions with large fluctuations in ambient temperature, is that correspondingly large fluctuations occur in the pressure in the filled gaseous-fuel container. For example, if gas is introduced into the gaseous-fuel container of a vehicle at a filling pressure of 200 bar at an ambient temperature of -20°C, and if the vehicle is parked in an area at a temperature of e.g., +20°C, the gas will be at a temperature of about 300 bar. The filling pressure must therefore be adapted to the local temperature conditions, i.e., must be suitably reduced at low ambient temperatures. The installations hitherto required for this purpose have been relatively expensive and need to be carefully operated by experts, in order to obtain the required reliability in operation, both of the refuelling installation and of the fuel container to be filled, when handling explosive gaseous fuel.

The object of the invention is to construct a filling device which is improved in this respect, simple to operate, and automatically adjusts the filling temperature

of the gaseous fuel to the local ambient temperature and also increases the reliability of the installation during operation.

To this end, according to the invention, the supply line comprises a discharge valve, the discharge valve and the inlet valve of the suction line are connected to at least one control device adapted to be influenced in dependence on control signals from a temperature sensor detecting the ambient temperature at the place where the device is installed, and from a pressure sensor detecting the pressure at which the compressor is supplied, at least the pressure-limiting valve and the discharge valve are disposed with the control device in a casing sealed from the immediate environment and connected to a discharge line leading from the place where the device is disposed, and the portion of the suction line conected to the source of gaseous fuel comprises a pressure-difference sensor detecting the difference between the gaseous-fuel pressure in the portion and the pressure in the casing, and connected to the control device.

In the device according to the invention, the gas pressures in the suction line and the supply line can be adjusted to predetermined values corresponding to local operating conditions largely independently of voluntary intervention, thus more particularly preventing faulty manipulation of the plant or the risk of explosion, e.g., through over-filling the container or through unchecked escape of gas.

Embodiments of the invention are disclosed in the dependent claims.

Other details and features will be clear from the following description of embodiments of the invention shown diagrammatically in the drawings, in conjunction with the claims. In the drawings:

Figure 1 is a diagram of a filling device constructed according to the invention;

Figure 2 shows a unit of a corresponding filling device in a modified embodiment;

Figure 3 shows a unit of another filling device in a modified embodiment;

Figure 4 shows a unit from the filling device in Figure 1, in partial longitudinal section.

Figure 5 shows the unit in cross-section corresponding to line V-V in Figure 4;

Figure 6 shows the unit in cross-section corresponding to line VI-VI in Figure 4, and

Figure 7 is a diagram of another filling device in a modified embodiment.

Figure 1 shows a device comprising a compressor 1 connected by a coupling 2 to a drive shaft 3 of a motor 4, and a safety unit 5 connected to compressor 1 and disposed in a pressure-tight casing 6. The drive shaft 3 can have an impeller 7 for cooling the compressor. The compressor 1, which can have any suitable construction, e.g., a multistage reciprocating compressor, can be connected at the suction side via a suction line 8 to a source of gaseous fuel, i.e., to a natural-gas pipe 9 in the example shown. The pressure side of compressor 1, which corresponds to the last stage in a multistage compressor, can be connected via a supply line 11 to a gaseous fuel container 10 to be filled, e.g., the fuel tank of a vehicle (not shown).

The casing 6 comprises a fittings chamber 15 bounded by a first end wall 12, a cylindrical side wall 13 and a partition wall 14, and a buffer chamber 16 separated from chamber 15 and bounded by the partition 14, a cylindrical side wall 17 and a second end wall 18. Walls 12 and 14 are constructed as distribution blocks. Wall 12 has peripheral connection places for a discharge line 20 and a first suctionline portion 8a adapted to be connected to the natural-gas line 9, whereas partition 14 has a peripheral connection place for a second suction-line portion 8b leading to the compressor, and two connection places for a

first supply-line portion 11a connected to compressor 1 and a second portion 11b for connecting to the gaseous fuel container 10.

The first portion 8a of suction line 8, which can be connected to the natural-gas line 9 either directly or via an e.g., manual shut-off means 21 as shown in Figure 1, has a filter 22 for removing any impurities in the natural gas and is connected to two flow channels 23,24 formed in the end wall 12 and respectively connected to the inlet side of an inlet shut-off valve 26 disposed in chamber 15 or to a pressure-difference sensor 25 disposed in chamber 15. The discharge line 20 is connected to the fittings chamber 15 via a flow channel 27 in the end wall 12 and containing a restrictor 28, and extends away from the immediate neighbourhood of the filling device, e.g. over a roof (not shown) covering the device. The outlet side of valve 26 is connected to a flow channel formed in partition 14 and connected by a non-return valve 31 to the buffer chamber 16. The buffer chamber is connected via a flow channel 32 formed in partition 14 to a safety valve 33 disposed in and opening into the fittings chamber 15 and adjustable to a preset maximum value of the pressure prevailing in the buffer chamber 16. Chamber 16 is also connected via another flow channel 34 to the second portion 8b of suction line 8 leading to compressor 1.

