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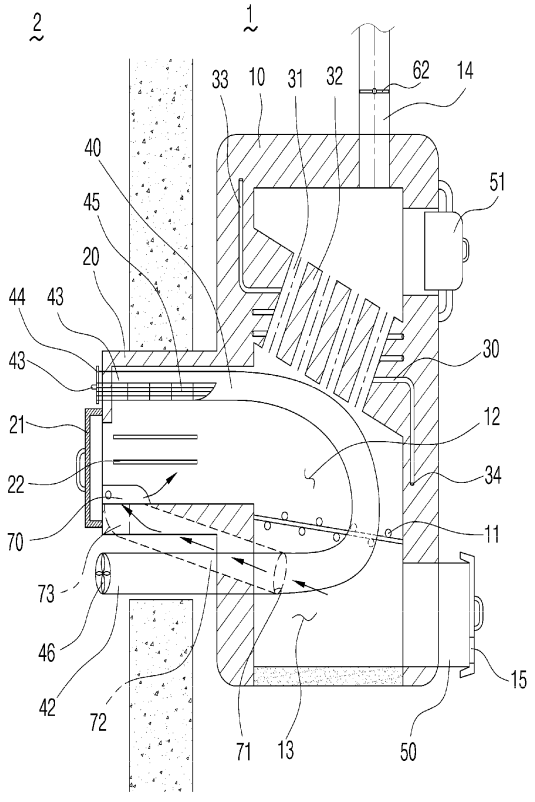
(54) REGENERATIVE FIREPLACE BOILER

(57) The present invention provides a regenerative fireplace boiler that includes: a main furnace (10) disposed at an outdoor side; an indoor port (20) disposed at an indoor side; hot water circulation pipe (30) disposed over a first combustion chamber (12) of the main combustion chamber (10); a hot air circulation pipe (40) having hot air outlets (41) disposed through an upper portion of a front side of the indoor port (20) and hot air inlets (41) disposed through a lower portion of the front side of the indoor port (20), connecting the hot air outlets (41) and the hot air inlets (42) being connected, and being positioned through the first combustion chamber (12) and the second combustion chamber (13); a cleaning socket (51) disposed at an upper portion of a rear side of the main combustion chamber (10) and an outdoor port (50) disposed at a lower portion of the rear side of the main combustion chamber (10); a damper (62) disposed on a rotary shaft (61) in the stove pipe 14 of the main combustion chamber (10), supporting rods (63) fixed to a side of the main combustion chamber (10), connection bars (64) supported by the supporting rods (63), with a first end connected to a side of the damper (62), and a damper adjuster (60 connected to the connection bars (64) in order to move up and down the damper (62) when the connection bars (64) are pulled; and an air intake port (71) for sucking exterior air disposed outside the main combustion chamber (10), an air intake line (72) extending from the air intake port (71), an air exit port (73) disposed in the indoor port (20) to supply exterior air flowing inside through the air intake line (72) to the first combustion chamber (12), and an ash shield (70) covering the air exit port (73) to block ashes.

[Fig. 4]



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Description

Technical Field

[0001] The present invention relates to a regenerative fireplace boiler and, more particularly, to a regenerative fireplace boiler that can be used as both a fireplace and a boiler by connecting a hot water pipe to the fireplace, whereby the regenerative fireplace boiler can humidify the interior of a space, and has a grill to roast sweet potatoes, etc., whereby it can be used for various purposes.

Background Art

[0002] In general, a fireplace is a kind of heating apparatus that is formed in the interior wall of a building, for example the wall of a living room of a house, and heats the interior in winter by emitting to the interior heat generated by burning solid fuel such as firewood to the interior.

[0003] Fireplaces have various and unique designs, so they are used as an interior decorative structure in a room in other seasons except winter.

[0004] Further, the other portion except the frame of a door disposed ahead of a combustion chamber of a fireplace is made of transparent glass such as reinforced glass so that the combustion state of firewood or fuel in the combustion chamber can be visually exposed to the outside.

[0005] On the other hand, a boiler system, which is an apparatus for heating and supplying hot water using oil, electricity, and gas, etc. as fuel, heats water up to predetermined temperature and supplies the hot water through a supply line so that the hot water heats an interior space and is then circulated by a circulation pump. The boiler system heats interior air and supplies hot water at home, so it is in close connection with our life.

[0006] Accordingly, many combinations of a fireplace and a boiler system have been proposed, these combinations provide heating circulation systems by installing heat collection parts of a boiler system such as a water pipe and a container in the parts of a fireplace, and the heating circulation systems have little different configurations.

[0007] For example, Korean Patent No. 10-1192840 has proposed a 'Fire place with a boiler', which includes a combustion chamber and a main body having a stove pipe over the combustion chamber, in which a door is coupled to the front side of the main body to put solid fuel into the combustion chamber. Further, an ash pan is disposed under the main body to collect and take out ashes remaining after the solid fuel is burned, and an inner pipe spirally wound and spaced from an inner wall are connected to the combustion chamber, with a first end is connected to an inlet pipe fixed outside the main body and a second end connected to an outlet pipe fixed outside the main body.

