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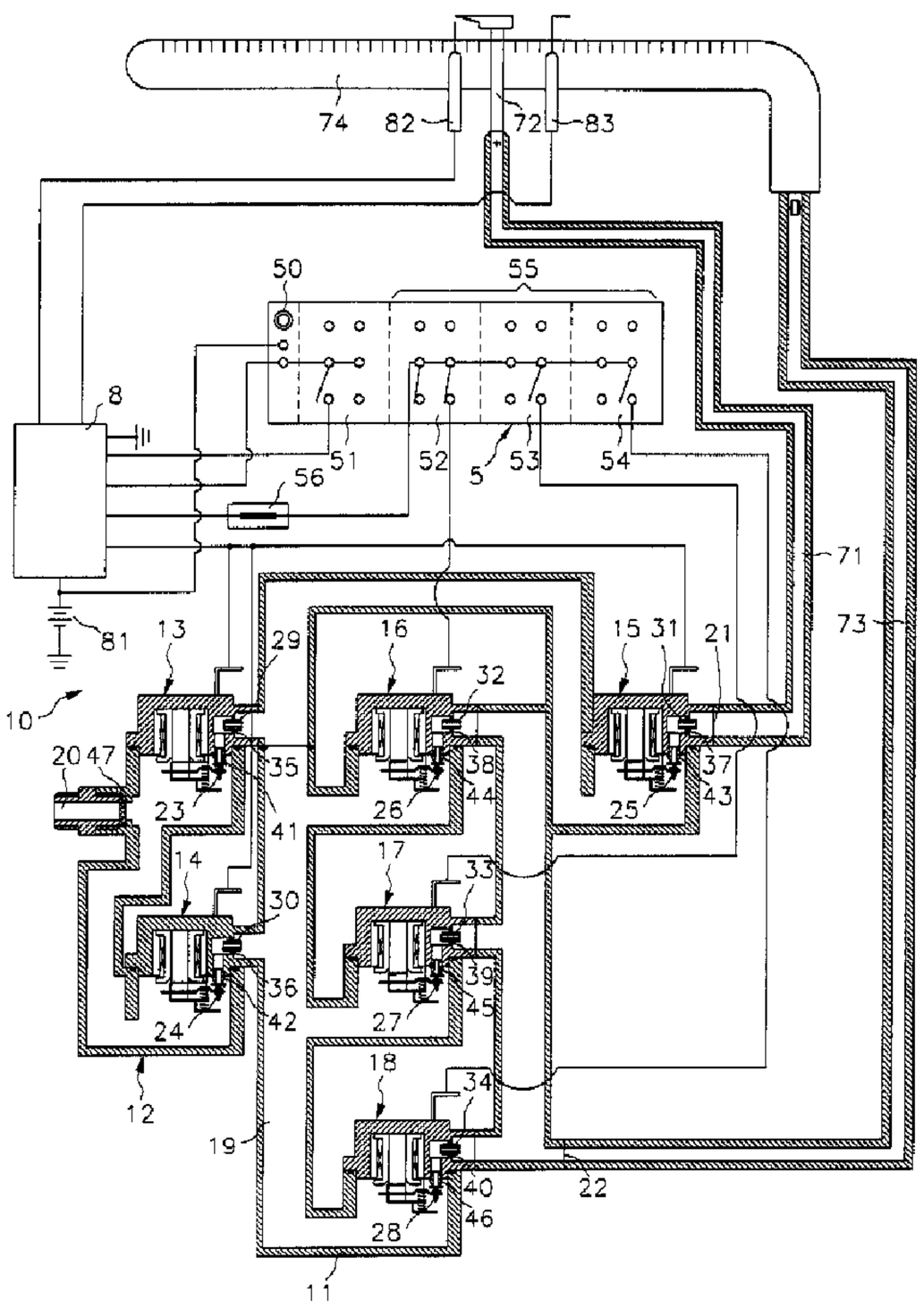
(54) Title: GAS BURNER CONTROL SYSTEM



(57) Abrégé/Abstract:
A gas burner control system includes a control unit formed of a valve seat and main valve assembly and at least one solenoid valve and installed in the burner body and connected to the electronic igniter, and an operation unit formed of a power switch and at least

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(57) Abrégé(suite)/Abstract(continued):
one flame intensity control switch and provided outside the burner body and connected to the control unit and the electronic igniter. Switching on the power switch opens the main valve assembly and drives the electronic igniter to ignite ignition flame. Switching on one flame intensity control valve opens the corresponding solenoid valve for producing the desired intensity of burner flame.

ABSTRACT OF THE DISCLOSURE

A gas burner control system includes a control unit formed of a valve seat and main valve assembly and at least one solenoid valve and installed in the burner body and connected to the electronic igniter, and an operation unit formed of a power switch and at least one flame intensity control switch and provided outside the burner body and connected to the control unit and the electronic igniter. Switching on the power switch opens the main valve assembly and drives the electronic igniter to ignite ignition flame. Switching on one flame intensity control valve opens the corresponding solenoid valve for producing the desired intensity of burner flame.

GAS BURNER CONTROL SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to gas burners, and more particularly to a gas burner control system, which enables the user to control the operation of the gas burner and regulate the intensity of flame at a far place away from the burner body of the gas burner.

Regular gas burners for use to keep rooms warm commonly use a piezoelectric ignition switch (cock) to control the ignition of fuel gas and the intensity of the flame. Because the ignition switch is installed in the body of the burner, the user must approach the burner when operating the ignition switch. When operating the ignition switch, the user may have to bend the body or draw up the legs closely beneath the body. This design is inconvenient to a disable or aged person. When in use, the user must hold the piezoelectric ignition switch in the depressed position after the presence of the ignition flame, and then release the piezoelectric ignition switch after the presence of the desired burner flame. In case the burner flame and/or the igniting flame is extinguished by wind or an accident, the user must depress the piezoelectric ignition switch and then rotate it from the off-position to the on-position again to ignite the ignition flame so as to further ignite the burner flame. When regulating the intensity of the burner flame, the user must approach the burner and then rotate the cock.

SUMMARY OF THE INVENTION

The invention has been accomplished to provide a gas burner control system, which eliminates the aforesaid drawbacks.

It is one object of the present invention to provide a gas burner control system, which enables the user to control the operation of the gas burner and regulates the intensity of flame without approaching the burner body of the gas burner.

It is another object of the present invention to provide a gas burner control system, which enables the user to ignite flame and to regulate the flame intensity as simple as operating an indoor lamp switch or a remote controller.

According to one aspect of the present invention, the gas burner control system comprises a control unit and an operation unit. The control unit comprises a valve seat, the valve seat comprising a fuel gas path, a gas inlet adapted to fuel gas from an external fuel gas source to the fuel gas path, a first gas outlet adapted to guide fuel gas from the fuel gas path to the ignition flame nozzle of the gas burner, and a second gas outlet adapted to guide fuel gas from the fuel gas path to the burner flame nozzle tube of the gas burner; a normal-close main valve assembly supported in the valve seat and electrically connected to an electronic igniter of the gas burner for actuation thereby and adapted to close/open the fuel gas passage from the gas inlet of the valve seat to the fuel gas path of the valve

seat; and at least one normal-close solenoid valve (hereinafter called as solenoid valve) supported in the valve seat and adapted to close/open the fuel gas passage from the fuel gas path of the valve seat to the second gas outlet of the valve seat. The operation unit comprises a power switch electrically connected to the electronic igniter for selective activation thereof, and at least one flame intensity control switch electrically connected between the electronic igniter of the gas burner and the at least two solenoid valves for selective actuation thereof, each flame intensity control switch being adapted to open/close at least one of the solenoid valves to arrange the solenoid valves in a respective one of at least two distinct states in each of which the respective fuel gas passages of the solenoid valves are not collectively closed.

As an alternate form of the present invention, a cock is used to substitute for the operation unit to control on/off of the electronic igniter, to close/open the fuel gas passage, and to regulate the flow rate of fuel gas.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a system block diagram of a wire-controlled type gas burner control system according to the present invention.

FIG. 2 is a system block diagram of a remote-control type gas burner control system according to the present invention.

FIG. 3 is a sectional view of a gas burner control system

according to a first embodiment of the present invention.

FIG. 4 is similar to FIG. 3 but showing the power switch and the high flame control switch switched on, the main valve assembly, the ignition flame control valve and the high flow rate

control valve opened.

FIG. 5 is similar to FIG. 4 but showing the power switch and the medium flame control switch switched on, the main valve assembly, the ignition flame control valve and the medium flow rate control valve opened.

FIG. 6 is similar to FIG. 4 but showing the power switch and the low flame control switch switched on, the main valve assembly, the ignition flame control valve and the low flow rate control valve opened.

FIG. 7 is a sectional view of a gas burner control system according to a second embodiment of the present invention.

FIG. 8 is a sectional view of a gas burner control system according to a third embodiment of the present invention.

FIG. 9 is a sectional view of a gas burner control system according to a fourth embodiment of the present invention.

FIG. 10 is a sectional view of a gas burner control system according to a fifth embodiment of the present invention.