The two portions 11a, 11b of supply line 11 are interconnected via the flow channels 35, 36, 37, 38 formed in partition 14 and are also connected to a group of fittings disposed in chamber 15. The group of fittings comprise a pressure sensor 41, a pressure-limiting valve 42 opening into the fittings chamber 15 and adjustable to a preset maximum pressure of the compressed gaseous fuel, and a shut-off discharge valve 43 whose outlet side is connected to the buffer chamber 16 via a discharge line 44 and a flow channel 45 formed in partition 14. The second portion 11b of supply line 11 can be connected to the gaseous fuel

container 10 via a shut-off means disposed thereon and, as shown in Figure 1, adapted to contain inter alia a non-return valve 46 and an e.g., manual shut-off valve 47.

An electronic control device 50, likewise disposed in chamber 15, is connected via signal lines 51, 52 respectively to the pressure-difference sensor 25 or the high-pressure sensor 41, and by control lines 53, 54 respectively to an actuator, e.g., a servomotor or electromagnet, of inlet valve 26 or of discharge valve 43. The control device 50 is also connected via signal lines 55, 56, 57 through the end wall 12 of the casing 6 to respective temperature sensors 58, 69m 61 and via a control line 62 to a switch device 63 and via an electric circuit 65 and emergency switch 64 to an electric current source (not shown). Motor 4 is connected by another electric circuit 66 to the control device 50. The temperature sensor is disposed at a distance frmo the filling device, preferably outside the casing 67 indicated by chain-dotted lines in Figure 4 and adapted to surround the compressor 1, motor 4 and safety unit 5. The temperature sensor 58 detects the ambient temperature at the place where the filling installation is installed, whereas the temperature sensors C0, C1 are disposed on motor 1 and compressor 1 respectively.

The filling device is started up by the switching device 63, actuated e.g. by a key, whereupon the discharge valve 43 of the supply line 11 is closed via control line 54, the inlet valve 26 of suction line 8 is opened via control line 51 and the motor 40 is switched on via electric circuit 66, by means of switching units (not shown) contained in the control device 50. When the shut-off means 21 is opened, natural gas supplied at a pressure of e.g. 10 mbar from line 9 is conveyed through the non-return valve 31 to the buffer chamber 16 and through feed-line portion 8b to compressor 1, compressed to a preset supply pressure and delivered through supply line 11 to the gaseous fuel

container 10. The supply pressure is limited to a maximum value of e.g. 230 bar by the pressure-limiting valve 42. By means of control device 50, the supply pressure during operation is limited to a value corresponding to the ambient temperature, in accordance with control signals from the pressure sensor 41 of supply line 11 and the temperature sensor 58 which detects the ambient temperature. The appropriate pressure can be e.g. 100 bar at an ambient temperature of -40°C and e.g. 200 bar at a temperature of +20°C, with corresponding limiting and intermediate values associated with each preset temperature range.

Depending on the temperatue/pressure function supplied to the control device 50, when the operating supply pressure (e.g. 150 bar) corresponding to the ambient temperature is reached, the inlet valve 26 of suction line 8 is closed, the dicharge valve 43 of supply line 8 is opened and motor 4 is switched off by the control device 50 influenced by the corresponding signals of pressure sensor 41 and temperature sensor 58. The compressed gaseous fuel remaining in the compressor 1 and in the suction line 11 closed by the non-return valve 46 flows through the opened discharge valve 43 and through the discharge channel 45 into the buffer chamber 16, where a pressure of e.g. 2 - 3 bar builds up, limited by the safety valve 33. When this pressure is exceeded, a corresponding amount of gaseous fuel is conveyed through a flow channel 32 and safety valve 33 to the fittings chamber 15 and thence, after a corresponding delay by restrictor 28, through discharge line 20 to a place at a distance from the filling plant and discharged to atmosphere.

Correspondingly, if the maximum supply pressure set by valve 42 is exceeded, the gas flowing out through valve 42 into chamber 15 is discharged through line 20.

The filling device can also be automatically switched off by the control device 50, even before reaching the supply pressure corresponding to the environmental

temperature. If the pressure in supply line 11 does not rise after compressor 1 has been switched on, or if it falls below a preset value when compressor 1 has been switched on, a signal for closing the inlet valve 26, for opening the discharge valve 43 and for switching off the motor 4 can be triggered in dependence on a corresponding signal from the pressure sensor 41 in the control line 50. Corresponding switching-off signals can be triggered by the pressure-difference sensor 25 if the pressure rises in casing 15 after valve 42 responds, or if the input pressure of gaseous fuel in suction-line section 8a is too low. Other shut-off signals can be transmitted by the corresponding temperature sensor 60, 61 to the control device if a temperature preset in a measuring range of motor 4 and/or compressor 1 is exceeded. Of course, the filling device can also be switched off beforehand by the switching device 63 or the emergency switch 64.

