



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.02.2016 Bulletin 2016/07

(51) Int Cl.:
F23Q 21/00 ^(2006.01) **G08C 17/02** ^(2006.01)

(21) Application number: **14189479.0**

(22) Date of filing: **20.10.2014**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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(30) Priority: **14.08.2014 KR 20140105992**

(54) **Fireplace apparatus having remote automatic control function**

(57) Disclosed is a fireplace apparatus having a remote automatic control function. The fireplace apparatus is capable of automatically controlling opening and closing of an air supply passage mounted below a combustion chamber corresponding to a detected temperature of the fireplace, displaying information related to an ignition state, a key selection state, a heating power setting state and key buttons for key selection, preventing foreign materials from being adhered to an electric heating

member by a cover, and enabling a user to carry out remote ignition control, air amount control and temperature setting at a remote location. Accordingly, initial ignition can be stably achieved and the air supply amount is automatically controlled corresponding to the temperature of the combustion chamber. A user can achieve remote ignition or ignition reservation, and ignition and combustion are carried out at an optimum time according to the indoor temperature and time for returning home.

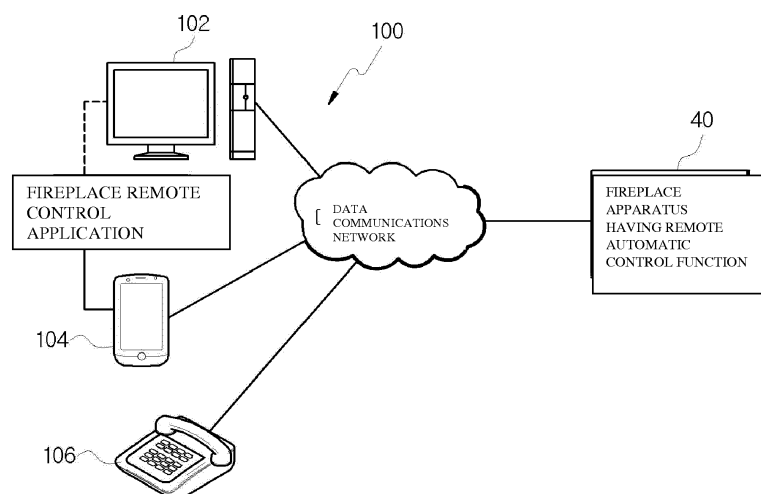


FIG. 2

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a fireplace apparatus and, more particularly, to a fireplace apparatus having a remote automatic control function capable of detecting a temperature of the fireplace, automatically controlling opening and closing of an air supply passage mounted below a combustion chamber corresponding to the detected temperature of the fireplace, displaying information related to an ignition state, a key selection state, a heating power setting state and key buttons for key selection, preventing foreign materials from being adhered to an electric heating member by a cover, and enabling a user to carry out remote ignition control, air amount control and temperature setting at a remote location, thereby enhancing convenience in use and safety.

Description of the Related Art

[0002] In general, a fireplace is a kind of heater which includes a furnace, i.e., a combustion chamber mounted to an indoor wall surface and a smoke flue, i.e., a chimney mounted in the wall. Early fireplaces were built by laying bricks on the wall surface, however, the recent trend in fireplaces has been to separate the fireplace from the wall surface in order to reduce heat loss through the wall surface.

[0003] FIG. 1 is a perspective view illustrating a conventional fireplace.

[0004] As shown in the drawing, similar to a typical fireplace, a conventional fireplace 2 includes a main body 4, an ashpan 14, a smoke flue 8, a combustion chamber 10 provided in middle of the main body 4, and legs 6 provided at a bottom of the main body 4.

[0005] A solid fuel such as firewood is loaded and burns in the combustion chamber 10, and combustion gas of the solid fuel is discharged through the smoke flue 8 communicating with the top of the combustion chamber 10. A heat storage unit (not shown) is mounted between the combustion chamber 10 and the smoke flue 8 in order to store heat generated in the combustion chamber 10 before heat dissipates through the smoke flue 8.

[0006] A large opening is formed at a front surface of the main body 4 in order to define a fuel intake of the combustion chamber 10. A door unit 20 is hinged to the front surface of the main body 4 in order to open and close the fuel intake. The door unit 20 includes a heat dissipation glass 24 made from tempered glass, a door frame 22 for supporting the heat dissipation glass 24, and a door knob 26 provided at a front surface of the door frame 22. An air curtain unit 30 having a plurality of air intake holes 28 arranged horizontally is provided at the top of the door unit 20.