FIG. 11 is a sectional view of a gas burner control system according to a sixth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a gas burner control system **10** in accordance with the present invention is shown comprising a control unit **1** and an operation unit **5**. The control unit **1** is

installed in the burner body 7 and connected to the electronic igniter 8 in the burner body 7. The operation unit 5 is provided outside the burner body 7, for example, on the wall, and electrically connected to the control unit 1 and the electronic igniter 8 for enabling the user to ignite the electronic igniter 8 and regulate the burner flame by means of operating the switches 51~54 of the operation unit 5 without approaching the burner.

Referring to FIG. 3, the control unit 1 comprises a valve seat 11 supporting a main valve assembly 12, an ignition flame control valve 15, a high flow rate control valve 16, a medium flow rate control valve 17 and a low flow rate control valve 18. The valve seat 11 has a gas path 19, a gas inlet 20, a first gas outlet 21, and a second gas outlet 22. The gas inlet 20 is connected to gas source, and mounted with a wire gauze filter 47 adapted to remove solid matter from fuel gas passing through the gas inlet 20. The first gas outlet 21 is connected through a subsidiary gas pipe 71 to the ignition flame nozzle 72 of the gas burner. The second gas outlet 22 is connected through a main gas pipe 73 to the burner flame nozzle tube 74. The main valve assembly 12 is comprised of a plurality of solenoid valves 13 and 14 that are normally closed (hereinafter called as normal-close valves). The normal-close valves 13 and 14 are connected in parallel to the electronic igniter 8, and synchronously switched to open the gas passage from the gas

inlet **20** to the gas path **19**. The ignition flame control valve **15** is electrically connected to the electronic igniter **8**, and adapted to control the gas passage from the gas path **19** to the first gas outlet **21**. The operation unit **5** comprises a high flame control switch **52**, a medium flame control switch **53**, and a low flame control switch **54**. The high flame control switch **52** of the operation unit **5** controls the high flow rate control valve **16** to close/open the gas passage from the gas path **19** to the second gas outlet **22**, for enabling a high flow rate of fuel gas to pass from the gas path **19** to the second gas outlet **22** and then from the second gas outlet **22** through the main gas pipe **73** to the burner flame nozzle tube **74** for burning and for producing a high intensity of burner flame. The medium flame control switch **53** of the operation unit **5** controls the medium flow rate control valve **17** to close/open the gas passage from the gas path **19** to the second gas outlet **22**, for enabling a medium flow rate of fuel gas to pass from the gas path **19** to the second gas outlet **22** and then from the second gas outlet **22** through the main gas pipe **73** to the burner flame nozzle tube **74** for burning and for producing a medium intensity of burner flame. The low flame control switch **54** controls the low flow rate control valve **18** to close/open the gas passage from the gas path **19** to the second gas outlet **22**, for enabling a low flow rate of fuel gas to pass from the gas path **19** to the second gas outlet **22** and then from the second

gas outlet **22** through the main gas pipe **73** to the burner flame nozzle tube **74** for burning and for producing a low intensity of burner flame. The aforesaid 6 valves **13~18** are electrically controlled solenoid valves of normally closed type, i.e., the contacts of the valves **13~18** are opened when electrically disconnected, and the corresponding valve plugs **23~28** are closed to stop fuel gas from passing; the contacts of the valves **13~18** are closed when electrically connected, and the corresponding valve plugs **23~28** are opened for letting fuel gas pass. Because the solenoid valves **13~18** are of the known art, no further detailed description is necessary.

In order to facilitate fabrication, the solenoid valves **13~18** have same structure with the exception of the installation of different inner diameters of gas outlet tubes **29~34** in the respective solenoid valves **13~18**. By means of the control of different inner diameters of gas outlet tubes **29~34**, the solenoid valves **13~18** provide different fuel gas outputs. Therefore, the solenoid valves **13~18** are inter-exchangeable. i.e., only one particular specification of solenoid valve is sufficient to satisfy the demand.

Further, O-rings **35~40** are respectively peripherally mounted on the gas outlet tubes **29~34** and fitted with the respective gas outlet tubes **29~34** into the respective gas outlet of each of the solenoid valves **13~18** to prevent fuel gas leakage. Of course, changing the

inner diameters of the gas inlet tubes **41~46** of the solenoid valves **13~18** can achieve the same gas flow rate control effect.

Referring to FIG. 3 again, in addition to the aforesaid high flame control switch **52**, medium flame control switch **53**, and low flame control switch **54**, the operation unit **5** further comprises a battery low indicator light **50** and a power switch **51**. A control circuit (not shown) in the operation unit **5** controls on/off status of the indicator light **50**, and is connected to a battery **81**. When battery power low, the control circuit turns on the battery low indicator light **50**, informing the user to replace the battery **81**. The power switch **51** controls the supply of electricity to the electronic igniter **8**. The high flame control switch **52** is electrically connected to the high flow rate control valve **16**, and adapted to close/open the high flow rate control valve **16**. The medium flame control switch **53** is electrically connected to the medium flow rate control valve **17**, and adapted to close/open the medium flow rate control valve **17**. The low flame control switch **54** is electrically connected to the low flow rate control valve **18**, and adapted to close/open the low flow rate control valve **18**. Further, the flame control switches **52~54** form a linkage switch **55**, i.e. when switched on the high flame control switch **52**, the medium flame control switch **53** and the low flame control switch **54** are automatically switched off; when switched on the medium flame

control switch **53**, the high flame control switch **52** and the low flame control switch **54** are automatically switched off; when switched on the low flame control switch **54**, the high flame control switch **52** and the medium flame control switch **53** are automatically switched off. Because the linkage switch **55** is of the known art, no further detailed description is necessary.

The operation control of the gas burner is outlined hereinafter with reference to FIG. 4. When switched on the power switch **51** to electrically connect the electronic igniter **8**, the main valve assembly **12** (i.e., the normal-close valves **13** and **14**) and the ignition flame control valve **15** are opened (The respective valve plugs **23~25** are opened), enabling fuel gas to pass in proper order through the fuel gas path **19**, the ignition flame control valve **15**, the first gas outlet **21** and the subsidiary gas pipe **71** to the ignition flame nozzle **72**, and at the same time sparks are discharged through the discharging electrode **82** to ignite the desired ignition flame. After the presence of the desired ignition flame, the sensor, referenced by **83**, gives a signal to the electronic igniter **8**, causing it to stop discharging high voltage through the discharging electrode **82**. At the same time, the sensor **83** connects power supply to the linkage switch **55**. When the user switches on one of the flame control switches, for example, the high flame control switch **52**,the high flow rate control valve **16** is energized to open

the valve plug **26**, enabling a high flow rate of fuel gas to pass through the high flow rate control valve **16** to the second gas outlet **22** and then the burner flame nozzle tube **74** for burning and for producing a high intensity of burner flame.

When the temperature of the room surpassed a predetermined level, as shown in FIG. 5, switch on the medium flame control switch **53** to open the valve plug **27** of the medium flow rate control valve **17** and to simultaneously switch off the high flame control switch **52** and the low flame control switch **54**, causing the high flame control switch **52** and the low flame control switch **54** to close the high flow rate control valve **17** and the low flow rate control valve **18**. At this time, fuel gas passes through the medium flow rate control valve **17** to the burner flame nozzle tube **74** for producing a medium intensity of burner flame while the ignition flame is maintained available.

When changing the burner flame to the low intensity, as shown in FIG. 6, switch on the low flame control switch **54** to open the valve plug **28** of the low flow rate control valve **18** and to simultaneously switch off the high flame control switch **52** and the medium flame control switch **53**. At this time, the high flow rate control valve **16** and the medium flow rate control valve **17** are closed, and fuel gas passes through the low flow rate control valve **18** to the burner flame nozzle tube **74** for producing a low intensity

of burner flame while the ignition flame is maintained available.

As indicated above, the operation of the present invention is to switch on the power switch **51** to produce the desired ignition flame, and then to switch on the high flame control switch **52**, medium flame control switch **53** or low flame control switch **54** for letting fuel gas pass through the high flow rate control valve **16**, medium flow rate control valve **17**, or low flow rate control valve **18** to the burner flame nozzle tube **74** for producing the desired high intensity of burner flame, medium intensity of burner flame, or low intensity of burner flame. This operation is as easy as switching on/off an indoor lamp switch.

Referring to FIG. 2, a receiver **57** and a remote controller **58** may be used instead of the switches **51~54** of the operation unit **5**. The receiver **57** is installed in the burner body 7 and electrically connected to the electronic igniter **8** and the control unit **1**. The remote controller **58** is controlled to output control signal by radio to the receiver **57**, causing the receiver to turn on/off the electronic igniter **8** and close/open the solenoid valves **13~18**.