Figure 2 shows an embodiment in whcih the inlet side of the inlet valve 26 and the pressure-difference sensor 25 are connected to flow channels 70, 71 respectively formed in partition 14. Flow channel 71 is connected to flow channel 70, which is connected by a filter 22 disposed in partition 14 to the suction-line portion 8a connected to the periphery of partition 14. In this embodiment, the signal lines 55, 56, 57 leading to temperature sensors 58, 60, 61, the control line 62 and the electric circuit 65 are conveyed through partition 14 to chamber 15, which is bounded by an end wall 12' which does not have any flow channels or pipe bushings and can therefore be made correspondingly thin.

In the embodiments in Figures 1 and 2, all the fittings essential for controlling the filling device and through which the gaseous fuel flows are disposed, together with the associated connecting and switching-places, in the pressure-tight casing 15, which has only a few, relatively easily-sealed external connections and is therefore simple

in construction and reliably encloses those parts of the filling device which are at risk of explosion, e.g., if the seals are defective.

As shown in Figure 3, an embodiment is also possible in which only the fittings exposed to the highest pressure are disposed in chamber 15, whereas the fittings (sensor 25, valve 26 and valve 31) exposed to a lower gaseous-fuel pressure, e.g., 2 - 3 bar, are disposed outside casing 5 and connected at the periphery of partition 14 to a flow channel 74 leading directly to the buffer chamber 16. A sensor line 75 detecting the pressure in chamber 15 can lead from the pressure-difference sensor 25 to the fittings chamber 15, or, as shown in Figure 3, to a flow channel 75 formed in partition 14 and connected to chamber 15.

Figures 4, 5, 6 are a grahpic representation of the safety unit 5 in Figure 1. As shown, the end wall 12 and the partition wall 14 are clamped together by bolts 80 via a side wall 13, which is inserted between them in a sealing-tight manner. Side wall 17 and end wall 18 of buffer chamber 16, form a cap-like part welded to partition 14. The inlet valve 26 is screwed into a bore in end wall 12, connected to flow channel 23. The control device 50 and a teminal box 81 for the signal and control-line connections are secured to the end wall 12. The safety valve 43 and the pressure-limiting valve 42 are screwed in respective bores in partition 14. the non-return valve 31 is disposed in a bore in partition 14 and screwed into a bore in valve 26.

In the previously-described embodiments, the inlet valve 26 of suction line 8 and the discharge valve 43 of supply line 11 can be influenced by two independently controllable actuators, one of the two valves 26, 43 being open at any time whereas the corresponding other valve is closed. In the embodiment shown in Figure 7, an inlet valve 126 and a discharge valve 143 form a common change-over means 90 adjustable bwtween two switch positions by an actuator 91. The change-over means 90, which can be a

3/2-way valve as shown in the drawing, has a first input E1 connected to the flow channel 23 of suction line 8, a second input E2 connected to the flow channel 38 of supply line 11, and an output A connected to the flow channel 30 of suction line 8. When the changeover means 90 is in one switch position (not shown in Figure 7), its first input E1 is conencted to output A and its second input E2 is automatically blocked, whereas in the other switch position, shown in Figure 7, the second input E2 is connected to output A and the first input E1 is automatically blocked.

In this embodiment, the non-return valve 32 is disposed at the inlet side of means 90. The non-return valve 32 can be a separate inserted part, connected in front of changeover means 90, or can be incorporated in means 90 as shown. The actuator 91 of means 90 is connected by control lines 92 to the control device 50. The actuator 91 can be a servomotor or, as shown, a lifting electromagnet.

By means of the switching device 63 actuated in the manner described, the changeover means 91 is moved from the switch position shown into the switch position for blocking the connected portion of supply line 11, and connecting the flow channel 23 of suction line 8 to the flow channel 30, and motor 4 is switched on via electric circuit 66.

Correspondingly, when the operating supply pressure corresponding to the environmental temperature is reached or when the pressure in the supply line 11 fails to rise or falls below a preset value after switching on the compressor 1, the changeover means 90 is moved by the control device 50 out of the position connecting the two flow channels 23, 30 or suction line 8 and into the position shown in Figure 7, in which the line portion 8a is blocked and the portion 11a of supply line 11 is connected to flow channel 30. Motor 4 is switched off at the same time.

During the adjusting process, the non-return valve 31 associated with the inlet side of the changeover means 90 prevents the gaseous fuel at the supply pressure from

overflowing from the supply line 11 into the upstream portion 8a of supply line 8. When the non-return valve 32 is incorporated int he casing of switching means 90 as shown, an overflow of the gaseous fuel from the second input E2 to the first input E1 is already prevented inside the casing.

When means 90 is in the switch position shown, the compressed gaseous fuel remaining in compressor 1 and in the supply line 11 closed by the non-return valve 46 flows through the flow channel 30 to the buffer chamber 16.