[0008] This configuration used a both a fireplace and a boiler system by supplying hot water for heating the interior using the heat source of a fireplace.

[0009] However, the configuration is used as a fireplace and a boiler system, but is not given any additional configuration, so spatial usability is low.

[0010] Further, there is a need for a humidifier to maintain interior humidity in winter, but the fireplaces of the related art have no humidifying unit, so it is required to separately purchase and install a humidifier. Accordingly, the entire cost is increased and spatial usability is deteriorated because the separate humidifier occupies a predetermined area in a small interior space.

Disclosure

Technical Problem

[0011] An object of the present invention is to provide a regenerative fireplace boiler that can be used as both a fireplace and a boiler, can humidify an interior space using a humidifying unit, and allows for roasting sweet potatoes, nuts, and potatoes, and can supply hot water to an interior space, and can be used as a oven, whereby it can be used for various purposes.

Technical Solution

[0012] In order to achieve the above object, according to one aspect of the present invention, there is provided a regenerative fireplace boiler, including: a main combustion chamber disposed at an outdoor side, having a first combustion chamber and a second combustion chamber separated by a stoker therein, and having a stove pipe connected to a top of the main combustion chamber at the outdoor side and an air adjuster coupled to a lower end of a rear outer side; an indoor port extending from and communicating with the main combustion chamber, positioned at an indoor side, and having a door at a front side thereof; a hot water circulation pipe having combustion pipes spaced from each other with regular intervals over the first combustion chamber with flame passages therebetween, a hot water outlet disposed around the combustion pipes and positioned at an upper portion of the main combustion chamber, and a hot water inlet disposed at a rear portion of the main combustion chamber; a hot air circulation pipe having hot air outlets disposed through an upper portion of a front side of the indoor port and hot air inlets disposed through a lower portion of the front side of the indoor port, connecting the hot air outlets and the hot air inlets, and being positioned through the first combustion chamber and the second combustion chamber; a cleaning socket disposed at an upper portion of a rear side of the main combustion chamber and an outdoor port disposed at a lower portion of the rear side of the main combustion chamber; a damper disposed on a rotary shaft in the stove pipe of the main combustion chamber, supporting rods fixed to a side of the main combustion chamber, connection bars support-

ed by the supporting rods, with a first end connected to a side of the damper, and a damper adjuster connected to the connection bars in order to move up and down the damper when the connection bars are pulled; and an air intake port for sucking exterior air disposed outside the main combustion chamber, an air intake line extending from the air intake port, an air exit port disposed in the indoor port to supply exterior air flowing inside through the air intake line to the first combustion chamber, and an ash shield covering the air exit port to block ashes.

[0013] A cover having a knob and opening and closing the hot air outlet may be disposed in the hot air outlet, and a gauze-like grill connected to the cover may be further disposed at a lower portion in the hot air outlet.

[0014] An intake fan forcibly sucking interior air may be disposed in the hot air inlets.

[0015] Shelves facing each other may be disposed on an inner side of the indoor port having the door.

[0016] A humidifier may be coupled to the front side of the indoor port and may have a vapor exit exposed through the front side of the indoor port and a water container connected to the vapor exit and disposed inside the indoor port.

[0017] A freeze protection electric heater may be further disposed in the main combustion chamber and may be electrically connected to a temperature sensor for detecting the temperature at the outdoor side where the main combustion chamber is disposed and a freezing-bursting sensor for operating or stopping the freeze protection electric heater in cooperation with the temperature sensor.

Advantageous Effects

[0018] According to the present invention, when firewood is put into and burned in the first combustion chamber, the hot water circulation pipe is heated by flames, so it is possible to increase the interior space temperature and use hot water. Further, air heated through the hot air circulation pipe flows to the interior and increases the interior space temperature. Furthermore, it is possible to cook sweet potatoes or potatoes using a grill and cook food like using an oven by using shelves.

Description of Drawings

[0019]

Fig. 1 is a front view showing a regenerative fireplace boiler of the present invention.

Fig. 2 is a rear view showing the regenerative fireplace boiler of the present invention.

Fig. 3 is a side view showing the regenerative fireplace boiler of the present invention.

Fig. 4 is a side view showing a boiler configuration of the regenerative fireplace boiler of the present invention.

Fig. 5 is a side view showing another embodiment of a regenerative fireplace boiler of the present invention.

Fig. 6 is a perspective view showing an ash shield of a regenerative fireplace boiler of the present invention.

Fig. 7 is a perspective view showing a grill of a regenerative fireplace boiler of the present invention.

Fig. 8 is a side view showing another embodiment of a regenerative fireplace boiler of the present invention.