In the embodiment shown in FIG. 3, the gas burner control system **10** further comprises a temperature sensor. The probe of the temperature sensor is set in the desired detecting area (either inside or outside the burner body 7). The contacts **56** of the sensor are respectively connected to the electronic igniter **8** and the linkage

switch **55**. When the temperature of the room surpassed the set temperature level, the contacts **56** are disconnected to cut off power supply from the high flame control switch **52**, the medium flame control switch **53**, or the low flame control switch **54**, to further close the high flow rate control valve **16**, the medium flow rate control valve **17**, or the low flow rate control valve **18**, preventing fuel gas from passing to the burner flame nozzle tube **74** (the ignition flame is maintained available). If the burner flame extinguished accidentally and the temperature of the room dropped below the set level, the contacts **56** are connected to turn on the high flame control switch **52**, the medium flame control switch **53**, or the low flame control switch **54**, to further open the high flow rate control valve **16**, the medium flow rate control valve **17**, or the low flow rate control valve **18**, for producing the desired high intensity, medium intensity, or low intensity of burner flame.

Alternatively, the contacts **56** can be respectively connected to the electronic igniter **8** and the power switch **51** (see FIG. 7). In this case, the contacts **56** are disconnected to cut off power supply from the electronic igniter **8** and to extinguish the burner flame and the ignition flame when the temperature of the room surpassed the set level. On the contrary, when the temperature of the room dropped below the set value, the contacts **56** are connected to turn on the electronic igniter **8**, resuming the original operation status

before power off.

In the embodiment shown in FIG. 7, the high flow rate control valve **16** of the aforesaid first embodiment (FIG. 3) is eliminated, and the medium flow rate control valve **17** and the low flow rate control valve **18** are incorporated to substitute for the function of the high flow rate control valve **16**. To fit this change, the high flame control switch **52** is electrically connected to the medium flow rate control valve **17** and the low flow rate control valve **18**. When switched on the high flame control switch **52**, the medium flame control switch **53** and the low flame control switch **54** are simultaneously switched on to open the medium flow rate control valve **17** and the low flow rate control valve **18** for enabling a high flow rate of fuel gas to pass to the burner flame nozzle tube **74** for burning.

As shown in FIG. 7, the main valve assembly **12** and the ignition flame control valve **15** are respectively connected to two terminals of the electronic igniter **8**, enabling the electronic igniter **8** to control the main valve assembly **12** and the ignition flame control valve **15** separately. The advantage of this design enables an additional control circuit to be added to the electronic igniter **8** to automatically disconnect the circuit to the ignition flame control valve **15** a predetermined length of time after the presence of the burner flame, so as to further close the valve plug **25** and

extinguish the ignition flame. This design saves power and fuel gas consumption.

The alternate form shown in FIG. 8 eliminates the ignition flame control valve **15** shown in FIG. 7, enabling fuel gas to pass from the main valve assembly **12** to the first gas outlet **21**, the subsidiary gas pipe **71**, and then the ignition flame nozzle **72** for producing the desired ignition flame. The posterior actions including the operation of the high flame control switch **52**, medium flame control switch **53**, or the low flame control switch **54** to regulate the intensity of burner flame are same as the aforesaid first embodiment of the present invention.

The alternate form shown in FIG. 9 eliminates the normal-close valve **14** shown in FIG. 8. The operation of this alternate form is same as the embodiment shown in FIG. 8.

The embodiment shown in FIG. 10 uses a cock **6** to substitute for the operation unit **5** of the third embodiment (FIG. 8). The cock **6** has a gas inlet **61** and a gas outlet **62**. The gas inlet **61** is connected to fuel gas source and mounted with a wire gauze filter **63**. The gas outlet **62** is connected to the gas inlet **20** of the valve seat **11**. The cock **6** closes/opens the fuel gas path, regulates the flow rate of fuel gas, and switches on/off a micro switch **65**. The normal-open terminal and common terminal of the micro switch **65** are respectively connected to the electronic igniter **8**. When

rotating the rotary knob (not shown) of the cock **6** and depressing the actuator **66** of the micro switch **65**, the two terminals are electrically connected to turn on the electronic igniter **8**, and to further open the normal-close valves **13** and **14**, enabling fuel gas to pass through the gas path **19** to the ignition flame nozzle **72** via the first gas outlet **21**, and at the same time the discharging electrode **82** discharges a high voltage to produce sparks and to ignite the desired ignition flame. After the presence of the desired ignition flame, the sensor **83** outputs a signal to turn off the discharging electrode **82** and to open the valve plugs **27** and **28** of the solenoid valves **17** and **18**, and therefore fuel gas pass through the solenoid valves **17** and **18** to the burner flame nozzle tube **74** through the second gas outlet **22** and the main gas pipe **73** for producing the desired burner flame. By means of rotating the rotary knob of the cock **6**, the flow rate of fuel gas is regulated. Because the cock **6** is of the known art, no further detailed description is necessary.

FIG. 11 is a simplified design obtained from the embodiment shown in FIG. 10. This embodiment eliminates the normal-close valve **14** and the solenoid valve **18** of the embodiment shown in FIG. 10, and the cock **6** is used with the normal-close valve **13** and the solenoid **17** to control the operation of the gas burner. The operation principle of this embodiment is same as the

embodiment shown in FIG. 10.

It is to be understood that the drawings are designed for purposes of illustration only, and are not intended for use as a definition of the limits and scope of the invention disclosed.

What the invention claimed is:

1. A gas burner control system installed in a gas burner and adapted to control the operation of the gas burner, comprising:

a control unit, said control unit comprising:

a valve seat, said valve seat comprising a fuel gas path, a gas inlet adapted to fuel gas from an external fuel gas source to said fuel gas path, a first gas outlet adapted to guide fuel gas from said fuel gas path to the ignition flame nozzle of the gas burner, and a second gas outlet adapted to guide fuel gas from said fuel gas path to the burner flame nozzle tube of the gas burner;

a normal-close main valve assembly supported in said valve seat and electrically connected to an electronic igniter of the gas burner for actuation thereby and adapted to close/open a fuel gas passage from the gas inlet of said valve seat to said fuel gas path of said valve seat; and

at least two normal-close solenoid valves (hereinafter called solenoid valves) each supported in said valve seat and adapted to close/open a respective fuel gas passage from the fuel gas path of said valve seat to the second gas outlet of said valve seat; and

an operation unit, said operation unit comprising:

a power switch electrically connected to said electronic igniter for selective activation thereof; and

at least one flame intensity control switch electrically

between said electronic igniter of the gas burner and said at least two solenoid valves for selective actuation thereof, each flame intensity control switch being adapted to open/close at least one of said solenoid valves to arrange said solenoid valves in a respective one of at least two distinct states in each of which said respective fuel gas passages of said solenoid valves are not collectively closed.

2. The gas burner control system as claimed in claim 1 wherein said normal-close main valve assembly is comprised of a plurality of normal-close solenoid valves (hereinafter called as normal-close valves) connected in parallel to the electronic igniter of the gas burner and adapted to synchronously close/open the fuel gas passage from the gas inlet of said valve seat to the fuel gas path of said valve seat.

3. The gas burner control system as claimed in any one of claims 1 and 2 wherein said control unit further comprises a normal-close ignition flame control valve electrically connected to said electronic igniter of the gas burner for actuation thereby and adapted to close/open a fuel gas passage from the fuel gas path of said valve seat to the first gas outlet of said valve seat.

4. The gas burner control system as claimed in any one of claims 1 to 3 wherein the gas inlet of said valve seat further comprises a wire gauze filter.

5. The gas burner control system as claimed in any one of

claims 1 to 4 wherein said operation unit further comprises a receiver electrically connected to the electronic igniter and said control unit, and a remote controller adapted to transmit a control signal to said receiver by radio to turn on/off the electronic igniter of the gas burner and to close/open said solenoid valves.

6. The gas burner control system as claimed in any one of claims 1 to 5 further comprising a temperature sensor adapted to detect the temperature of a predetermined area and to turn on/off the electronic igniter of the gas burner and the at least one flame intensity control switch subject to the temperature level of the predetermined area.

7. The gas burner control system as claimed in any one of claims 1 to 5 further comprising a temperature sensor adapted to detect the temperature of a predetermined area and to turn on/off the electronic igniter of the gas burner and said power switch subject to the temperature level of the predetermined area.

8. The gas burner control system as claimed in claim 3 wherein said main valve assembly and said ignition flame control valve are respectively connected to a respective terminal of the electronic igniter of the gas burner for enabling the electronic igniter of the gas burner to close/open said main valve assembly and said ignition flame control valve separately.

9. The gas burner control system as claimed in claim 8

further comprising a control circuit installed in the electronic igniter of the gas burner and adapted to cut off power supply from said ignition flame control valve a predetermined length of time after the presence of burner flame at the burner flame nozzle tube of the gas burner.

