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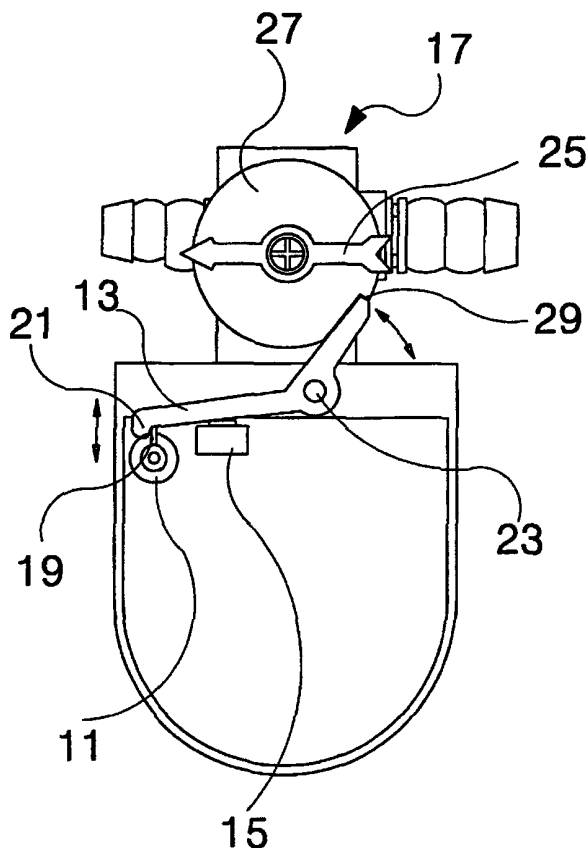
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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: VALVE ASSEMBLY WITH ELECTRONIC TIMER TO CONTROL OPEN/SHUT FUNCTIONS



(57) Abstract: The present invention relates to a valve assembly equipped with an electronic timer to control the length of time a valve is opened. A valve assembly comprising a timer to electronically predetermine the operation period, a motor having a pin fixed on to one side operates based on a signal from the timer, a valve sensor 15 which is turned on or off by the rotation of the lever member and monitors open/close status of the valve and a valve having a home formed at the valve cap, and a winding spring which is secured onto the main body of the valve and a valve cap connected to the knob to perform the open/close functions of the valve and other end is fixed onto the inside of a valve cap to push the valve cap in the direction of a closed position of the valve as the lever member moves. The valve assembly according to the present invention provides safer way to use a gas fueled cooking device and allows more precise control of valve system.



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VALVE ASSEMBLY WITH ELECTRONIC TIMER TO CONTROL  
OPEN/SHUT FUNCTIONS

5 Technical Field

This invention relates to a valve assembly such as a gas valve, more particularly a valve assembly having an electronic timer to precisely control the duration of a usage time period and a status of a valve while in use.

10

Background Art

Generally, many homes use a gas fueled cooking device for cooking. A gas pipe is utilized for connecting a gas fueled cooking device such as a gas burner and a gas source such as a gas tank, and a  
15 gas pipe is equipped with a gas control valve to shut off the gas from flowing into a gas burner. A spring is placed in the cap of the valve to prevent unintended rotation of a knob of a gas control valve which causes opening of a gas passage. To open the gas passage, the knob is pushed down against the spring and rotated 90 degrees. And to shut

off the gas passage, the knob is rotated 90 degrees in an opposite direction and when the knob is at the closed position the spring push the knob outwardly to a position in which the knob is prevented from rotating freely.

5           To operate the a gas fueled cooking device for cooking, an ignition switch is turned on to start a flame and the gas supply lever is controlled to regulate the amount of the gas that is being flown into the gas fueled cooking device so that the heat may be adjusted according to the type of food being prepared.

10           However, in the conventional, in the event that a user leave the gas fueled cooking device unattended for a long period of time while the food is being cooked, overheating of the gas fueled cooking device is resulted and the food that is being cooked may overflow and extinguish a flame causing the gas to flow into the house resulting in a  
15 build-up of gas and a subsequent explosion.

Attempts to prevent the foregoing accident, the gas fueled cooking device that comprises a system which prevents a fire from extinguished due to the overflow of the food being cooked, and cuts of the gas supply has been invented. However, since the gas control

valve attached to the gas pipe is not closed, there still is a chance of a gas leakage.

In order to resolve the foregoing problems, I have invented a device which mechanically controls the opening duration of the gas valve. (Korean Patent No. 10-219443)

Fig. 1 and 2 illustrate the foregoing mentioned patent. The valve assembly according to the foregoing invention comprises; a spring and a plurality of gears to preset the operation time period; a timer having a cam member 107 placed at the axis of a timer 105 which rotates according to the predetermined time; a lever member 111 fixed onto a rotation axis 109 such that the center part of the lever member 111 moves, and one end touches the cam member 107 rotates about the rotation axis 109; a spring 113 attached to the lever member 111 and the cam member 107 such that the lever member 111 is pulled toward the cam member 107; a home 115 which covers the lever member 111; a valve cap 119 attached with the valve member and a handle 121 to open and close the valve 117. This safety system automatically shuts off the gas supply when the predetermined time period comes to end.

However, the foregoing valve assembly utilizes mechanically

operated controls, thus the construction of the system is complex.

And also frequent occurrences of operational problem and system breakdown must be addressed.