Mode for Invention

[0020] Hereinafter, other objects and characteristics of the present invention except the objects described above will be made clear through the following description about embodiments referring to the accompanying drawings.

[0021] Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the present invention belongs. It must be understood that the terms defined by the dictionary are identical with the meanings within the context of the related art, and they should not be ideally or excessively formally defined unless the context clearly dictates otherwise.

[0022] Hereinafter, regenerative fireplace boilers according to embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0023] As shown in the figures, a regenerative fireplace boiler of the present invention includes a main combustion chamber 10, an interior fuel intake 20, a hot water circulation pipe 30, a hot air circulation pipe 40, an exterior port 50, a damper adjuster 60, and an ash shield 70.

[0024] The main combustion chamber 10 is disposed at an outdoor side 1, has a first combustion chamber 12 and a second combustion chamber 13 separated by a stoker 11 therein, and has a stove pipe 14 connected to the top of the main combustion chamber 10 at the outdoor side and an air adjuster 15 coupled to a lower end of a rear outer side.

[0025] The first combustion chamber 12 is a space where firewood that is the fuel of the fireplace boiler is burned, ashes remaining after the firewood are burned in the first combustion chamber 12 drop down into the second combustion chamber 13 from the first combustion chamber 11. However, the ashes are held on the stoker 11 while firewood is burned, and the drop into the second combustion chamber 13 through the stoker 11 after the firewood is burned.

[0026] The stoker 11, which separates the first combustion chamber 12 and the second combustion chamber 13, is a cylindrical gauze-like member.

[0027] The air adjuster 15 that allows air at the outdoor side 1 to flow into the main combustion chamber 10 communicates with the main combustion chamber 10.

[0028] The interior fuel intake 20 extends from and

communicates with the main combustion chamber 10, is positioned at an indoor side 2, and has a door 21 at the front.

[0029] Accordingly, a user opens the door 21 to open the interior port 20, puts firewood into the first combustion chamber 12, ignites the firewood, and then close the door 21, and a window may be disposed on the front side of the door 12 for the user to see the inside of the interior port 20 and the first combustion chamber 12 at the outside in this process.

[0030] The hot water circulation pipe 30 has combustion pipes 32 spaced from each other with regular intervals over the first combustion chamber 12 with flame passages 31 therebetween, a hot water outlet 33 disposed around the combustion pipes 32 and positioned at the upper portion of the main combustion chamber 10, and a hot water inlet 34 disposed at the rear portion of the main combustion chamber 10.

[0031] Accordingly, the heat from the firewood burning in the first combustion chamber 12 transfers to the hot water circulation pipe 30 disposed around the combustion pipes 32 through the combustion pipes 32 the flame passages 31, so hot water for the boiler can be supplied.

[0032] The hot water outlet 33 and the hot water inlet 34 are connected to pipes of the boiler in the same way that a hot water outlet pipe and a hot water inlet pipe are connected to a common boiler, so the detailed description is not provided.

[0033] Hot water circulating through the hot water circulation pipe 30 can be heated by the heat of the flame produced in the first combustion chamber 12, so it is possible to heat the floor of an interior space and supply hot water even without an oil boiler or a gas boiler.

[0034] Further, in summer, it is possible to prevent heat from flowing to the interior through the indoor port 20 connected to the first combustion chamber 12 and to heat only the hot water circulation pipe 30 by putting and burning firewood in the second combustion chamber 13, whereby it is possible to use hot water without heating the interior in summer.

[0035] The hot air circulation pipe 40 has hot air outlets 41 disposed through the upper portion of the front side of the indoor port 20 and hot air inlets 41 disposed through the lower portion of the front side of the indoor port 20, connects the hot air outlets 41 and the hot air inlets 42, and is positioned through the first combustion chamber 12 and the second combustion chamber 13.

[0036] The hot air circulation pipe 40 is provided to circulate the air at the indoor side 2 where the indoor port 20 is positioned so that the air is heated. The air at the indoor side flows into the hot air inlet 42 disposed through the lower portion of the front side of the indoor port 20, circulates through the hot air circulation pipe 40 positioned in the first combustion chamber 12 and the second combustion chamber 13, and then flows outside to the indoor side 2 through the hot air outlet 41 disposed through the upper portion of the front side of the indoor port 20.

[0037] The air circulating through the hot air circulation pipe 40 is heated by the heat produced in the first combustion chamber 12, so hot air is discharged to the indoor side through the hot air outlet 41, thereby heating the interior air.

[0038] Further, an intake fan 46 forcibly sucking the interior air may be disposed in the hot air inlets 42.

[0039] Accordingly, when the intake fans 46 are operated to forcibly suck the interior air into the hot water inlets 42, air can easily circulate through the hot air circulation pipe 40, so it is possible to achieve the effect of a hot blower heater for heating interior air.