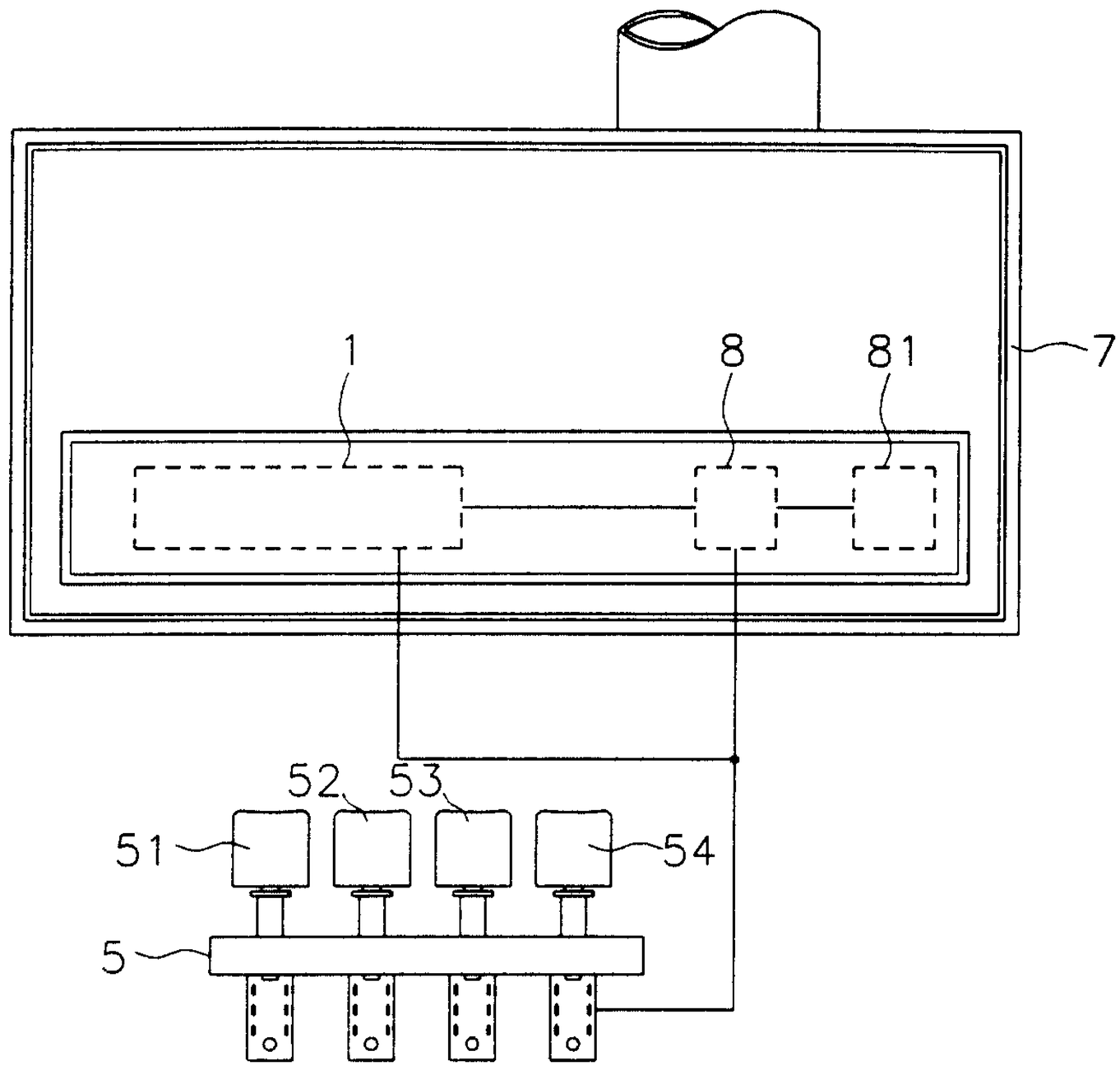
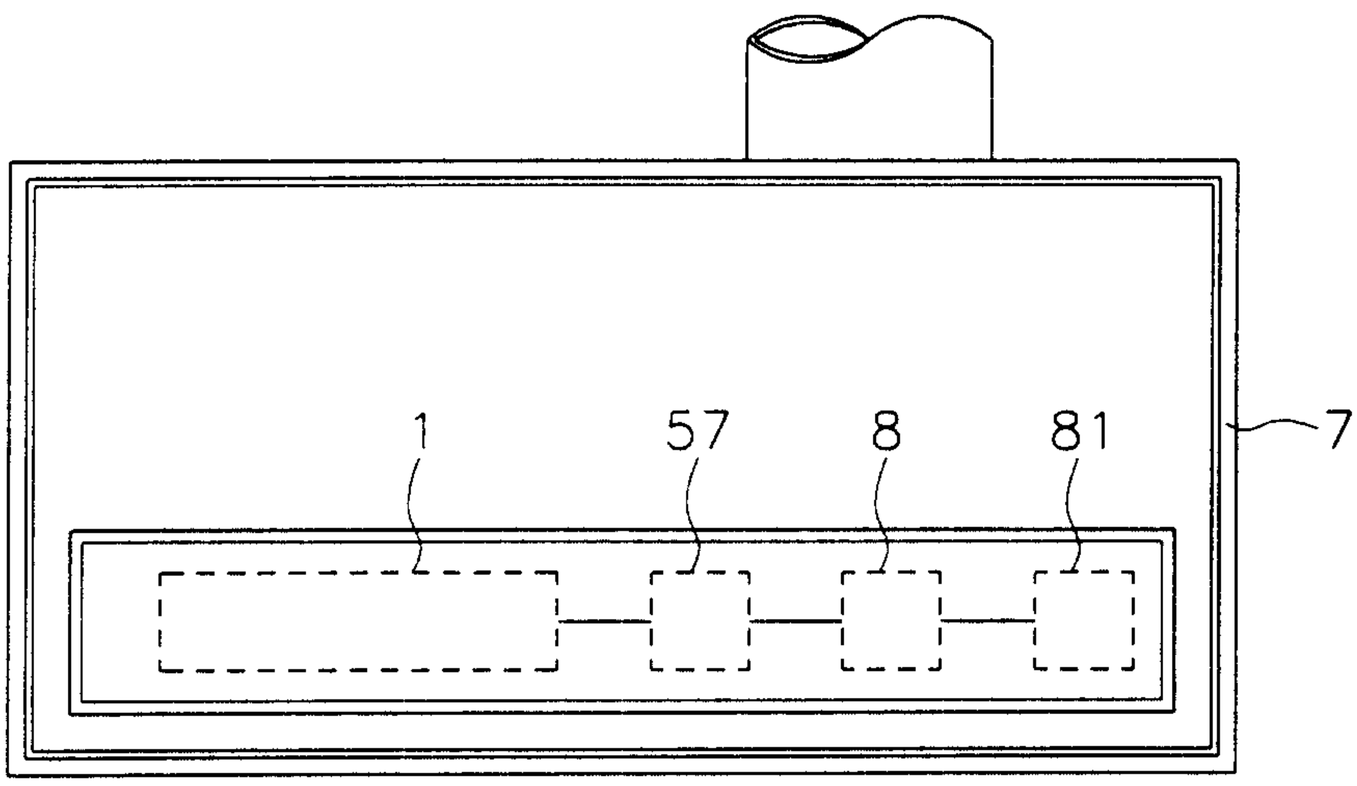