## 5 Disclosure of Invention

It is therefore an object of the present invention to provide a valve assembly in which the aforementioned problems are addressed. The aforementioned object is satisfied by a valve assembly comprising a timer to electronically predetermine the operation period, a motor  
10 having a pin fixed on to one side operates based on a signal from the timer, a valve sensor 15 which is turned on or off by the rotation of the lever member and monitors open/close status of the valve and a valve having a home formed at the valve cap, and a winding spring which is secured onto the main body of the valve and a valve cap connected to  
15 the knob to perform the open/close functions of the valve and other end is fixed onto the inside of a valve cap to push the valve cap in the direction of a closed position of the valve as the lever member moves.

### Brief Description of Drawings

FIG. 1 is a partial sectional view showing the valve of the conventional valve assembly that allows the control of the length of time the valve is opened.

- 5 FIG. 2 is a cross sectional view showing the valve of FIG. 1 in a closed status.

FIG. 3 is a cross sectional view of the valve assembly in accordance with the first embodiment of the present invention.

- 10 FIG. 4 is a perspective view of a timer employed in the present invention.

FIG. 5 is a cross sectional view of the valve assembly in accordance with the second embodiment of the present invention.

FIG. 6 is a flowchart showing the control processes of the timer when an electric current flows into the timer.

- 15 FIG. 7 is a flowchart illustrating the control processes of the timer of the valve assembly in accordance with the first embodiment of the present invention.

FIG. 8 is a flowchart illustrating the control processes of the timer of the valve assembly in accordance with the second embodiment of the

present invention.

### Best Mode for Carrying Out the Invention

Fig. 3 is an illustration of the first preferred embodiment of the present invention, and Fig. 4 shows electronically operated timer employed by the valve assembly of the present invention.

As shown in Fig. 4, the valve assembly in accordance with the present invention comprises a timer 1 that electronically predetermine the operation period is employed to control the length of time the valve is opened. In this preferred embodiment, the valve assembly comprises a motor 11 which operates based on a signal from the timer 1, a lever member 13 rotates about the rotational axis 23 placed at middle of the lever member 13, a valve sensor 15 which monitors open/close status of the valve and a valve 17.

A pin 17 is fixed onto the one side of the motor 11 and a protruded element 21 is formed at the end of the lever member 13 near the motor 11. When the motor 11 is activated, the pin 17 rotates and pushes the protruded element 21 of the lever member 13 causing the lever member 13 to rotate about the rotational axis 23.

The valve sensor 15 is activated by the movement of the lever member 13 and provides a signal indicating whether the valve 17 is opened or closed.

The valve 17 in accordance with the present invention comprises  
5 the valve cap 27 connected to the knob 25 to perform the open/close functions of the valve 17, and a winding spring (not shown) which pushes the valve cap 27 in the direction of a closed position of the valve 17.

A portion of the valve cap 27 is formed with a home 29 to place  
10 the end of lever member 13 opposite from the protruded element 21. One end of the winding spring is secured onto the main body of the valve and other end is fixed onto the valve cap 27. Therefore, during the predetermined time period determined by the electronic timer 1 the lever member 13 clicks into the home 29 formed at the valve cap 27  
15 resulting in opening of the valve 17. The signal indicating the end of the predetermined time period initiates the rotation of the lever member 13 causing the lever member 13 to separate from the home 29 of the valve cap 27, and then the winding spring forces the valve cap 27 to rotate in the direction of the closed position of the valve.



Fig. 5 illustrates the second embodiment of the valve assembly in accordance with the present invention.

The second embodiment comprises an electronic timer 1 (shown in Fig. 4) to predetermine and control the time period, a solenoid 51 which operates based on a signal of the timer 1, a lever member 53 which rotates about the rotational axis 63 placed in the middle of the lever member 53 through the operation of the solenoid 51, a valve sensor 55 which on/off functions are controlled by the lever member 53 and monitors open/close status of the valve 57, a home formed at the one side of the valve cap 67 in which the end of lever member 53 is placed upon, a valve cap 67 connected to the knob 65 to perform the open/close functions of the valve and a winding spring (not shown) which is secured onto the valve cap 67 and pushes the valve cap 67 in the direction of a closed position of the valve 57 as the lever member 53 rotates.

In this embodiment, the lever member 53 is moved by the solenoid 51 as the signal from the timer 1 initiates an electric current to flow into the solenoid 51 creating an electromagnetic effect which cause the solenoid 51 to either pull or push the lever member 53.

Other constructions of the second embodiment are same as that of the first embodiment.

Hereinafter, the flowcharts are used to illustrate the electronic timer utilized by the valve assembly.

5 Fig. 6 shows the operation of the electronic timer of the first embodiment when an electric current first flows into the electronic timer.

As illustrated in the flowchart, when the electronic timer is supplied with an electric current (1a) the motor is driven to close the  
10 valve (2a). Next phase is monitoring the outer sensor system (gas leakage sensor) to check whether any signal has been sent out. In the event that a signal is transmitted from the outer sensor system (gas leakage sensor), an alarm is raised and the motor is driven to close the  
15 valve (4a). If a gas leakage signal is monitored even after the valve has been closed, a warning message is sent out and operation comes to complete stop (6a). If no signal is monitored, then the timer is initiated and normal operation is performed (7a).