[0040] A cleaning socket 51 is disposed at the upper portion of the rear side of the main combustion chamber 10 and the outdoor port 50 is disposed at a lower portion of the rear side of the main combustion chamber 10 so that ashes in the second combustion chamber 13 can be removed to clean the second combustion chamber 13 or firewood can be put into the second combustion chamber 13. The outdoor port 50 is opened and closed by an outdoor port door.

[0041] Further, the cleaning socket 51 is used to check or clean the flame passages 31 or the combustion pipes 32 disposed over the first combustion chamber 12 of the main combustion chamber 10.

[0042] A damper 62 is disposed on a rotary shaft 61 in the stove pipe 14 of the main combustion chamber 10, supporting rods 63 are fixed to a side of the main combustion chamber 10, and connection bars 64 are supported by the supporting rods 63, with a first end connected to a side of the damper 62. The damper adjuster 60 is connected to the connection bars 64 in order to move up and down the damper 62 when the connection bars 64 are pulled.

[0043] That is, when the damper adjuster 60 is pulled, the connection bars 64 are pulled, so the damper 62 of which a side is connected to the connection bars 64 is lifted by the rotary shaft 61, so the stove pipe 14 is opened.

[0044] Further, when the pulled damper adjuster 60 is pushed, the pulled connection bars 64 are pushed back, so the lifted damper 62 is moved down, whereby the stove pipe 14 is closed.

[0045] An air intake port 71 for sucking exterior air is disposed outside the main combustion chamber 10, an air intake line 72 extends from the air intake port 71, and an air exit port 73 is disposed in the indoor port 20 to supply the exterior air flowing inside through the air intake line 72 to the first combustion chamber 12. The ash shield 70 covers the air exit port 73 to block ashes.

[0046] The ash shield 70 prevents the air exit port 73 from being clogged with ashes by covering the air exit port 73 connected to the first combustion chamber 12.

[0047] The air exit port 73 is provided to discharge exterior air to the first combustion chamber 12. Exterior air flows inside through the air intake port 71 exposed outside the main combustion chamber 10, keeps flowing into the main combustion chamber 10 through the air

intake line 72, and is then discharged to the first combustion chamber 12 of the main combustion chamber 10 through the air exit port 73, whereby air for burning the firewood in the first combustion chamber 12 is supplied.

[0048] A cover 44 having a knob 43 and opening/closing the hot air outlet 41 is disposed in the hot air outlet 41, and the gauze-like grill 45 connected to the cover 44 is further disposed at the lower portion in the hot air outlet 41.

[0049] Accordingly, it is possible to roast sweet potatoes, nuts, and potatoes etc. by the gauze-like grill 45 and the knob 43 of the cover 44 makes it possible to easily take the gauze-like roaster 45 out of the hot air outlet 41.

[0050] Further, shelves 22 facing each other are disposed on the inner side of the indoor port 20 having the door 21.

[0051] Accordingly, when a user opens the door 21, puts food in oven bowls, for example, to cook fishes or chickens, and then puts the oven bowls on the shelves 22 in order to cook food. Heat is applied to the food through the first combustion chamber 12, so the user can cook food like using an oven.

[0052] Further, a humidifier 23 is coupled to the front side of the indoor port 20 and has a vapor exit 23a exposed through the front side of the indoor port 20 and a water container 23b connected to the vapor exit 23a and disposed inside the indoor port 20.

[0053] The humidifier 23 is disposed at the center of the indoor port 20 where the hot air outlet 41 is disposed, so when a user fills the water container 23b with water and then puts the water container 23b into the indoor port 20, the water in the water container 23b is heated and vapor that is generated in this process of heating is discharged to the indoor through the vapor exit 23a disposed through the front side of the indoor port 20, so the indoor is humidified.

[0054] A freeze protection electric heater 80 is further disposed in the main combustion chamber 10 and is electrically connected to a temperature sensor 81 for detecting the temperature at the outdoor side where the main combustion chamber 10 is disposed and a freezing-bursting sensor 82 for operating or stopping the freeze protection electric heater 80 in cooperation with the temperature sensor 81.

[0055] Accordingly, when the fireplace boiler is not used in winter, the temperature sensor 81 detects the outdoor temperature and operates the freeze protection electric heater 80, so it is possible to prevent the hot water circulation pipe 30 from freezing and bursting.

[0056] Further, the outdoor port 50 protrudes from the rear side of the main combustion chamber 10 and a pot 90 is disposed over the outdoor port 50.

[0057] Since the pot 90 is provided, it is possible to use the pot 90, for example, in order to cook rice or other food, in which the source for heating the pot 90 is the heat produced in the process of combustion in the first combustion chamber 12 and the heat from the charcoals that drop into the second combustion chamber 13 while the firewood is burned in the first combustion chamber 12.

[0058] Hereinabove, although the present invention is described by specific matters such as concrete components, and the like, embodiments, and drawings, they are provided only for assisting in the entire understanding of the present invention. Therefore, the present invention is not limited to the embodiments. Various modifications and changes may be made by those skilled in the art to which the present invention pertains from this description.