[0007] An initial ignition stage needs a lot of oxygen. Further, because of lack of oxygen in the combustion chamber 10 due to combustion of the solid fuel, more outside air should be supplied by force to the combustion chamber 10. However, because the above-described conventional fireplace 2 does not have a function of supplying outside air by force to the combustion chamber 10 at an initial ignition stage, the ashpan 14 should be opened to make air flow backward through ash holes 12, thereby supplying more air for ignition or combustion.

[0008] However, the air introduced through the ashpan 14 is supplied very rapidly to the combustion chamber 10 due to convection, which results in fast combustion of the solid fuel in the combustion chamber 10.

[0009] Further, even when the temperature of the combustion chamber 10 rises above a predetermined temperature by sufficient combustion of the solid fuel such as firewood, if the ashpan 14 is kept in an opened state, the solid fuel is combusted too rapidly, which causes unnecessary waste of fuel and too fast heat dissipation through the smoke flue 8 without being used for indoor heating.

[0010] In this case, air introduction through the ashpan 14 needs to be blocked. However, if the ashpan 14 is closed too early before the combustion chamber 10 is sufficiently heated, combustion of the solid fuel may fail due to lack of air.

[0011] Therefore, it is difficult for a user who has little experience in using a fireplace to know when to close the ashpan 14.

[0012] Further, the solid fuel in the combustion chamber 10 is initially ignited using a gas torch (not shown). Such a method of initially igniting the solid fuel is not easy for a beginner and smoke may spread in the room.

[0013] Some recently developed fireplaces are equipped with an electric heating member which is mounted near the ash holes 12 in order to ignite the solid fuel by electric heat. However, such an electric heating member (not shown) easily becomes sooty or contaminated with foreign materials, which results in deterioration of heating ability due to a short circuit or corrosion and a reduction in lifespan.

[0014] In addition, because the indoor temperature is relatively low in winter, although a user operates the fireplace immediately after returning home, it takes a relatively long time to warm the room through combustion of the solid fuel loaded in the fireplace.

SUMMARY OF THE INVENTION

[0015] The present invention is devised to solve the above problems, and it is an object of the present invention to provide a fireplace apparatus having a remote automatic control function capable of detecting a temperature of the fireplace, automatically controlling opening and closing of an air supply passage mounted below a combustion chamber corresponding to the detected temperature of the fireplace, displaying information re-

lated to an ignition state, a key selection state, a heating power setting state and key buttons for key selection, preventing foreign materials from being adhered to an electric heating member by a cover, and enabling a user to carry out remote ignition control, air amount control and temperature setting at a remote location, thereby enhancing convenience in use and safety.

[0016] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a fireplace apparatus having a remote automatic control function including a smoke flue provided at a top of a main body and communicating with a combustion chamber, a door unit provided at a front portion of the main body, and an ashpan provided below the combustion chamber, the fireplace apparatus comprising: a communication module configured to receive an automatic ignition signal, an ignition reservation signal, an air amount control signal or a temperature setting signal from a user terminal located at a remote location; a data storage unit configured to store information related to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module; a control unit configured to apply control signals to respective corresponding components according to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module; an air supply amount control motor mounted below the combustion chamber to control the air supply amount by being changed in speed according to a driving control signal transmitted from the control unit; an automatic control valve mounted on an air supply passage to control an opening degree by being opened or closed according to the driving control signal transmitted from the control unit; an electric heating member configured to generate heat for ignition of a solid fuel according to an ignition control signal transmitted from the control unit; and a switching unit to switch a power supply path connected to the electric heating member according to a switching control signal transmitted from the control unit.

[0017] The fireplace apparatus may further comprise a fireplace temperature sensor attached to an outer wall of the combustion chamber to detect a temperature of the combustion chamber.

[0018] When receiving an ignition signal, the control unit may perform control processes such that the automatic control valve is opened to the maximum, the air supply amount control motor is increased in rotating speed to the maximum, and the electric heating member generates heat.

[0019] When a temperature of the combustion chamber after ignition is equal to or greater than a predetermined temperature, the control unit may perform control processes such that the automatic control valve is closed and the air supply amount control motor is stopped.

[0020] The control unit may control the switching unit to automatically cut off power supplied to the electric

heating member after ignition.

[0021] The control unit may control the automatic control valve and the air supply amount control motor according to a heating power control signal input by a user after ignition, and may store the corresponding control data in the data storage unit.