The embodiment in Figure 7 can ensure in simple manner that when the discharge valve 143 is closed, the inlet valve 126 is reliably opened, the main effect being reliably to avoid the risk of air being sucked through compressor 1.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for filling a gaseous fuel container, comprising a compressor for compressing the gaseous fuel and adapted to be connected on the suction side, via a suction line comprising an inlet shut-off valve to a source of gaseous fuel, more particularly a natural gas line and adapted to be connected at the pressure side to the gaseous-fuel container to be filled, via a supply line comprising a pressure-limiting valve adjustable to a predetermined maximum pressure of the compressed gaseous fuel, characterised in that the supply line comprises a discharge valve the discharge valve and the inlet valve of the suction line are connected to at least one control device adapted to be influenced in dependence on control signals from a temperature sensor detecting the environmental temperature at the place where the device is installed and a pressure sensor detecting the pressure supplied by the compressor, at least the pressure-limiting valve and the discharge valve are disposed with the control device in a casing sealed from the immediate environment and connected to a discharge line leading from the place where the device is disposed, and the portion of the suction line connected to the source of gaseous fuel comprises a pressure-difference sensor detecting the difference between the gaseous-fuel pressure in the portion and the pressure in the casing and connected to the control device.

~~2. A device according to claim 1 in which the control device is disposed within the casing.~~

2. A device according to claim 1, characterised in that the casing is divided by a partition wall into a fittings chamber containing the pressure-limiting valve the discharge valve and the control device and a buffer chamber

sealed from the fittings chamber and connected to the outlet side of the inlet valve and to a portion of the suction line leading to the compressor, the buffer chamber being connectable to the fittings chamber via a safety valve disposed in the fittings chamber and adjustable to a preset maximum pressure, and also connected to the outlet of the discharge valve.

~~3.~~ 3. A device according to claim ~~2~~ 2, characterised in that the partition is a distribution block comprising flow channels, to which the outlet side of the inlet valve is connected, the portion of the suction line leading to the compressor and the portions of the supply line connected to the compressor and the gaseous-fuel container to be filled are connected in a peripheral region of the partition and the inlet sides of the pressure-limiting valve and of the discharge valve are connected to the side of the partition facing the fittings chamber, the outlet sides of the inlet valve and of the discharge valve, the inlet side of the safety valve and the portion of the suction line connected to the compressor being connected via a respective one of the flow channels to the buffer chamber and the portions of the supply line connected to the compressor and the gaseous-fuel container are connected via corresponding flow channels to the pressure sensor the pressure-limiting valve and the inlet side of the discharge valve.

~~4~~ 4 A device according to claim ~~3~~ 3, characterised in that the pressure sensor of the supply line is disposed in the fittings chamber and is connected to the supply channel associated with the supply line.

~~5~~ 5 A device according to claim ~~4 or 5~~ 3 or 4, characterised in that the inlet valve is disposed in the fittings chamber.

6. ~~2.~~ A device according to any one of the preceding claims, characterised in that the inlet valve and the discharge valve form a common change-over means connected via a single actuator to the control device and adjustable between two switch positions, and having a first input connected to an upstream portion of the suction line a second input connected to the supply line and an output connected to a downstream portion of the suction line and in the first switching position of the change-over means its first input is connected to the output and its second input is blocked, whereas in the second switching position the second input is connected to the output and the first input is blocked.

7. ~~6~~ A device according to claim 6, ~~3,~~ characterised in that the changeover means is a three/two-way valve.

8. ~~9.~~ A device according to any of claims 3 to 7 ~~1 to 8~~, characterised in that the pressure-difference sensor associated with the suction line is disposed in the fittings chamber.

9. ~~10.~~ A device according to claim 3 or 4 ~~1 or 5~~, characterised in that the inlet valve is disposed outside the casing and its outlet side is connected tot he associated flow channel in the peripheral region of partition.

10. ~~12.~~ A device according to any of the preceding claims, characterised in that the suction line comprises a non-return valve.

11. ~~12.~~ A device according to claim 10, ~~11,~~ characterised in tha the non-return valve is connected to the flow channel connected to the outlet side of the inlet valve.

12. A device according to claim 6 or 7 and 10 ~~7 or 8 and 11~~, characterised in that the non-return valve is disposed in the upstream portion of the suction line adjacent the changeover means.

13. ~~14.~~ A device according to claim 12, characterised in that the non-return valve is incorporated in the changeover means.

14. ~~15.~~ A device according to any of claims 3 to 13, ~~4 to 14~~, characterised in that the discharge line leading away from the place where the device is installed is connected to the fittings chamber via one of the flow channels formed in the partition.

15. ~~16.~~ A device according to any of claims 3 to 13, ~~4 to 14~~, characterised in that the discharge line leading away from the place where the device is installed is connected to a flow channel formed in a wall part of the casing at a distance from the partition and connected to the fittings chamber.

16 ~~17.~~ A device according to any of the preceding claims, characterised in that a restrictor is associated with the discharge line leading away from the place where the device is installed.

17. ~~18.~~ A device according to any of claims 3 to 8, ~~4 to 9~~, characterised in that the inlet side of the inlet valve is connected to a flow channel formed in a wall part of casing disposed at a distance from partition and connected to the portion of the suction line for conection to the source of gaseous fuel.