[0059] Therefore, the sprit of the present invention should not be limited to the above-described embodiments, and the following claims as well as all modified equally or equivalently to the claims are intended to fall within the scope and spirit of the invention.

Claims

1. Regenerative fireplace boiler, comprising:

a main combustion chamber (10) disposed at an outdoor side (1), having a first combustion chamber (12) and a second combustion chamber (13) separated by a stoker (11) therein, and having a stove pipe (14) connected to a top of the main combustion chamber (10) at the outdoor side and an air adjuster (15) coupled to a lower end of a rear outer side;

an indoor port (20) extending from and communicating with the main combustion chamber (10), positioned at an indoor side (2), and having a door (21) at a front side thereof;

a hot water circulation pipe (30) having combustion pipes (32) spaced from each other with regular intervals over the first combustion chamber (12) with flame passages (31) therebetween, a hot water outlet (33) disposed around the combustion pipes (32) and positioned at an upper portion of the main combustion chamber (10), and a hot water inlet (34) disposed at a rear portion of the main combustion chamber (10);

a hot air circulation pipe (40) having hot air outlets (41) disposed through an upper portion of a front side of the indoor port (20) and hot air inlets (41) disposed through a lower portion of the front side of the indoor port (20), connecting the hot air outlets (41) and the hot air inlets (42) being connected, and being positioned through the first combustion chamber (12) and the second combustion chamber (13);

a cleaning socket (51) disposed at an upper portion of a rear side of the main combustion chamber (10) and an outdoor port (50) disposed at a lower portion of the rear side of the main combustion chamber (10);

a damper (62) disposed on a rotary shaft (61) in

the stove pipe 14 of the main combustion chamber (10), supporting rods (63) fixed to a side of the main combustion chamber (10), connection bars (64) supported by the supporting rods (63), with a first end connected to a side of the damper (62), and a damper adjuster (60 connected to the connection bars (64) in order to move up and down the damper (62) when the connection bars (64) are pulled; and

an air intake port (71) for sucking exterior air disposed outside the main combustion chamber (10), an air intake line (72) extending from the air intake port (71), an air exit port (73) disposed in the indoor port (20) to supply exterior air flowing inside through the air intake line (72) to the first combustion chamber (12), and an ash shield (70) covering the air exit port (73) to block ashes.

2. The regenerative fireplace boiler of claim 1, wherein a cover (44) having a knob (43) and opening and closing the hot air outlet (41) is disposed in the hot air outlet (41), and a gauze-like grill (45) connected to the cover (44) is further disposed at a lower portion in the hot air outlet (41).

3. The regenerative fireplace boiler of claim 1, wherein an intake fan (46) forcibly sucking interior air is disposed in the hot air inlets (42)

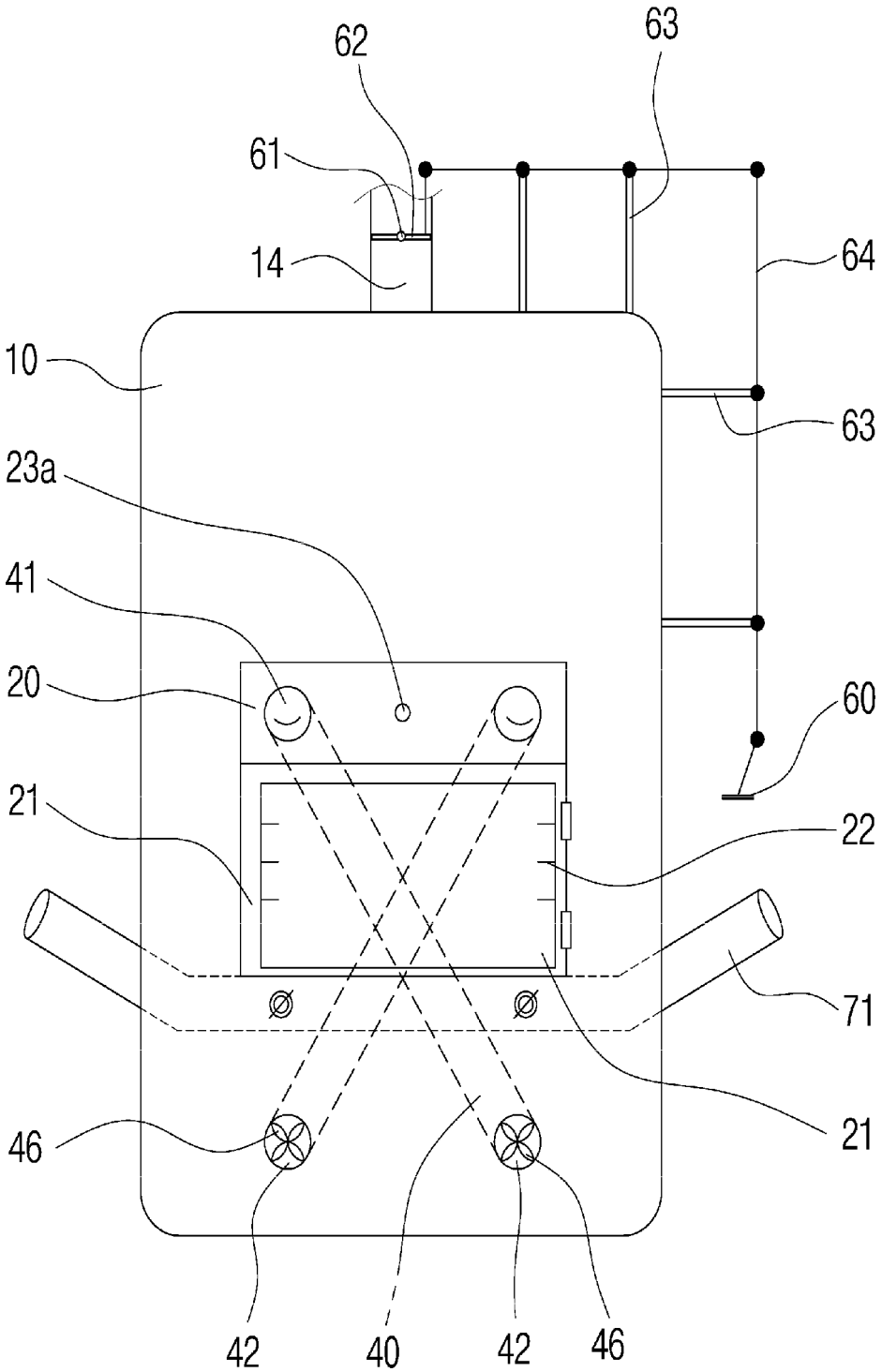
4. The regenerative fireplace boiler of claim 1, wherein shelves (22) facing each other are disposed on an inner side of the indoor port (20) having the door (21).