FIG. 1



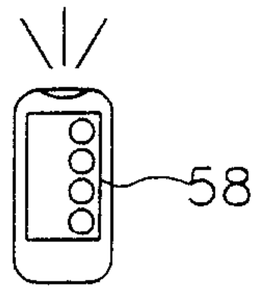


FIG. 2

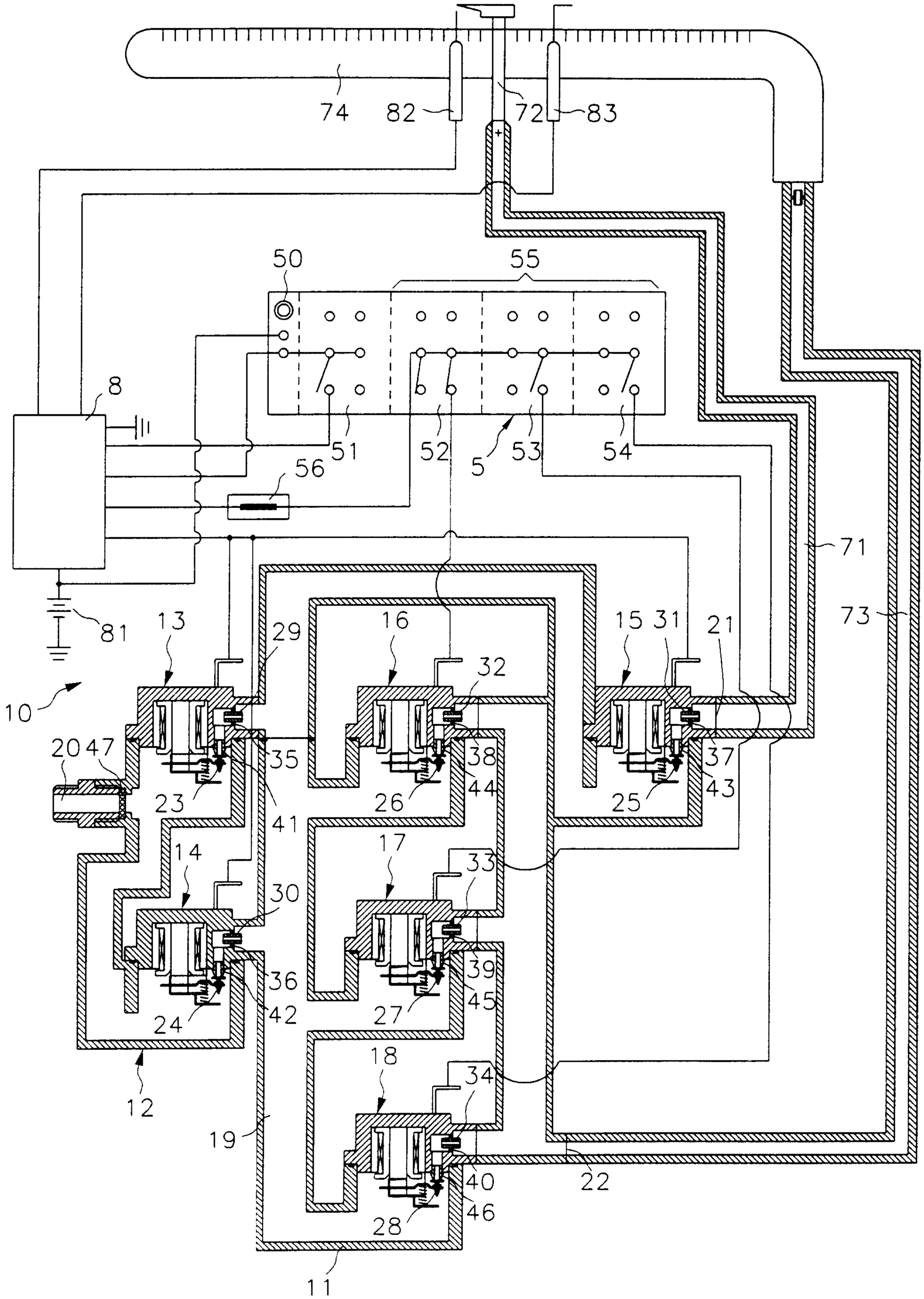

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FIG. 3

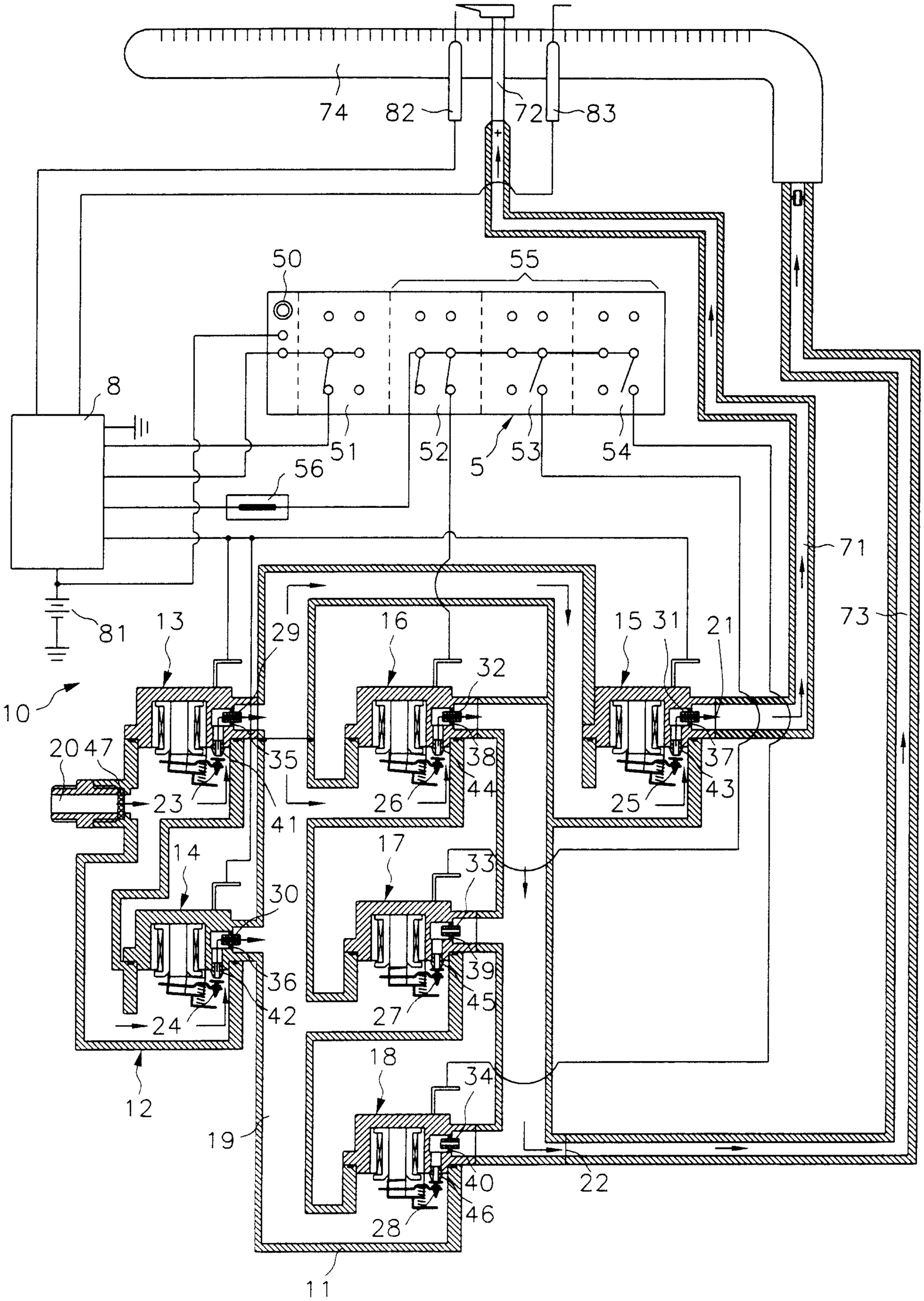
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FIG. 4

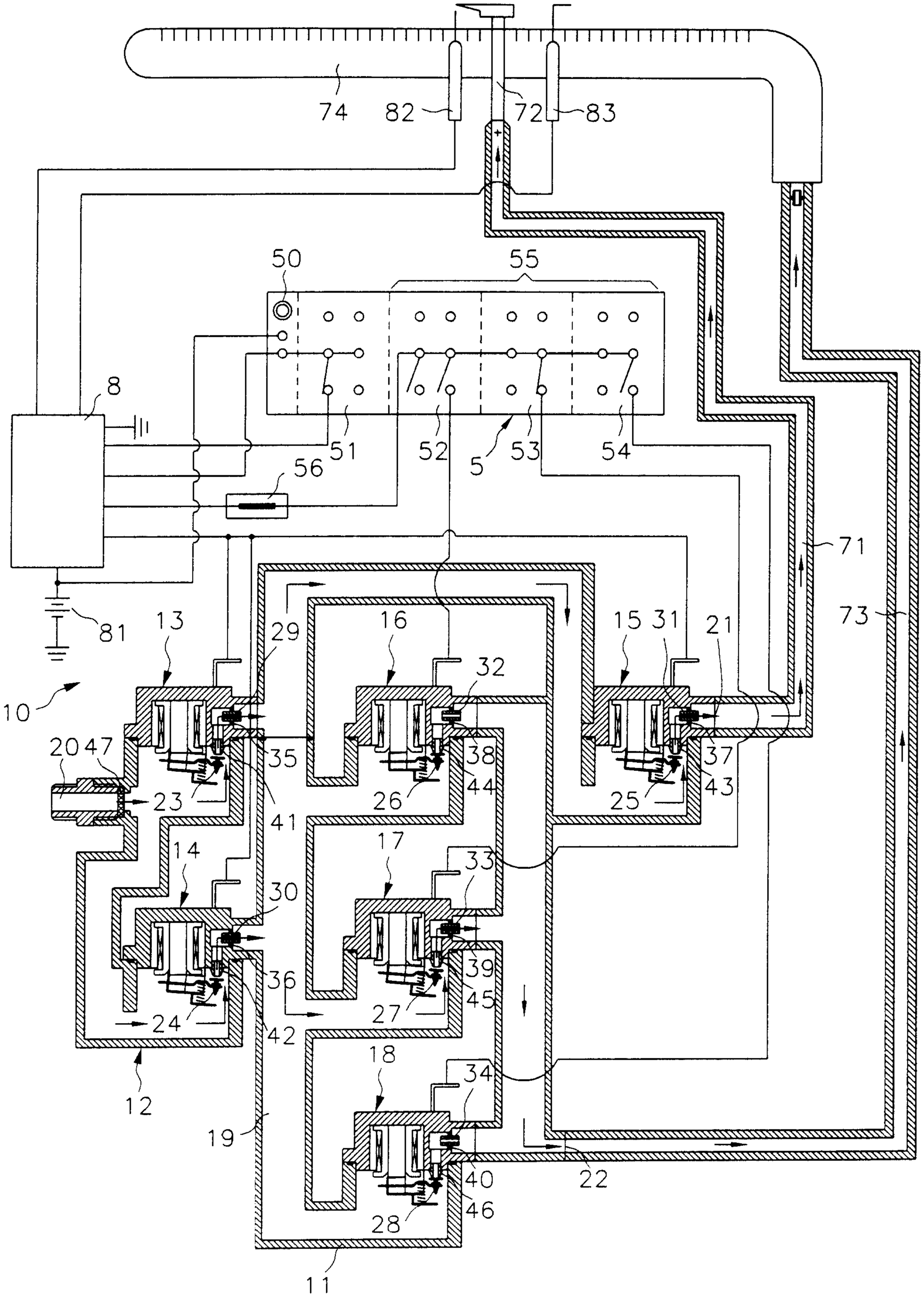
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FIG. 5