~~19.~~ 18. A device according to any of claims ~~4 to 9~~ 3 to 8, characterised in that the inlet side of the inlet valve is connected to one of the flow channels formed in the partition and the portion of the suction line for connecting to the source of gaseous fuel is connected to the flow channel in the peripheral region of the partition.

DATED this 26th day of June, 1990.

SULZER BROTHERS LIMITED

WATERMARK PATENT &
TRADEMARK ATTORNEYS
290 BURWOOD ROAD,
HAWTHORN, VICTORIA,
AUSTRALIA.

IAS:BB(9.7)

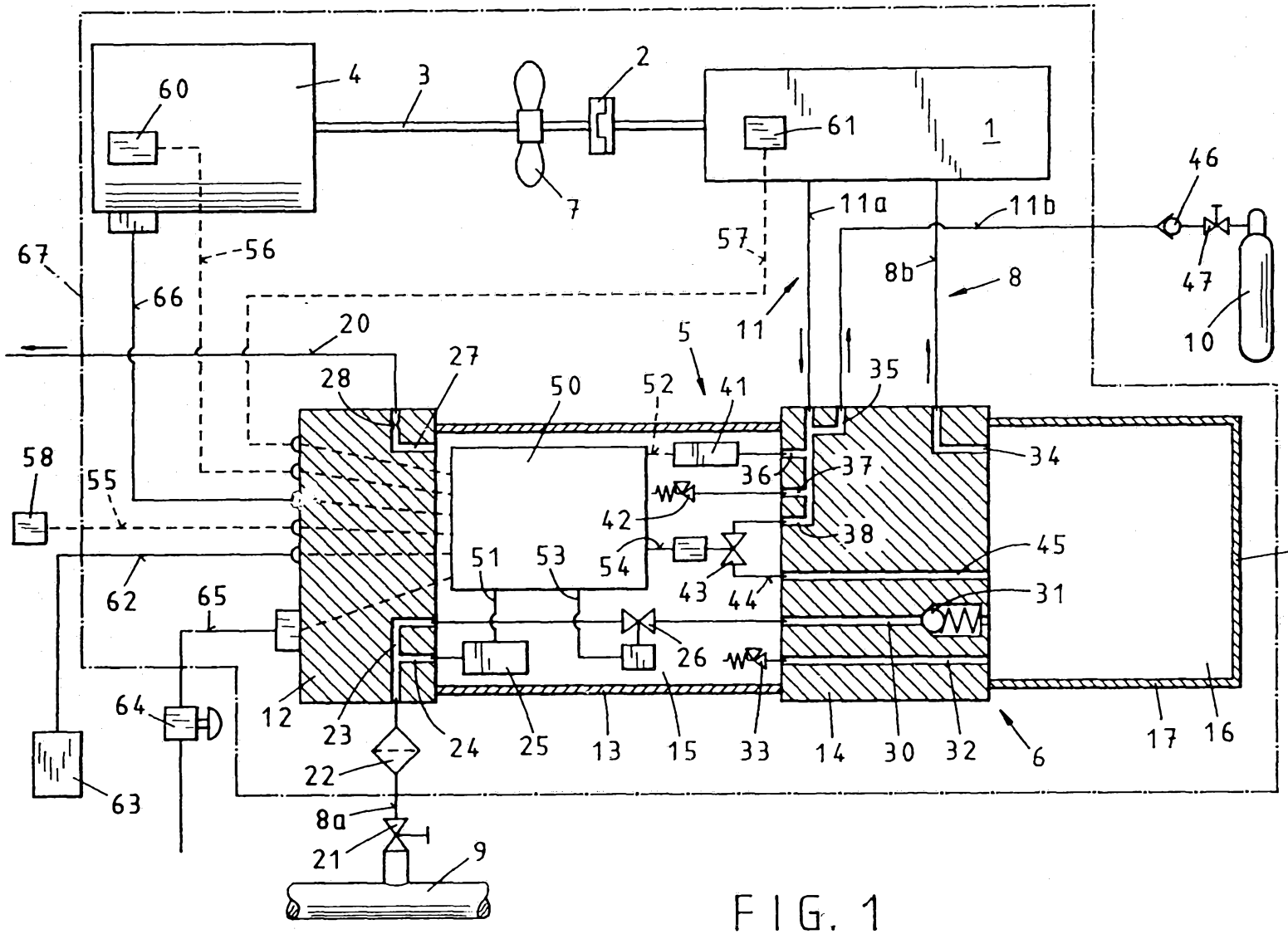


FIG. 1

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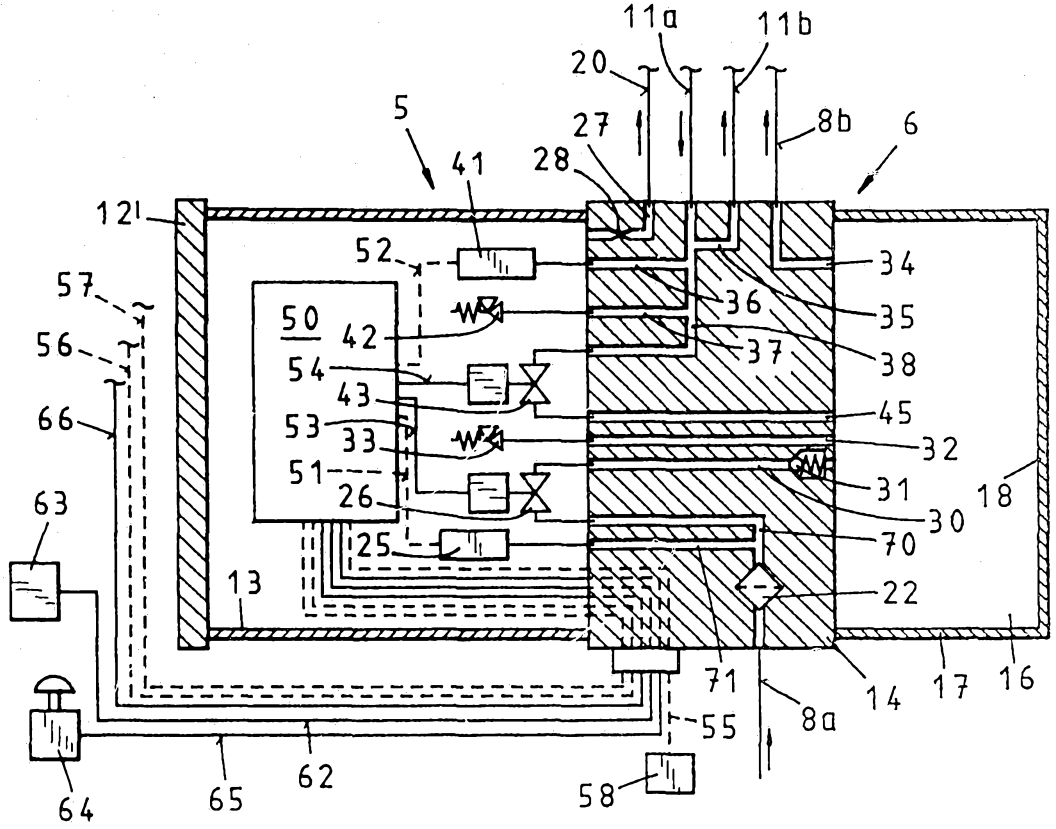
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FIG. 2

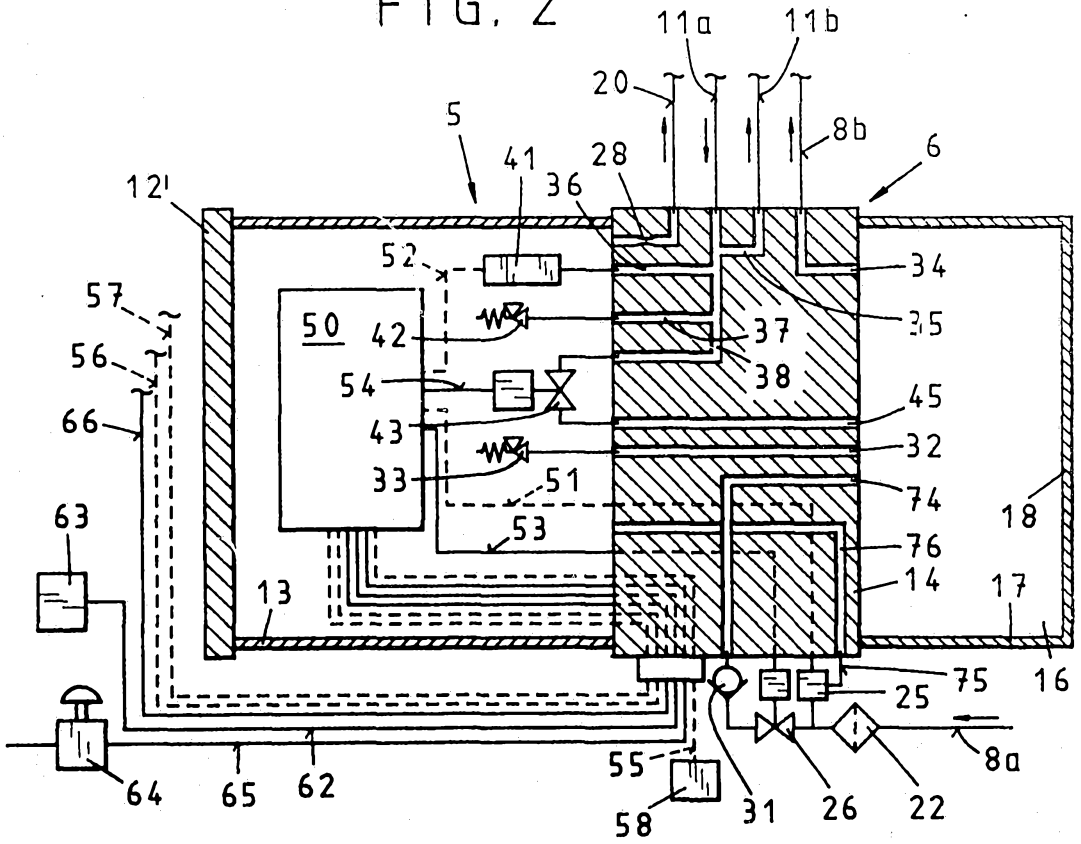
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FIG. 3