Fig. 7 is a flowchart illustrating normal operational processes of the electronic timer of the valve assembly according to the first

embodiment.

The electronic timer remains standby status until the warning signal is transmitted from the outer sensor system or the valve is opened. If the warning signal is transmitted from the outer sensor system, then the electronic timer conducts the alarming process (1b).  
5 If the valve is opened, then the timer goes into an operational mode and the standard predetermined time period (30 minutes) is inputted (2b). If a user adjusts the predetermined time period, the electronic timer is reset accordingly (3b). While is the operational mode, the electronic timer continuously monitors the sensor signal, the time setting button,  
10 the gas valve sensor and the remaining time period to perform the functions corresponding to messages sent from those parts (4b). If a user adjusts the predetermined time period while is the operational mode, then the electronic timer changes the setting to accommodate  
15 the adjusted predetermined time period (5b). If the user manually shuts off the valve, the operational mode comes to stop and the electronic timer goes into the standby status (6b). When the predetermined time period comes to end, the valve-closing signal is outputted and the end of the predetermined period is informed to the

user by a sound, and the motor is driven to close the valve (7b). If the valve is not closed even after the motor has been driven to close the valve, then the sound goes off to alert the user to check the valve assembly for a possible malfunction. If the valve closes properly, then

5 the electronic timer returns to the standby status of the initial phase (8b). In the event that a malfunction signal is transmitted, the warning signal is manifested and the sound goes off to alert the malfunction of the system. The user may manually close the valve (9b). If it has been determined that the valve has not been closed, and then the motor

10 is driven to close the valve (10). If the warning signal is transmitted, then the corresponding message is manifested and informed to the user. Unless the warning signal is turned off, the electronic timer returns to the standby status (11b).

Fig. 8 is a flowchart illustrating normal operational processes of

15 the electronic timer of the valve assembly according to the second embodiment.

As illustrated in the flowchart, the operational processes are same as the first embodiment. The difference is that the second embodiment utilizes the solenoid system (7c, 10c) instead of the motor.

The valve assembly according to the foregoing description comprises an electronic timer to precisely control the duration of a usage time and a status of a valve while in use. As a result, the present invention can be used for a gas fueled cooking device such as a  
5 gas burner to increase the safety measures.

Although the invention has been shown and described with respect to detailed embodiments thereof, it should be understood by those skilled in the art that various changes and omissions in form and detail may be made therein without departing from the spirit and the  
10 scope of the invention.

## CLAIMS.

## 1. The valve assembly comprising:

a timer to electronically predetermine the operation period;

a motor having a pin fixed on to one side operates based on a  
5 signal from the timer;

a valve sensor 15 which is turned on or off by the rotation of the  
lever member, and monitors open/close status of the valve; and

a valve having a home formed at the valve cap, and a winding  
spring which is secured onto the main body of the valve and a

10 valve cap connected to the knob to perform the open/close  
functions of the valve and other end is fixed onto the inside of a  
valve cap to push the valve cap in the direction of a closed  
position of the valve as the lever member moves.

15

## 2. The valve assembly comprising:

a timer to electronically predetermine the operation period;

a solenoid 51 which operates based on a signal of the timer;

a lever member which makes contact with the solenoid and

rotates about the rotational axis placed in the middle of the lever member when the solenoid operates;

a valve sensor 15 which is turned on or off by the rotation of the lever member and monitors open/close status of the valve; and

5 a valve having a home formed at the valve cap, and a winding spring which is secured onto the main body of the valve and a valve cap connected to the knob to perform the open/close functions of the valve and other end is fixed onto the inside of a valve cap to push the valve cap in the direction of a closed position of the valve as the lever  
10 member moves.