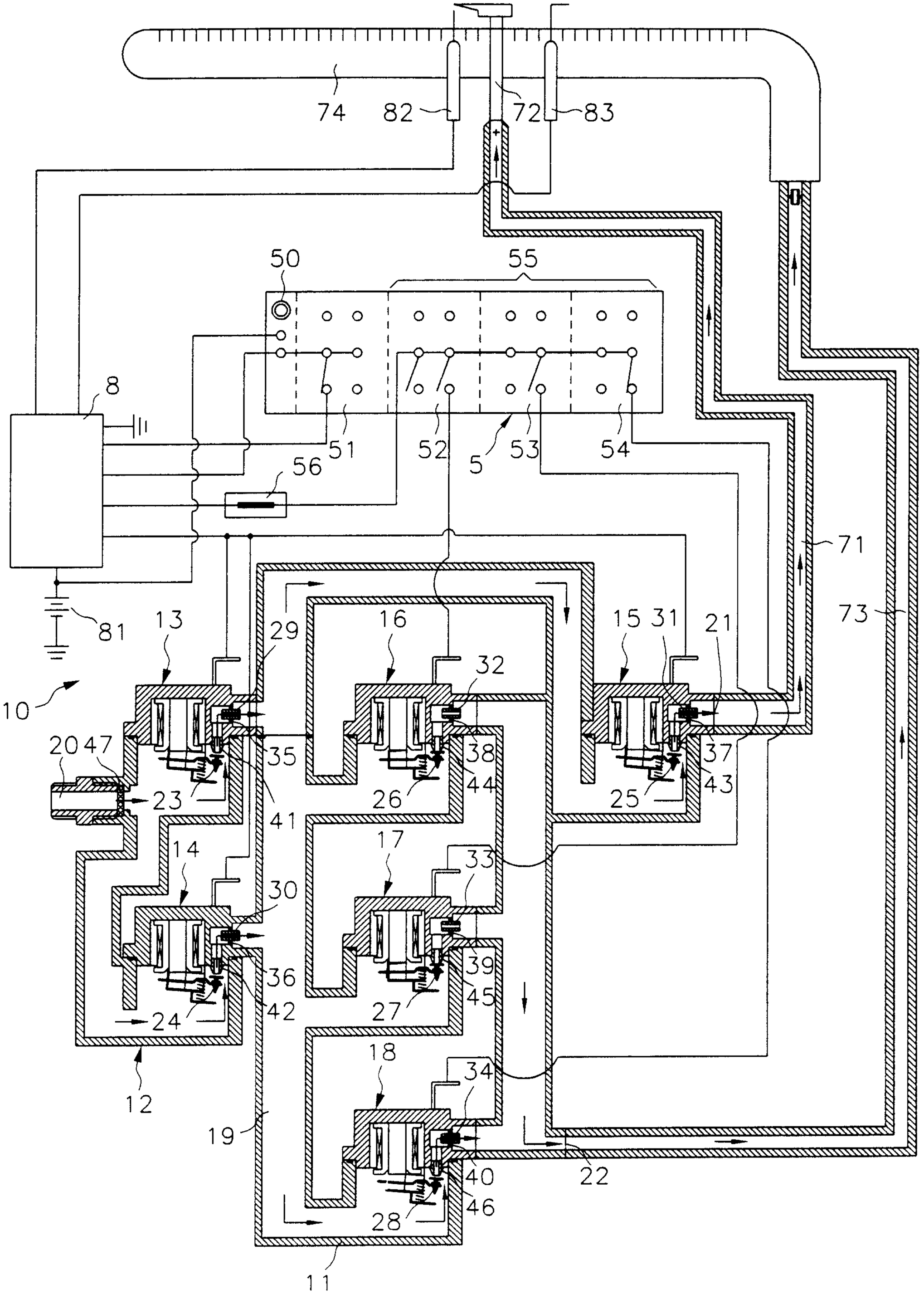
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FIG. 6

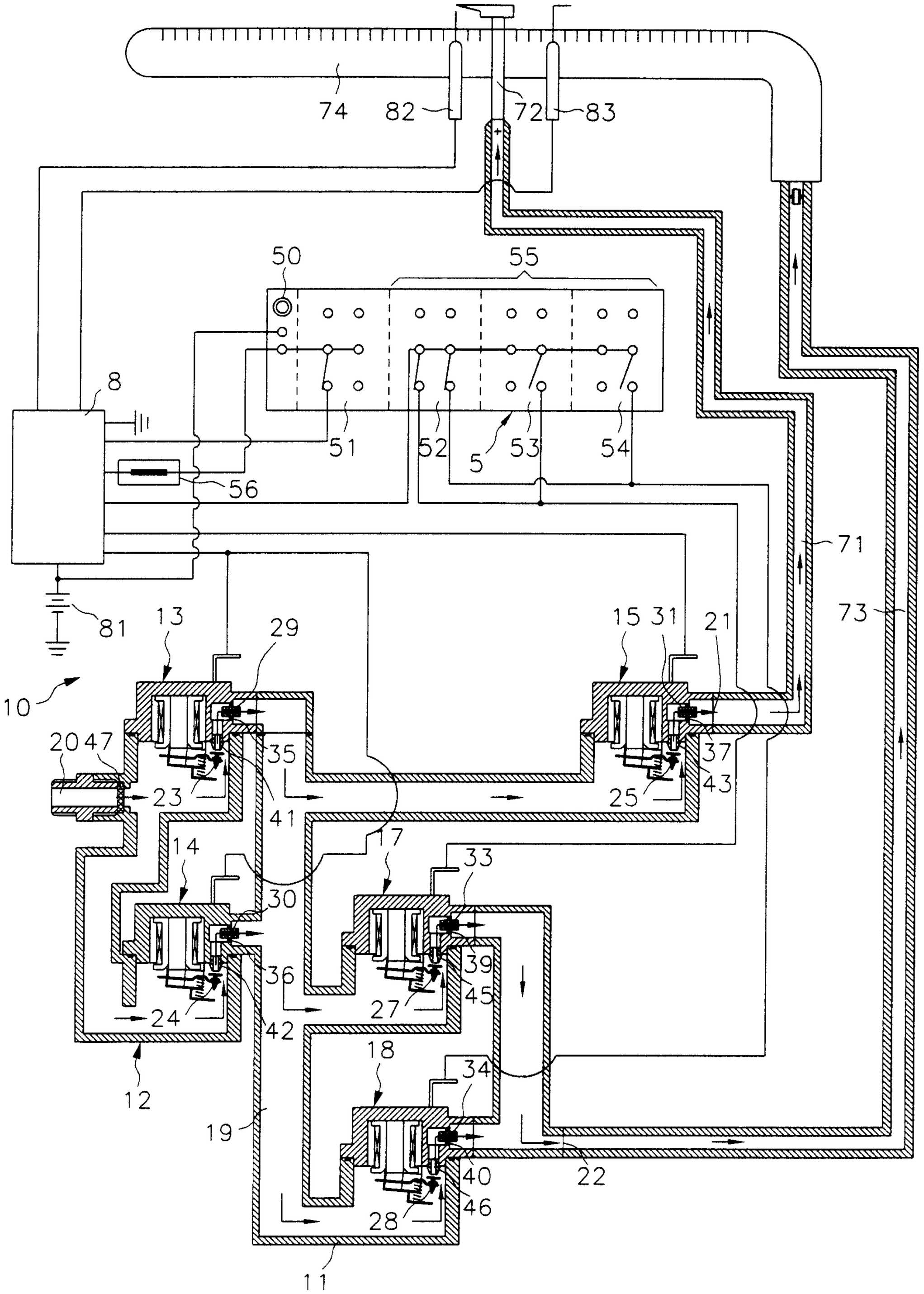
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FIG. 7