[0022] The fireplace apparatus may further comprise a display unit to display an ignition state, a key selection state, a temperature setting state, a heating power setting state, and key buttons for key selection, and a display driving unit to drive the display unit.

[0023] The fireplace apparatus may further comprise an indoor temperature sensor to detect an indoor temperature so that the control unit achieves automatic ignition and temperature control according to the indoor temperature.

[0024] The electric heating member may be covered with a ceramic cover.

[0025] As is apparent from the above description, initial ignition can be stably achieved and the air supply amount is automatically controlled corresponding to the temperature of the combustion chamber in order to increase fuel efficiency when the combustion chamber is heated. Accordingly, the fireplace apparatus having a remote automatic control function according to the present invention is convenient to use and economical. Further, a user can achieve remote ignition or ignition reservation, and ignition and combustion are carried out at an optimum time according to the indoor temperature and time for returning home. Accordingly, convenience in use is further enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a conventional fireplace;

FIG. 2 is a mimetic diagram schematically illustrating a constitution of a system including a fireplace apparatus having a remote automatic control function according to an embodiment of the present invention;

FIG. 3 is a side sectional view illustrating a constitution of the fireplace apparatus having a remote automatic control function according to an embodiment of the present invention;

FIG. 4 is a perspective view illustrating a constitution of an electric heating member included in the fireplace apparatus having a remote automatic control function according to an embodiment of the present invention; and

FIG. 5 is a block diagram illustrating a circuit constitution of the fireplace apparatus having a remote automatic control function according to an embodiment

of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings.

[0028] FIG. 2 is a mimetic diagram schematically illustrating a constitution of a system including a fireplace apparatus having a remote automatic control function according to an embodiment of the present invention, FIG. 3 is a side sectional view illustrating a constitution of the fireplace apparatus having a remote automatic control function according to an embodiment of the present invention, FIG. 4 is a perspective view illustrating a constitution of an electric heating member included in the fireplace apparatus having a remote automatic control function according to an embodiment of the present invention, and FIG. 5 is a block diagram illustrating a circuit constitution of the fireplace apparatus having a remote automatic control function according to an embodiment of the present invention.

[0029] A fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention is capable of detecting a temperature of the fireplace, automatically controlling opening and closing of an air supply passage mounted below a combustion chamber corresponding to the detected temperature of the fireplace, displaying information related to an ignition state, a key selection state, a heating power setting state and key buttons for key selection, preventing foreign materials from being adhered to an electric heating member by a cover, and enabling a user to carry out remote ignition control, air amount control and temperature setting at a remote location, thereby enhancing convenience in use and safety.

[0030] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention, similar to a conventional fireplace apparatus, comprises a main body 4 having a combustion chamber 10, a smoke flue 8 provided above the main body 4 and communicating with the combustion chamber 10, a door 20 provided at a front portion of the main body 4, and an ashpan 14 provided below the combustion chamber 10.

[0031] Further, in order to achieve a remote control or key setting function, the fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention comprises a communication module 42 configured to receive an automatic ignition signal, an ignition reservation signal, an air amount control signal or a temperature setting signal from a user terminal 100 located at a remote location, a data storage unit 72 configured to store information related to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module 42, and a control unit 74 configured to apply

control signals to respective corresponding components according to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module 42.

[0032] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises an air supply amount control unit 50. The air supply amount control unit 50 includes an air supply amount control motor 52 and an automatic control valve 60.

[0033] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises a motor driving unit 54 configured to drive the air supply amount control motor 52 mounted below the combustion chamber 10 to control the air supply amount by being changed in speed according to a driving control signal transmitted from the control unit 74.

[0034] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises a valve driving unit 62 configured to drive the automatic control valve 60 mounted on an air supply passage to control an opening degree by being opened or closed according to a driving control signal transmitted from the control unit 74.

[0035] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises an electric heating member 64 configured to generate heat for ignition of a solid fuel according to an ignition control signal transmitted from the control unit 74, and a switching unit 70 to switch a power supply path connected to the electric heating member 64 according to a switching control signal transmitted from the control unit 74.

[0036] The electric heating member 64 includes a heating element 66 implemented as a silicon nitride heater (or silicide heater) of a ceramic material which generates heat by receiving power through an electric cable 48, and has far superior conductivity.

[0037] The electric heating member 64 is covered with a ceramic cover 68. That is, the ceramic cover 68 is structured to cover an exterior of the heating element 66.