5. The regenerative fireplace boiler of claim 1, wherein humidifier (23) is coupled to the front side of the indoor port (20) and has a vapor exit (23a) exposed through the front side of the indoor port (20) and a water container (23b) connected to the vapor exit (23a) and disposed inside the indoor port (20).

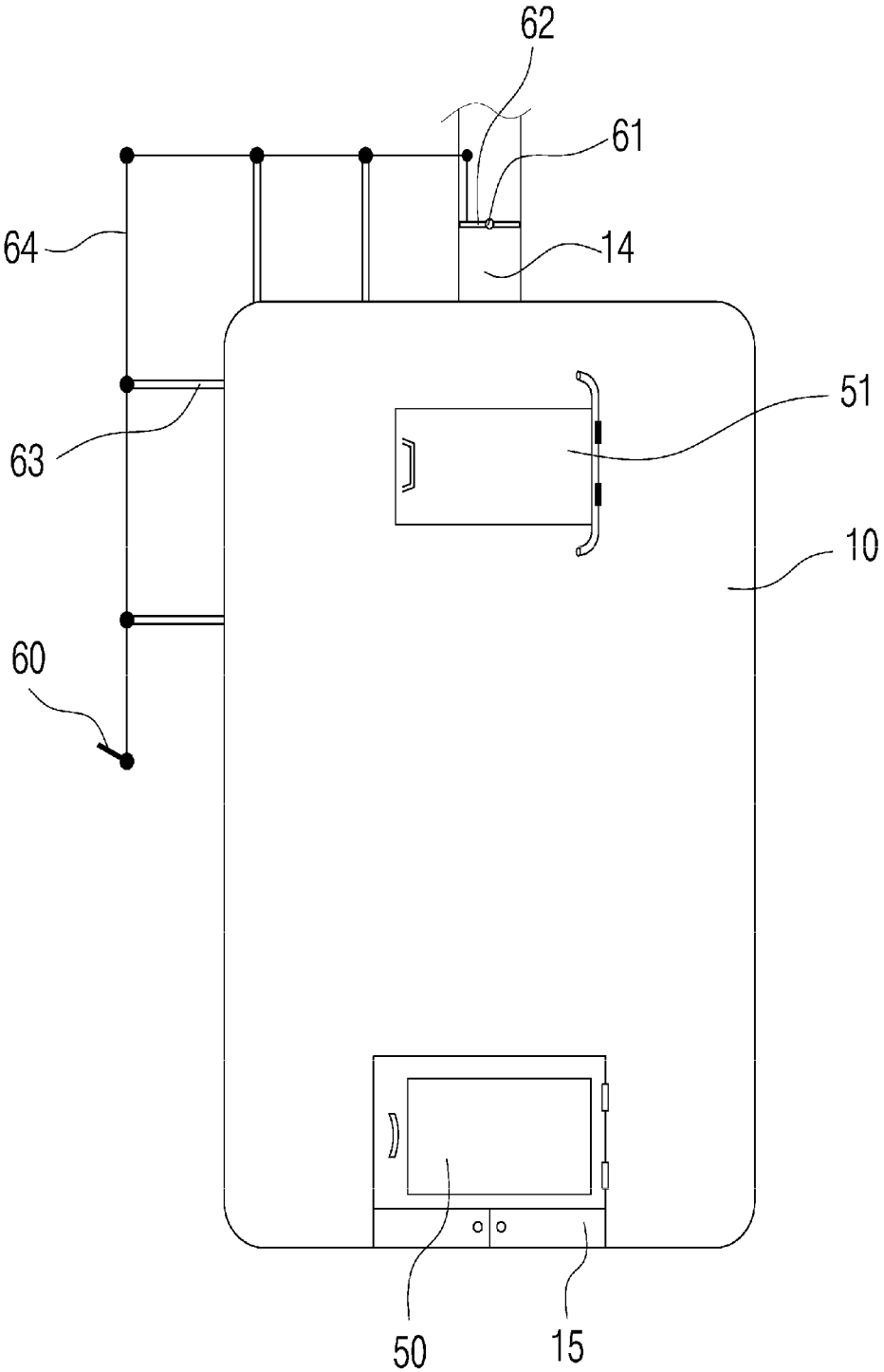
6. The regenerative fireplace boiler of claim 1, wherein a freeze protection electric heater (80) is further disposed in the main combustion chamber (10) and is electrically connected to a temperature sensor (81) for detecting the temperature at the outdoor side where the main combustion chamber (10) is disposed and a freezing-bursting sensor (82) for operating or stopping the freeze protection electric heater (80) in cooperation with the temperature sensor (81).