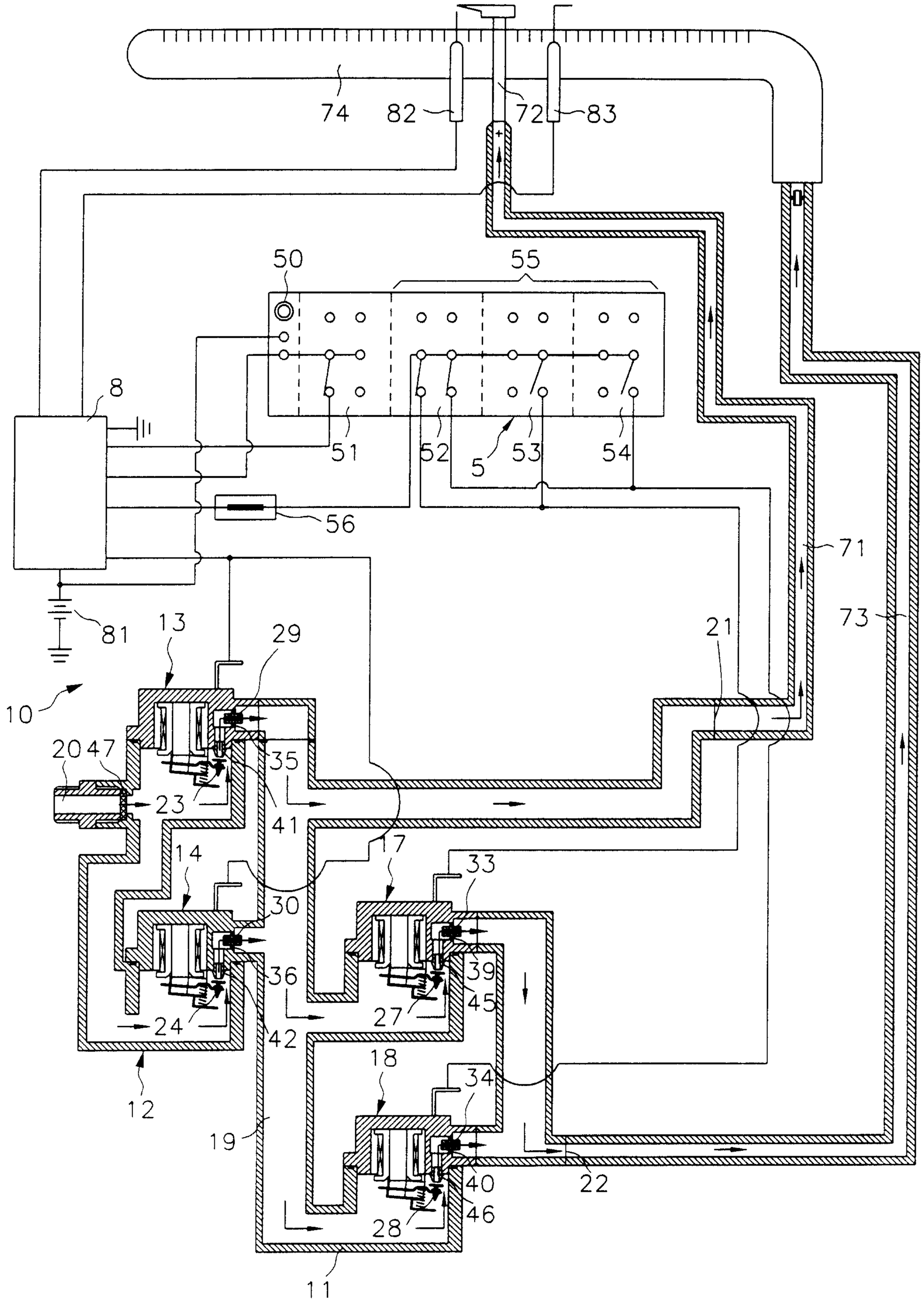
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FIG. 8

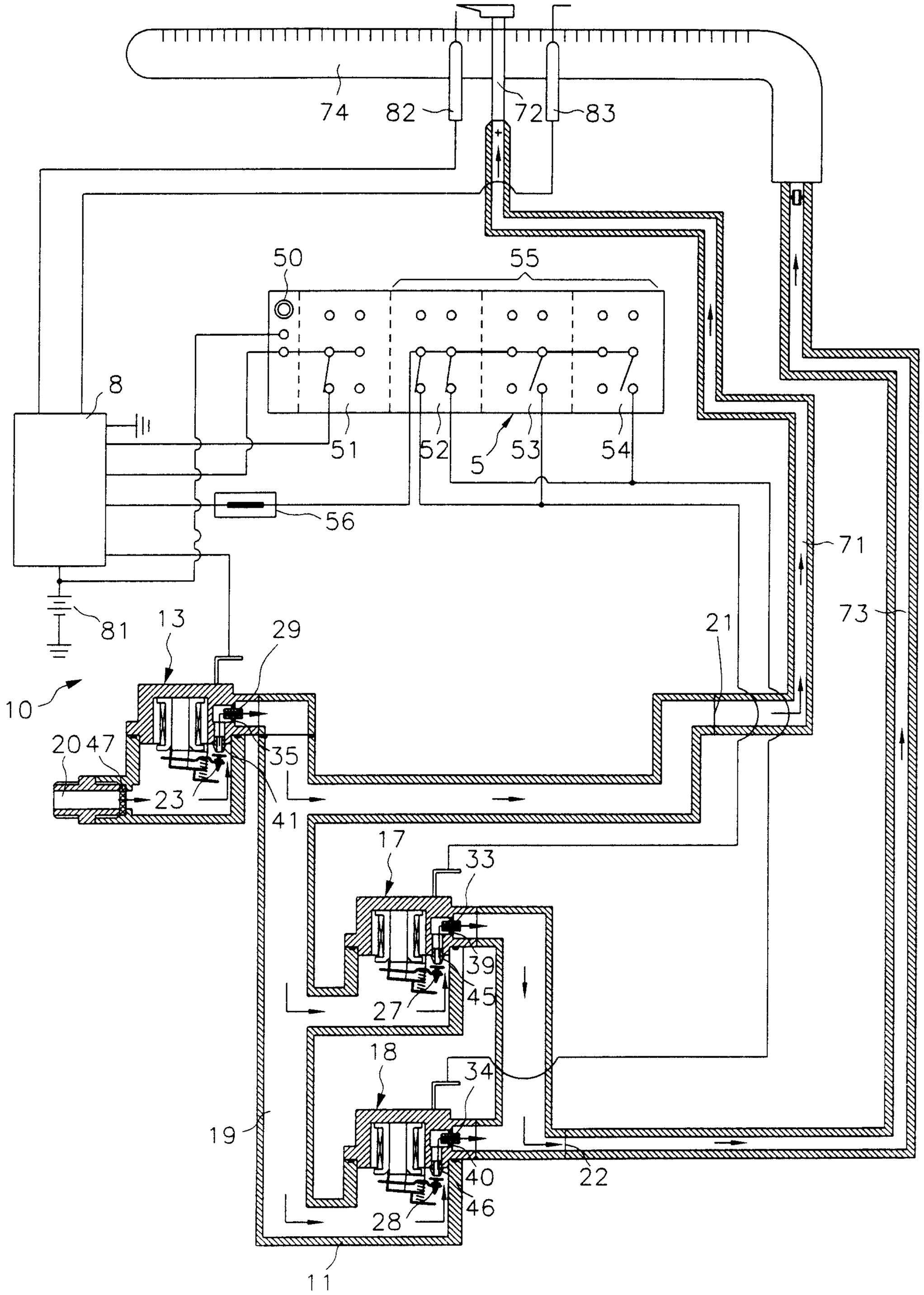
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FIG. 9

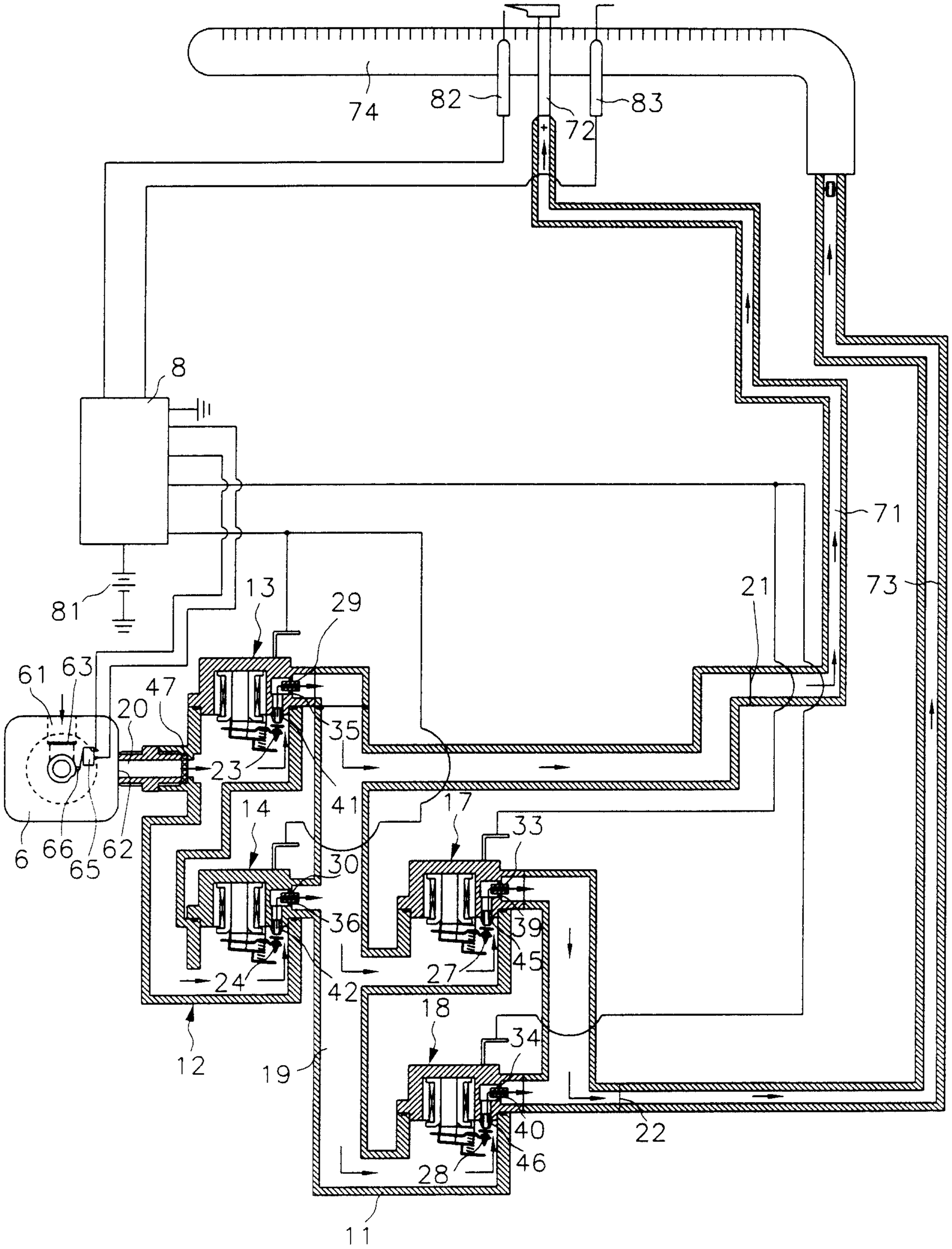
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FIG. 10