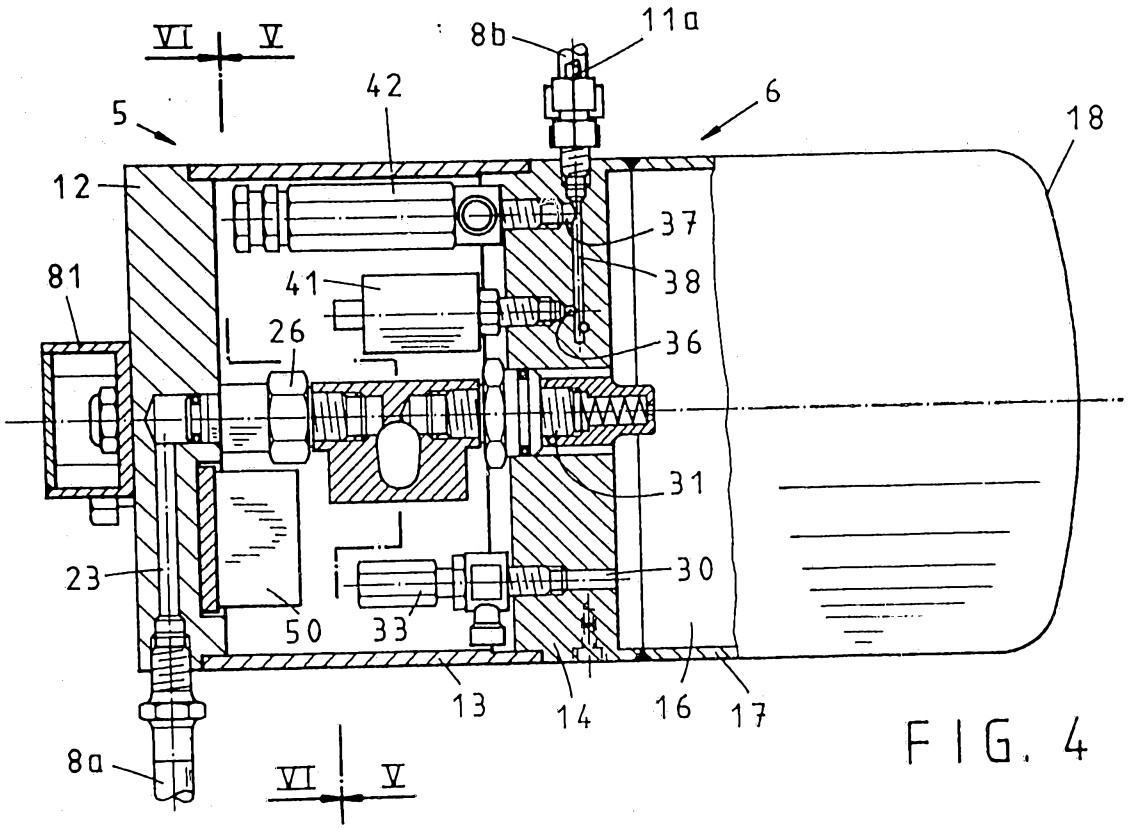



FIG. 4

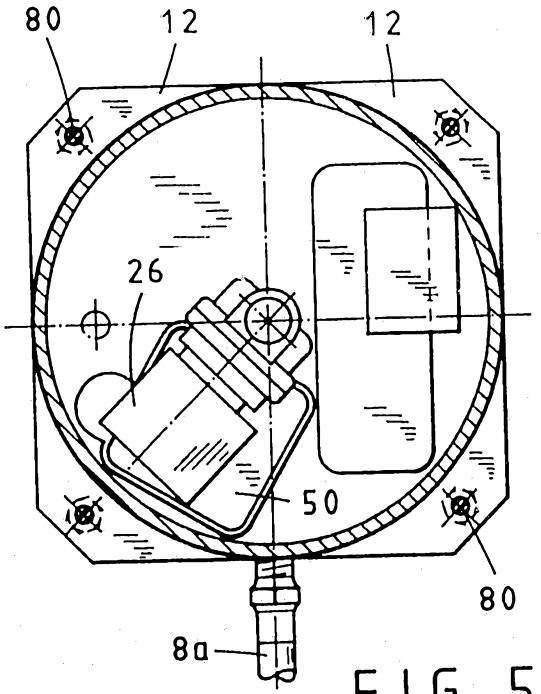



FIG. 5

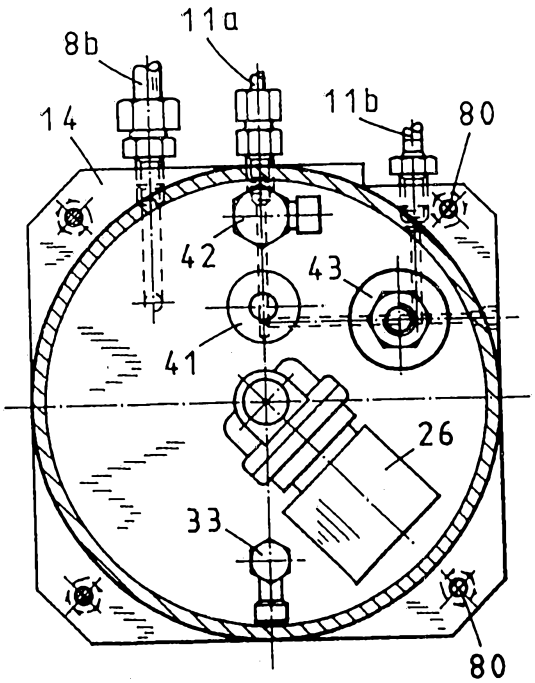
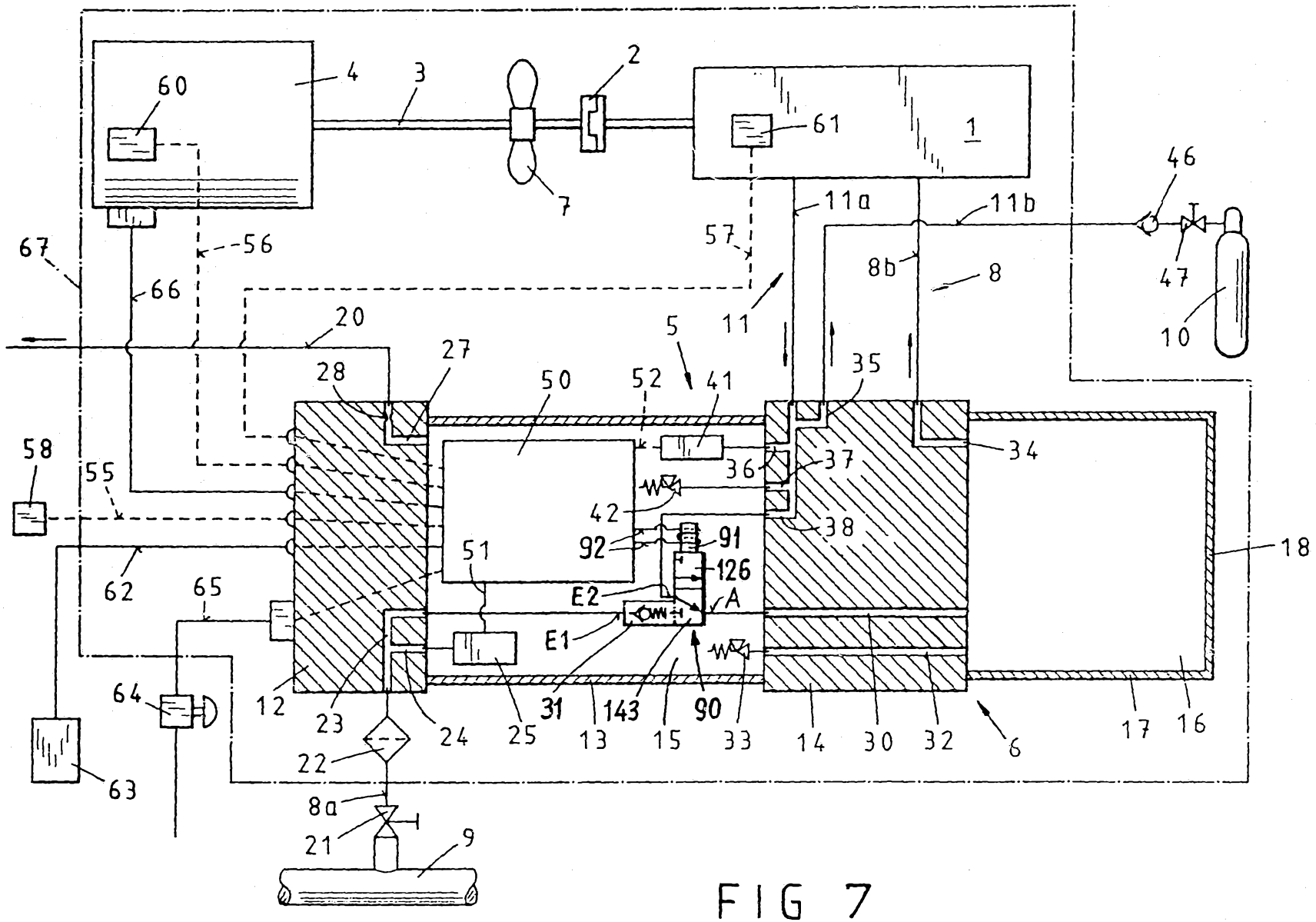



FIG. 6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4
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11a
11b
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56
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8b
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38
92
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126
51
18
62
65
E2
A
E1
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143
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8a
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FIG 7