[0038] The control unit 74 is configured to control a temperature according to a temperature of the fireplace, i.e., a temperature of the combustion chamber 10 and an indoor temperature.

[0039] For the temperature control, the fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises a fireplace temperature sensor 44 attached to an outer wall of the combustion chamber 10 to detect the temperature of the combustion chamber 10, and an indoor temperature sensor 46 to detect the indoor temperature so that the control unit 74 can achieve automatic ignition and temperature control according to the indoor temperature.

[0040] Specifically, if a user sets a desired indoor tem-

perature and time for returning home, the control unit 74 conducts automatic control processes by determining when ignition should be carried out and how much air should be supplied for combustion based on time-temperature proportional data stored in the data storage unit 72.

[0041] To this end, data about elevated temperature properties per time by fireplace capacity is stored in the data storage unit 72.

[0042] When receiving an ignition signal, the control unit 74 performs control processes such that the automatic control valve 60 is opened to the maximum, the air supply amount control motor 52 is increased in rotating speed to the maximum, and the electric heating member 64 generates heat.

[0043] When the temperature of the combustion chamber 10 after ignition is equal to or greater than a predetermined temperature, the control unit 74 performs control processes such that the automatic control valve 60 is closed and the air supply amount control motor 52 is stopped. The control unit 74 also controls the switching unit 70 to automatically cut off the power supplied to the electric heating member 64 after ignition.

[0044] Especially, the control unit 74 controls the automatic control valve 60 and the air supply amount control motor 52 according to a heating power control signal input by a user after ignition, and stores the corresponding control data in the data storage unit 72.

[0045] Even a beginner who has little experience in use of a fireplace can manipulate the fireplace apparatus skillfully by virtue of the operation such that the control unit 74 controls the automatic control valve 60 and the air supply amount control motor 52 so as to facilitate initial ignition and, when the solid fuel burns vigorously and the temperature of the combustion chamber 10 increases suddenly, the control unit 74 automatically controls the automatic control valve 60 and the air supply amount control motor 52 so as to increase solid fuel efficiency.

[0046] Further, the fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention enables a user to carry out a key selection for real-time ignition or ignition reservation through the user terminal 100 at a remote location. For example, a user may select a basic mode in which ignition, air supply amount, heating power, etc., are preset, or may manually set air supply amount, heating power, etc. as needed at a remote location.

[0047] A remote control application, through which a control command signal is transmitted from a remote location to the fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention, is loaded in the user terminal 100. The user terminal 100 may be implemented as a PC 102, a mobile terminal 104 or a common wired telephone 106.

[0048] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises a display unit 56 to display an ignition state, a key selection state, a tem-

perature setting state, a heating power setting state, key buttons for key selection, etc., and a display driving unit 58 to drive the display unit 56.

[0049] Preferably, the display unit 56 is implemented as a touchscreen.

[0050] The fireplace apparatus 40 having a remote automatic control function according to an embodiment of the present invention further comprises a manual adjustment lever 36 by which a user manually adjusts an opening degree of an air hole 34 in case of a blackout or breakdown.

[0051] Non-described numeral 32 refers to a heat storage unit.

[0052] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. A fireplace apparatus having a remote automatic control function including a smoke flue (8) provided at a top of a main body (4) and communicating with a combustion chamber (10), a door unit (20) provided at a front portion of the main body (4), and an ashpan (14) provided below the combustion chamber (10), the fireplace apparatus comprising:

a communication module (42) configured to receive an automatic ignition signal, an ignition reservation signal, an air amount control signal or a temperature setting signal from a user terminal (100) located at a remote location;

a data storage unit (72) configured to store information related to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module (42);

a control unit (74) configured to apply control signals to respective corresponding components according to the automatic ignition signal, the ignition reservation signal, the air amount control signal or the temperature setting signal transmitted from the communication module (42);

an air supply amount control motor (52) mounted below the combustion chamber (10) to control the air supply amount by being changed in speed according to a driving control signal transmitted from the control unit (74);

an automatic control valve (60) mounted on an air supply passage to control an opening degree by being opened or closed according to the driving control signal transmitted from the control