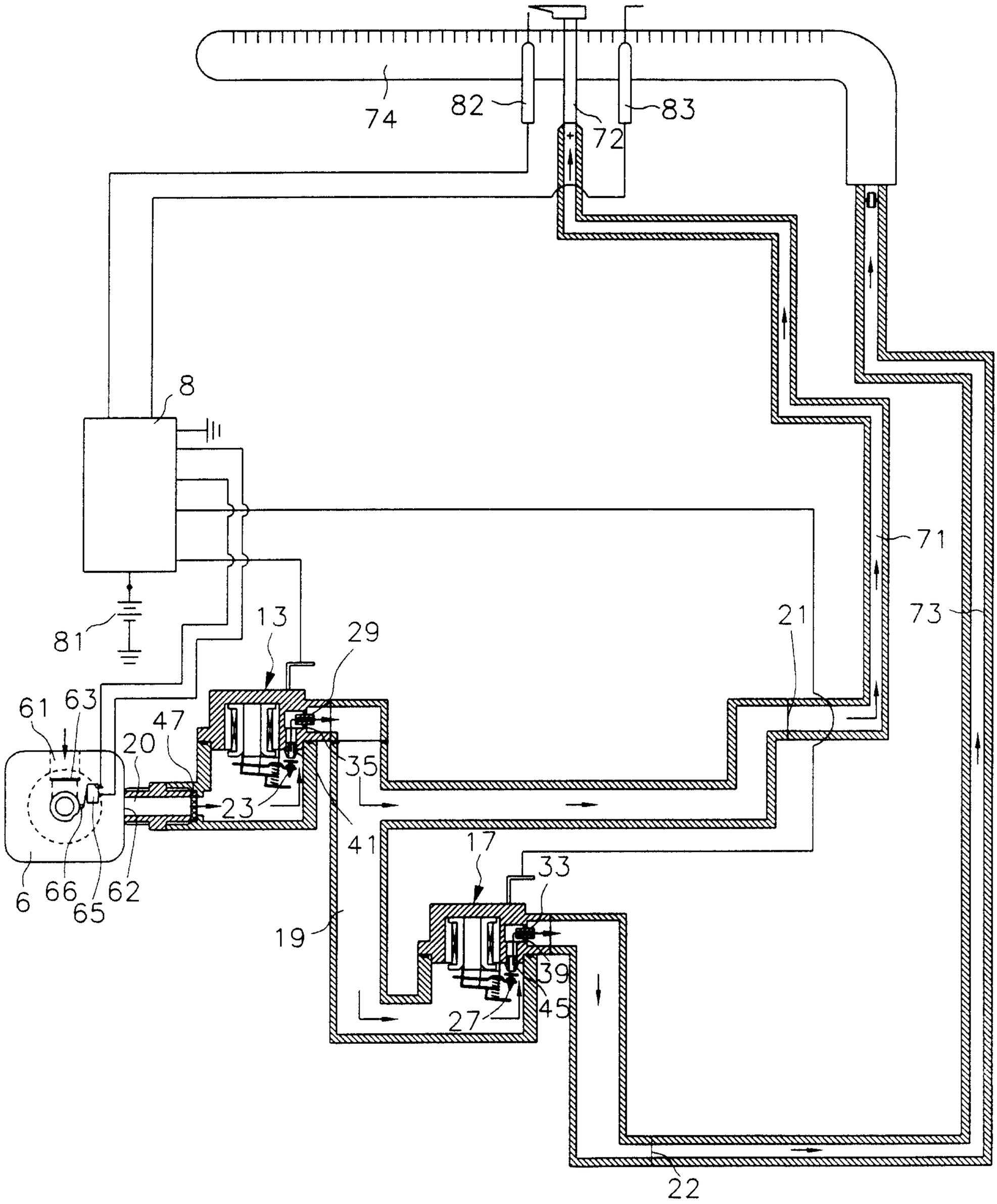
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FIG. 11

Application number/ Numéro de demande : 2359543

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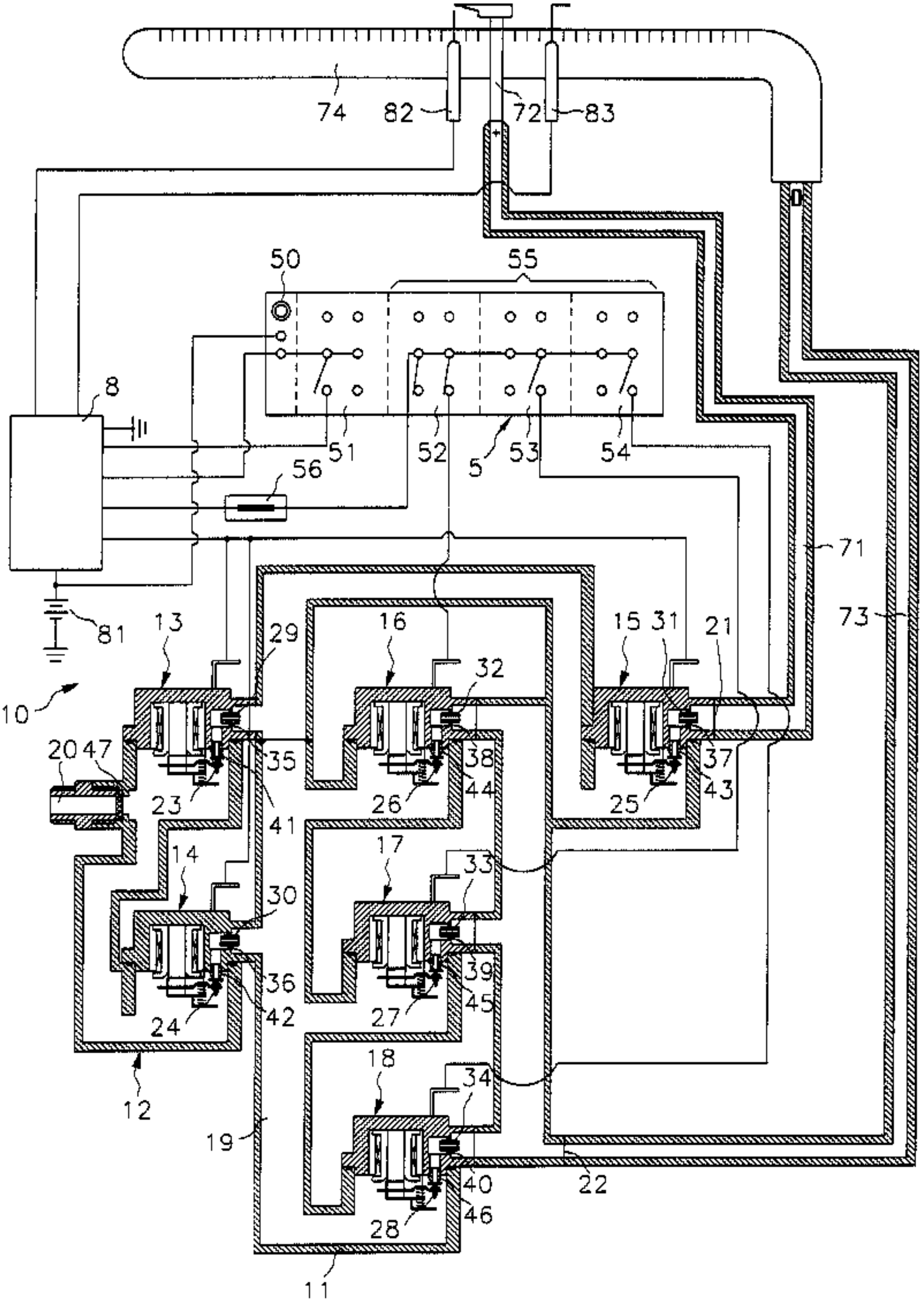
Documents de piètre qualité numérisés
(Pour obtenir les documents originaux, veuillez vous adresser à la Section de préparation des dossiers, située au 10e étage)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