7. The regenerative fireplace boiler of claim 1, wherein the outdoor port (50) protrudes from the rear side of the main combustion chamber (10) and a pot (90) is disposed over the outdoor port (50).

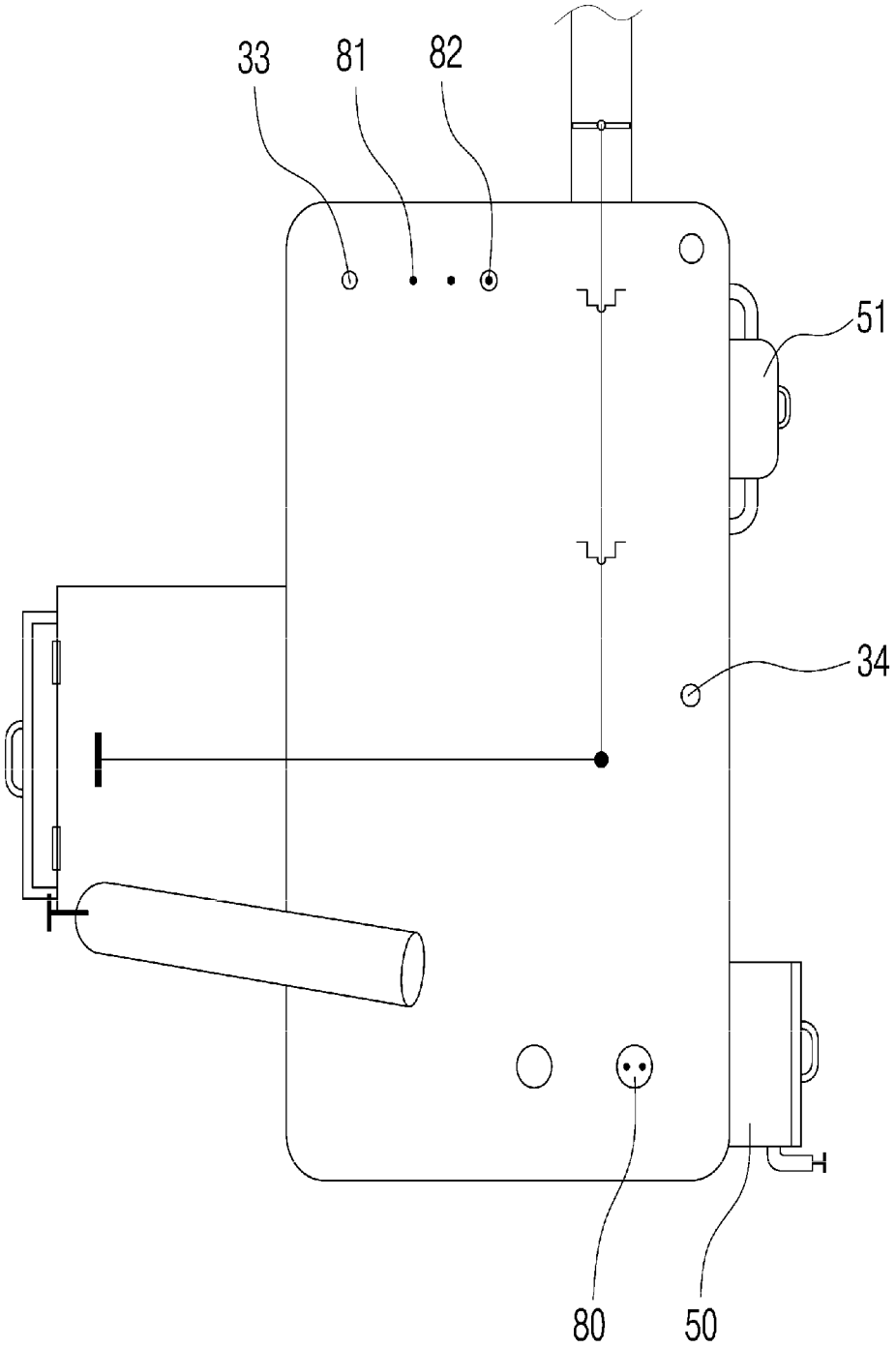
[Fig. 1]