- unit (74);
 an electric heating member (64) configured to generate heat for ignition of a solid fuel according to an ignition control signal transmitted from the control unit (74); and
 a switching unit (70) to switch a power supply path connected to the electric heating member (64) according to a switching control signal transmitted from the control unit (74).
2. The fireplace apparatus having a remote automatic control function according to claim 1, further comprising:
- a fireplace temperature sensor (44) attached to an outer wall of the combustion chamber (10) to detect a temperature of the combustion chamber (10).
3. The fireplace apparatus having a remote automatic control function according to claim 1, wherein, when receiving an ignition signal, the control unit (74) performs control processes such that the automatic control valve (60) is opened to the maximum, the air supply amount control motor (52) is increased in rotating speed to the maximum, and the electric heating member (64) generates heat.
4. The fireplace apparatus having a remote automatic control function according to claim 1, wherein, when a temperature of the combustion chamber (10) after ignition is equal to or greater than a predetermined temperature, the control unit (74) performs control processes such that the automatic control valve (60) is closed and the air supply amount control motor (52) is stopped.
5. The fireplace apparatus having a remote automatic control function according to claim 1, wherein the control unit (74) controls the switching unit (70) to automatically cut off power supplied to the electric heating member (64) after ignition.
6. The fireplace apparatus having a remote automatic control function according to claim 1, wherein the control unit (74) controls the automatic control valve (60) and the air supply amount control motor (52) according to a heating power control signal input by a user after ignition, and stores the corresponding control data in the data storage unit (72).
7. The fireplace apparatus having a remote automatic control function according to claim 1, further comprising:
- a display unit (56) to display an ignition state, a key selection state, a temperature setting state, a heating power setting state, and key buttons
- for key selection; and
 a display driving unit (58) to drive the display unit (56).
8. The fireplace apparatus having a remote automatic control function according to claim 1, further comprising:
- an indoor temperature sensor (46) to detect an indoor temperature so that the control unit (74) achieves automatic ignition and temperature control according to the indoor temperature.
9. The fireplace apparatus having a remote automatic control function according to claim 1, wherein the electric heating member (64) is covered with a ceramic cover (68).