Fig.1

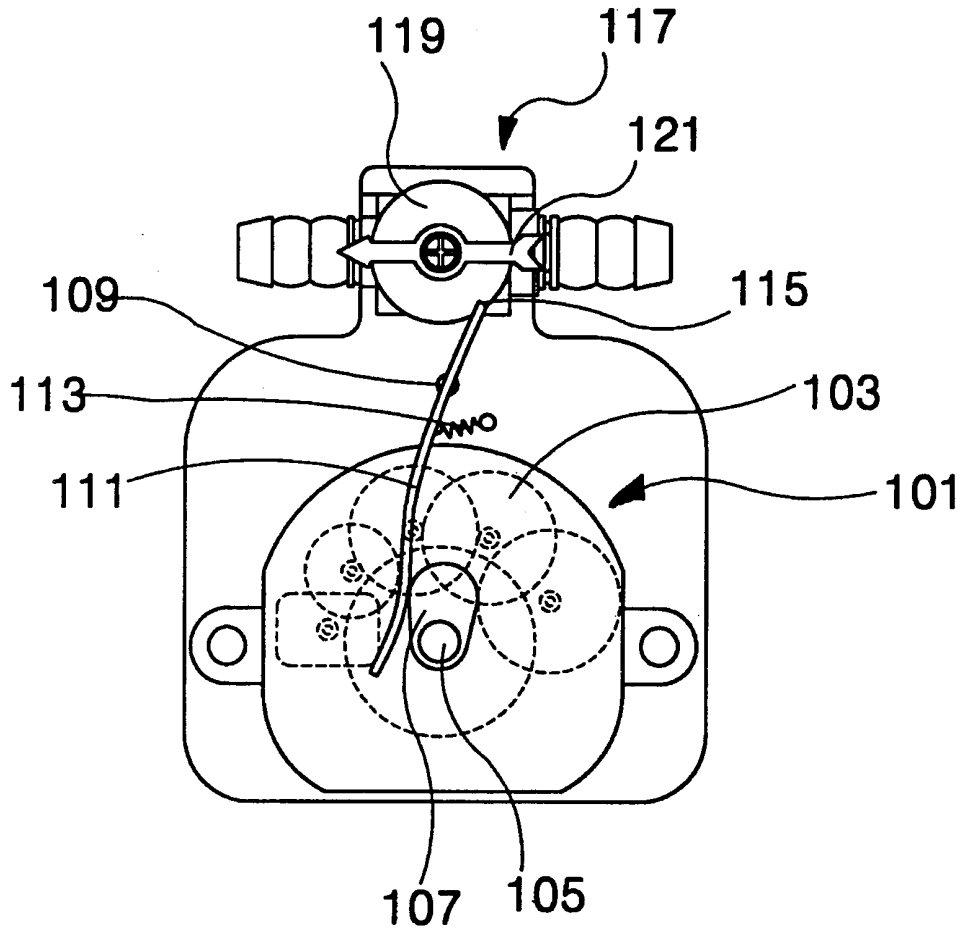




Fig.2

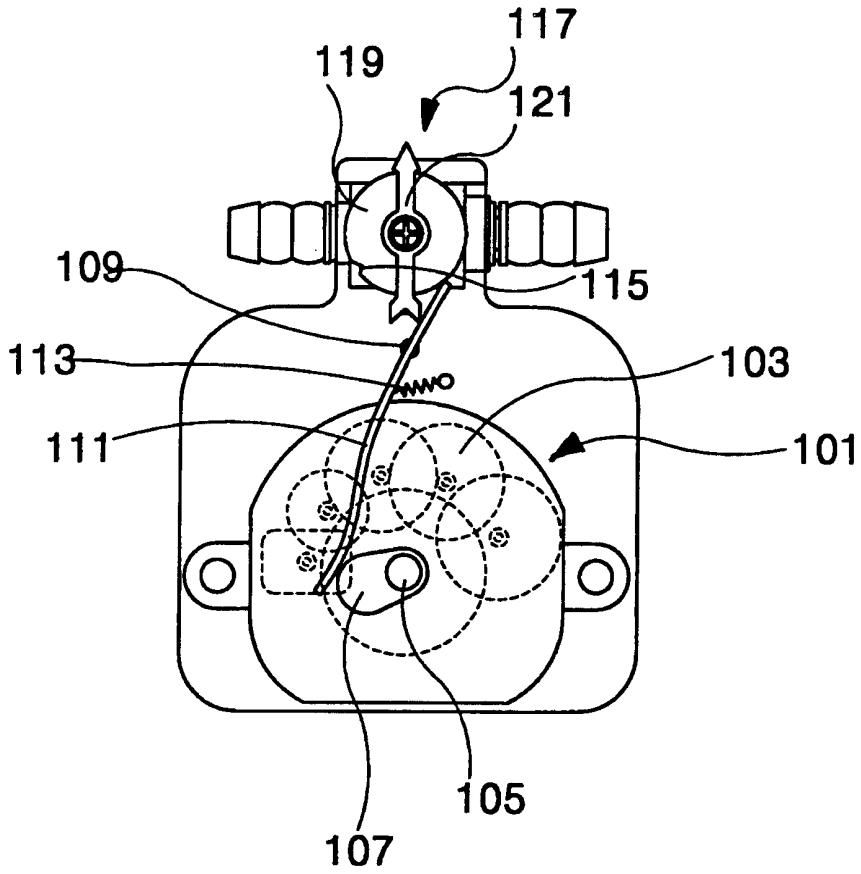


Fig.3

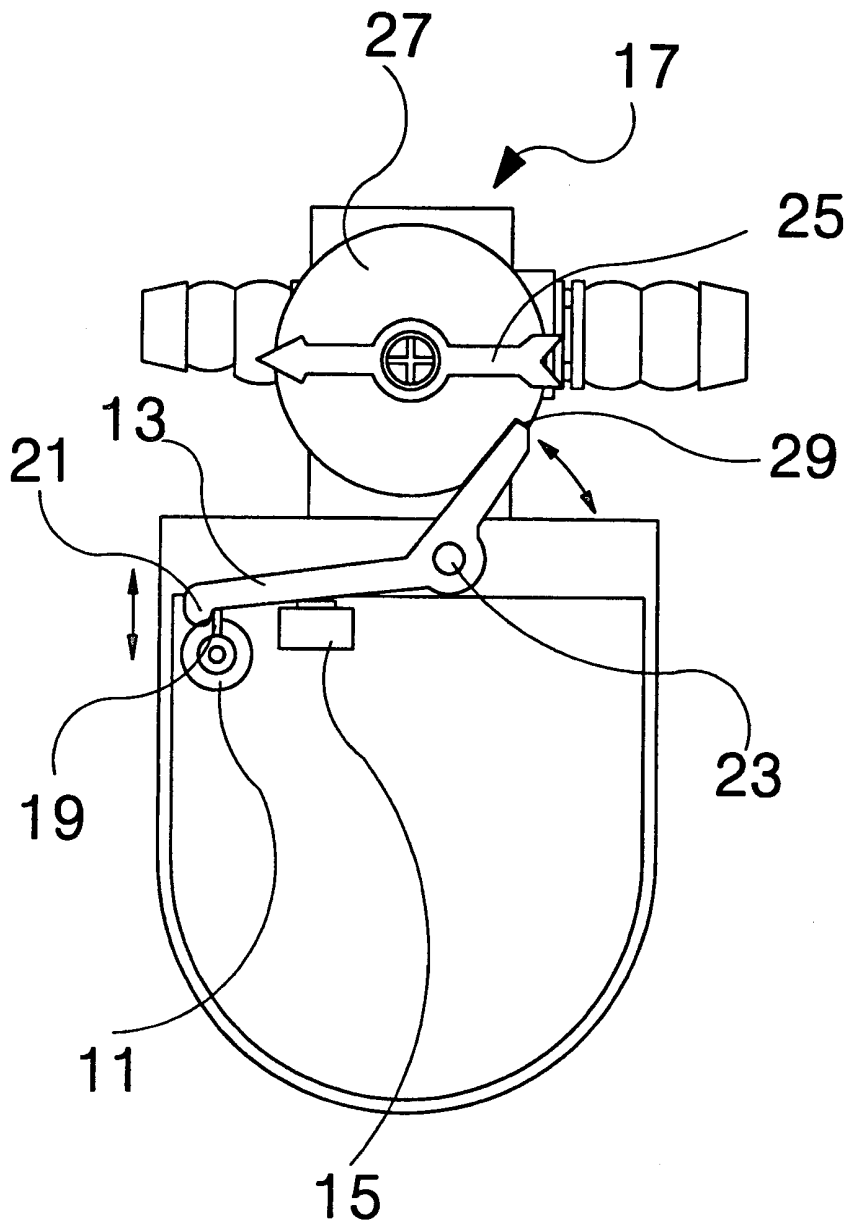


Fig.4

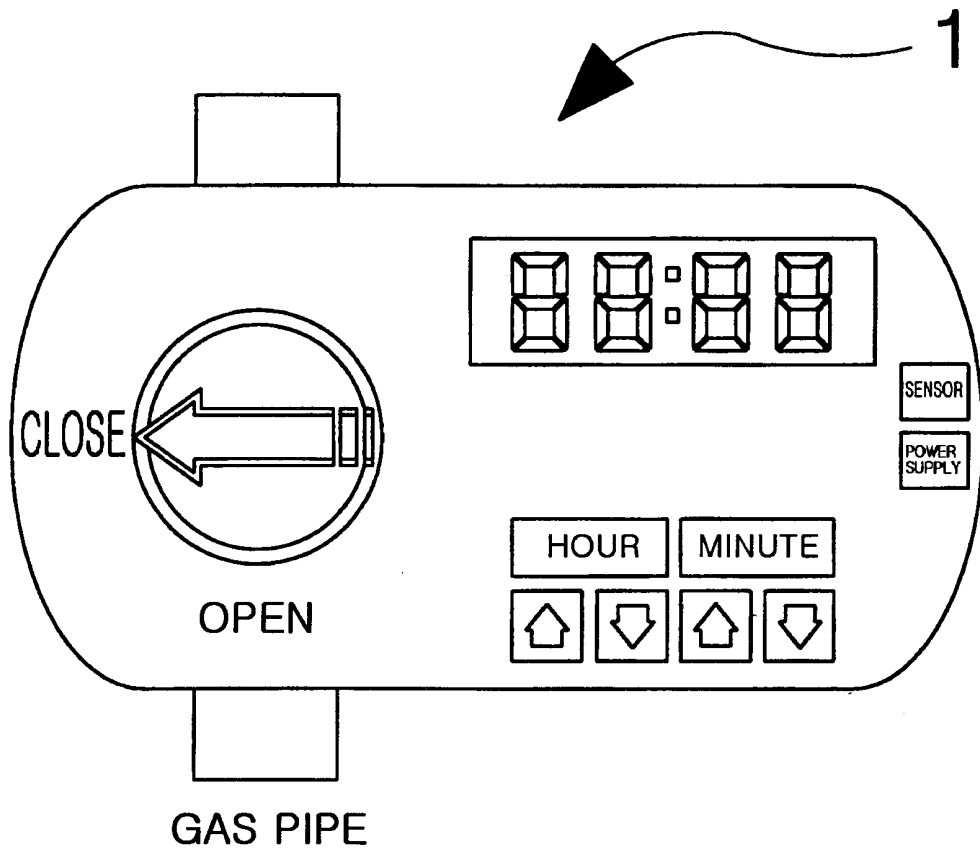


Fig.5

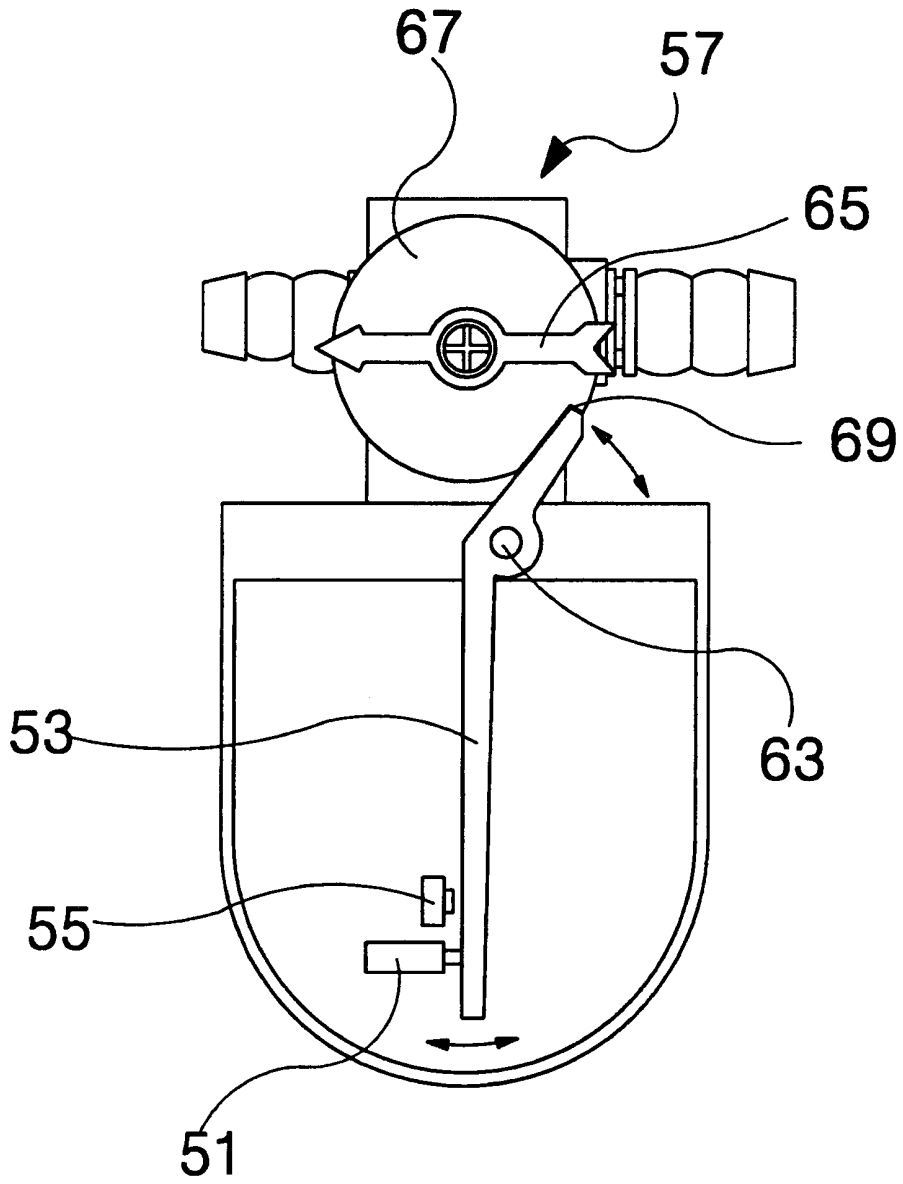


Fig.6

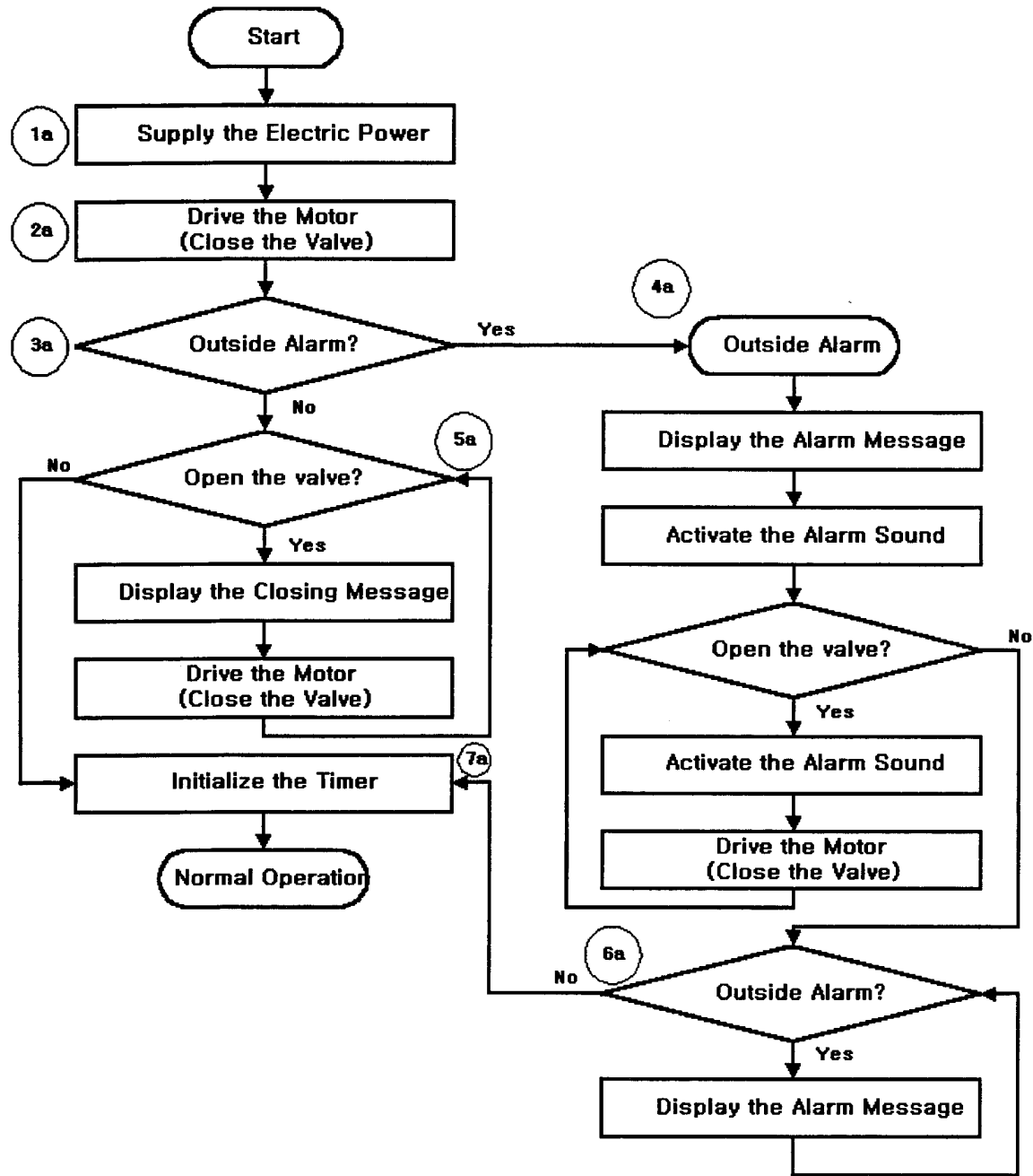


Fig.7