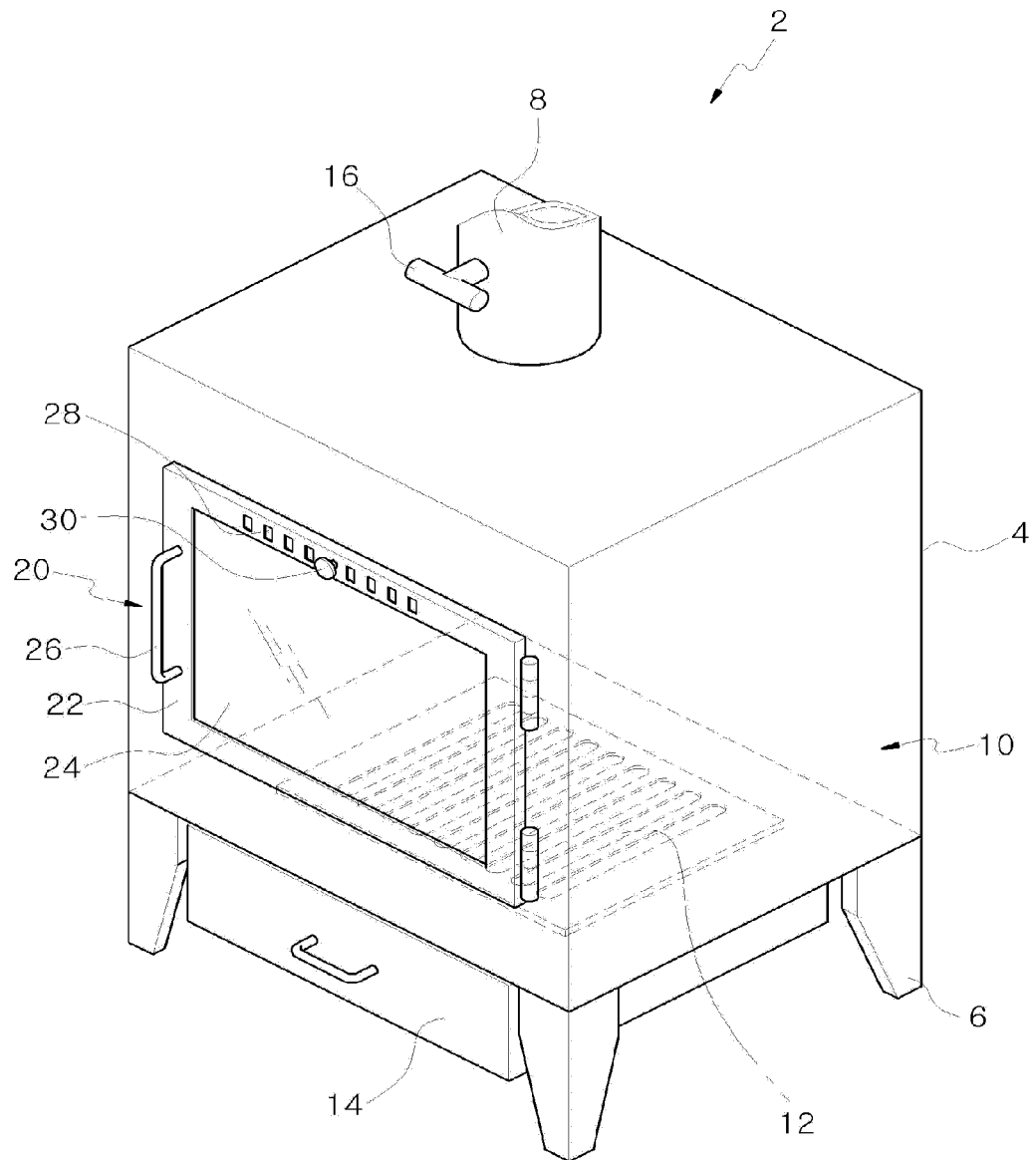


FIG.1

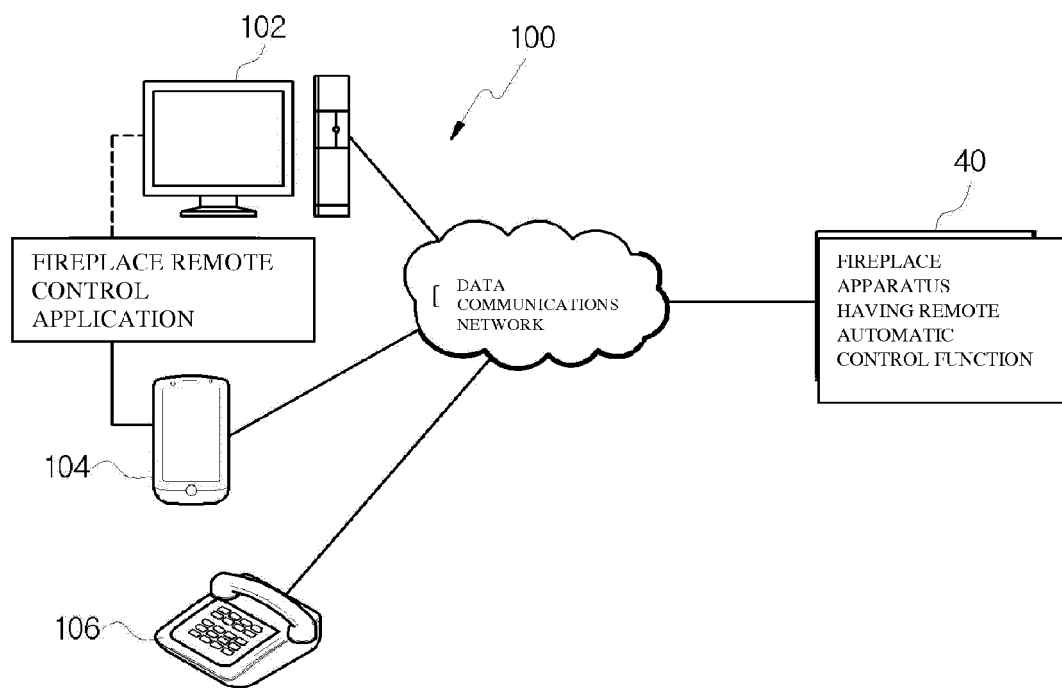


FIG. 2

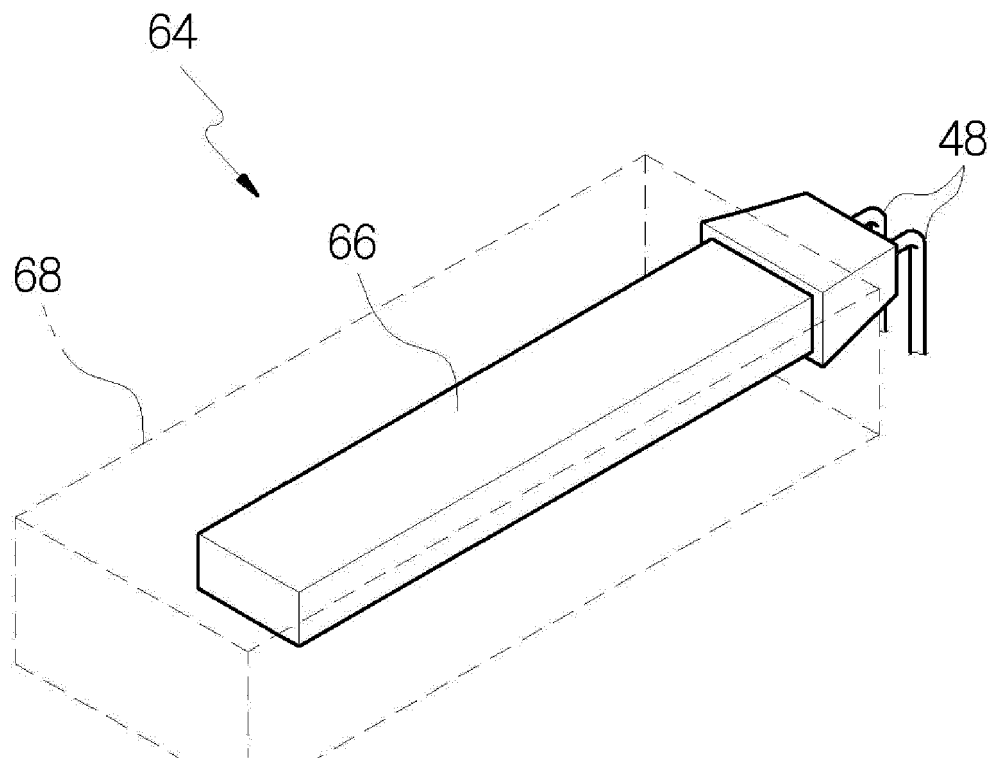


FIG. 3

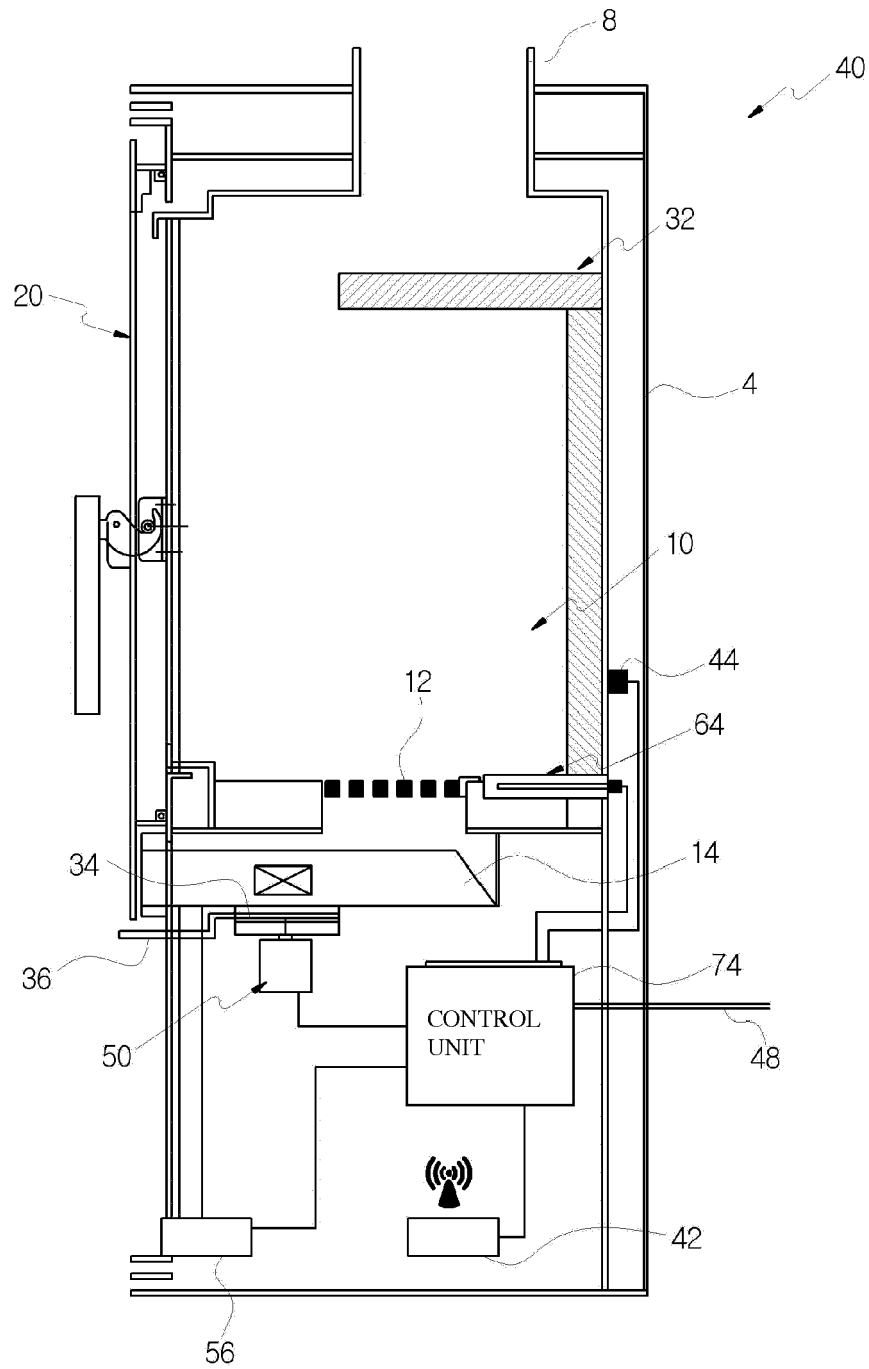


FIG. 4

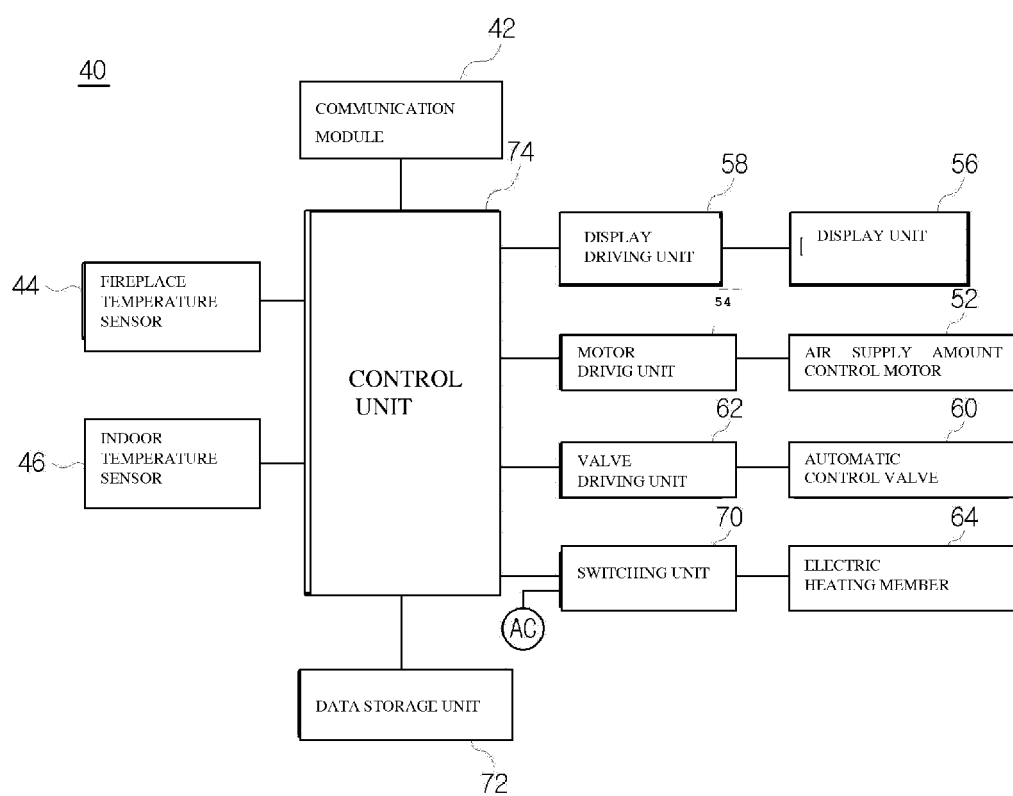


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 9479

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 770 334 A2 (HNI TECH INC [US]) 4 April 2007 (2007-04-04) * paragraphs [0017], [0025] - [0042] * * claims 11,18; figures 1,2,4,5 * -----	1-9	INV. F23Q21/00 G08C17/02
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			TECHNICAL FIELDS SEARCHED (IPC)
			F23Q G08C F23N
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 December 2015	Examiner Gijssels, Willem
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 18 9479

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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