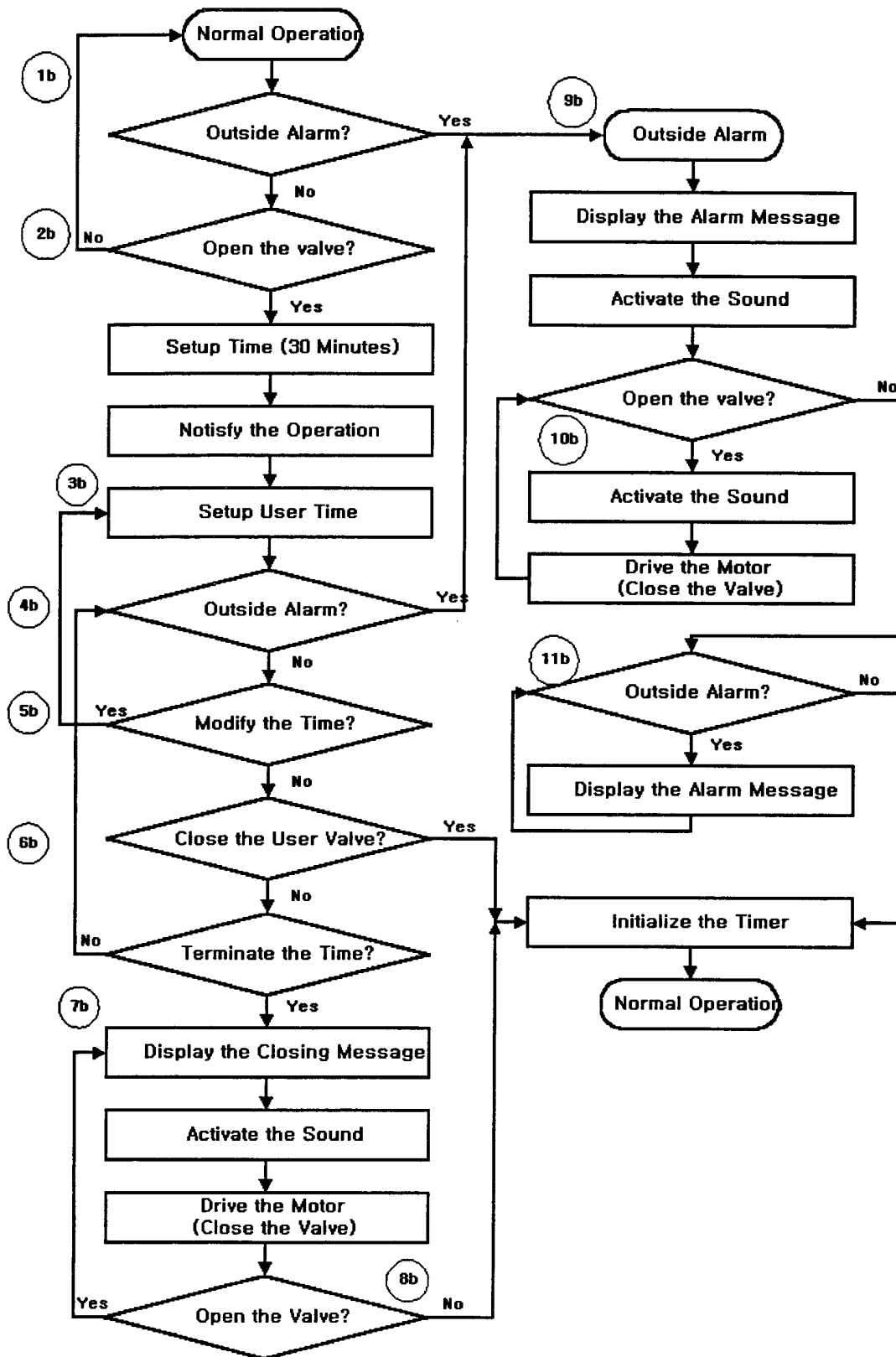
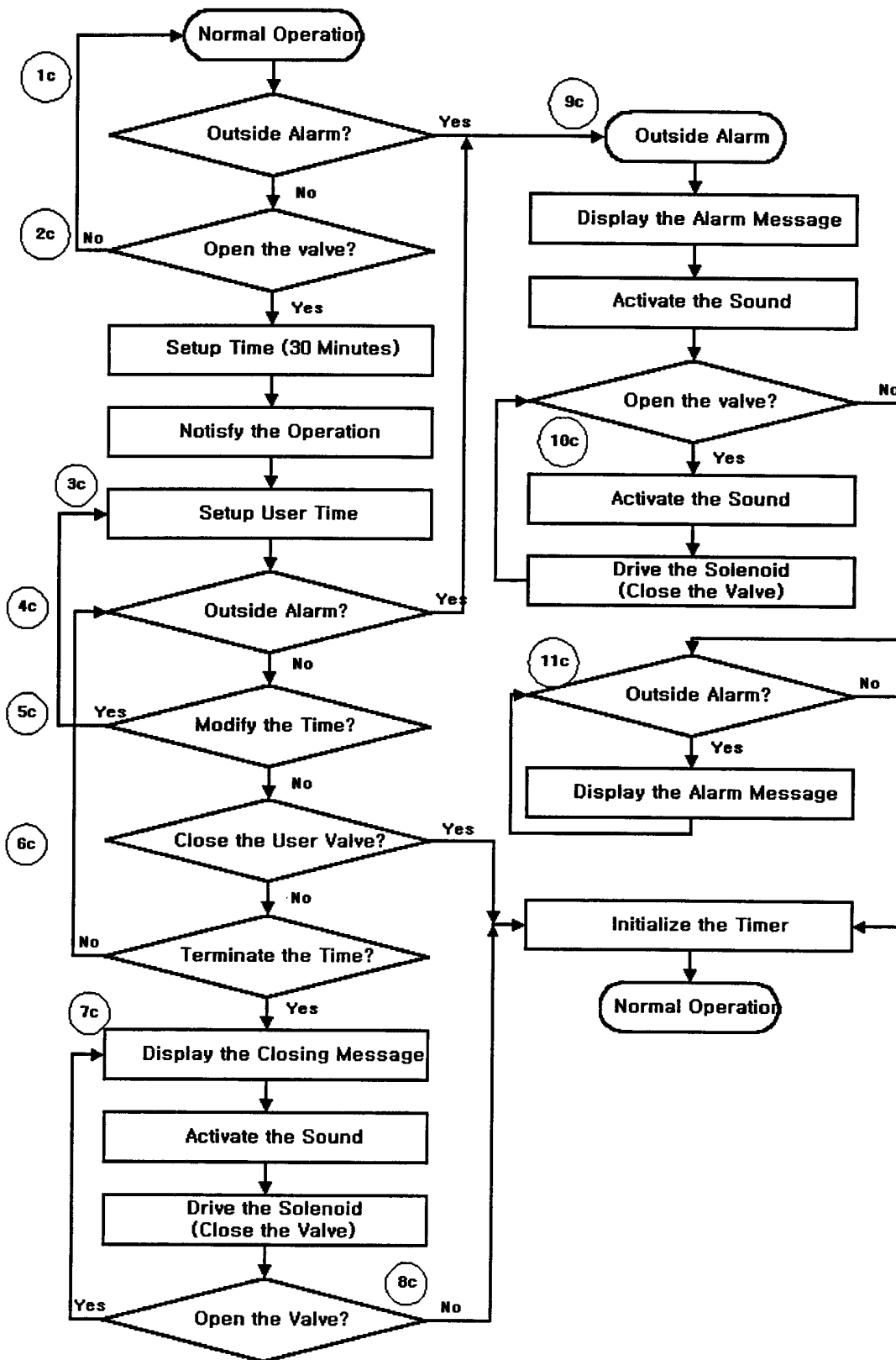


Fig.8



# INTERNATIONAL SEARCH REPORT

international application No.  
PCT/KR01/00294

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC7 F16K 37/00**

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)

IPC7 F16K. F17C.

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

KR. JP: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ESPACENET, DELPHION, PATROM6.0

"solenoid", "valve", "timer", "control", "motor", "alarm", "operation", "lever"

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4718454 A (William Appleby) 12 January 1988 See the whole document	1, 2
A	US 4690170 A (Tzong D. Tsai, Tsang J. Tsai) 1 September 1987 See the whole document	1, 2
A	KR 1999-36396 U (Oh. kwang soo) 27 September 1999 See the whole document	1, 2
A	KR 1999-8079 U (Na. ki dae) 25 February 1999 See the whole document	1, 2
A	KR 1999-5166 U (Lee. young ho, Choi young gyu) 5 February 1999 See the whole document	1, 2

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4718454 A	12-01-1988	AU 6396886 A1 EP 225016 A1 GB 2184260 A1 JP 62137482 A2	11-06-1987 10-06-1987 17-06-1987 20-06-1987
US 4690170 A	01-09-1987	None	
KR 99-36396 U	27-09-1999	None	
KR 99-8079 U	25-02-1999	None	
KR 99-5166 U	05-02-1999	None	