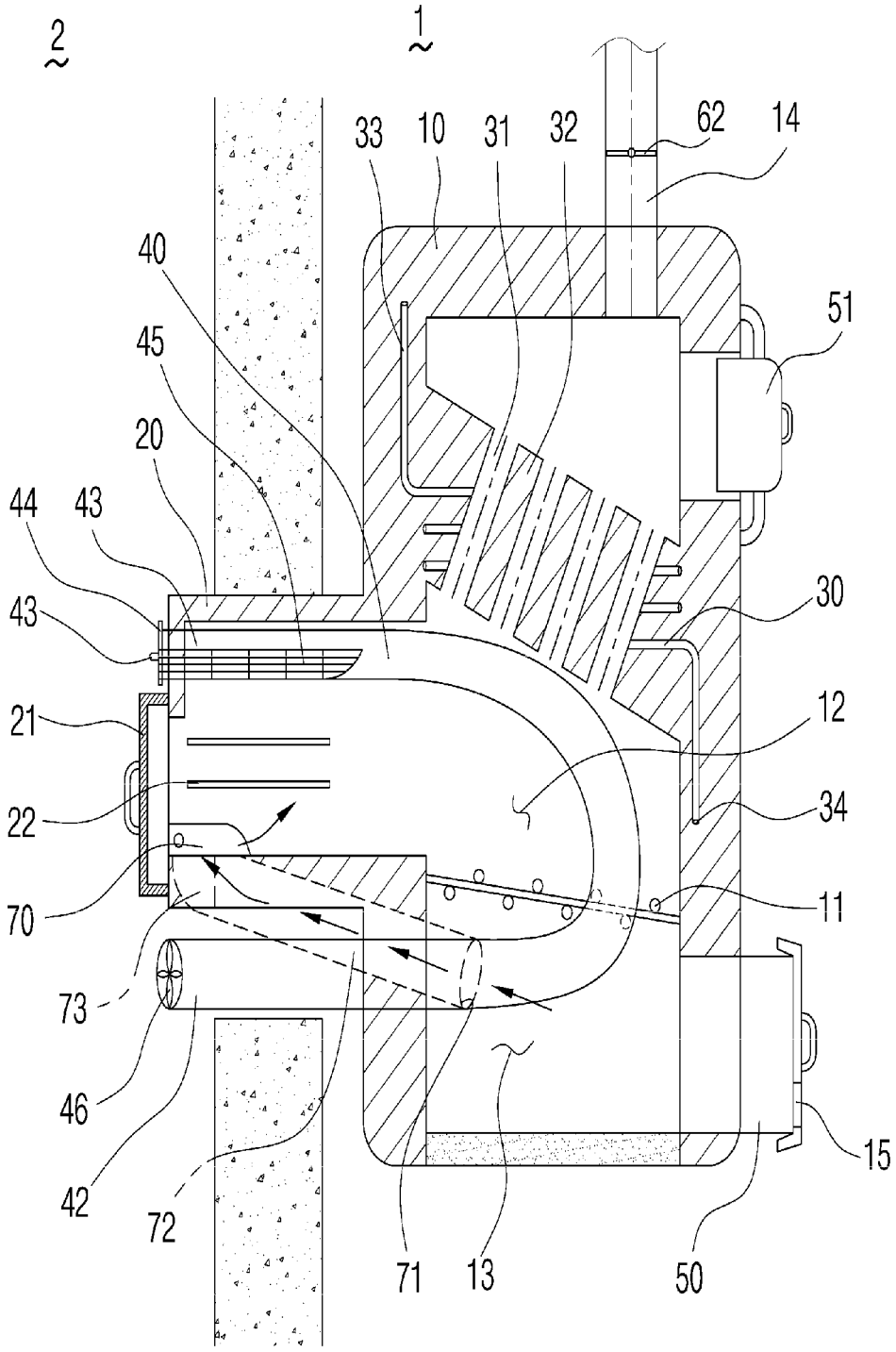
[Fig. 2]



[Fig. 3]



[Fig. 4]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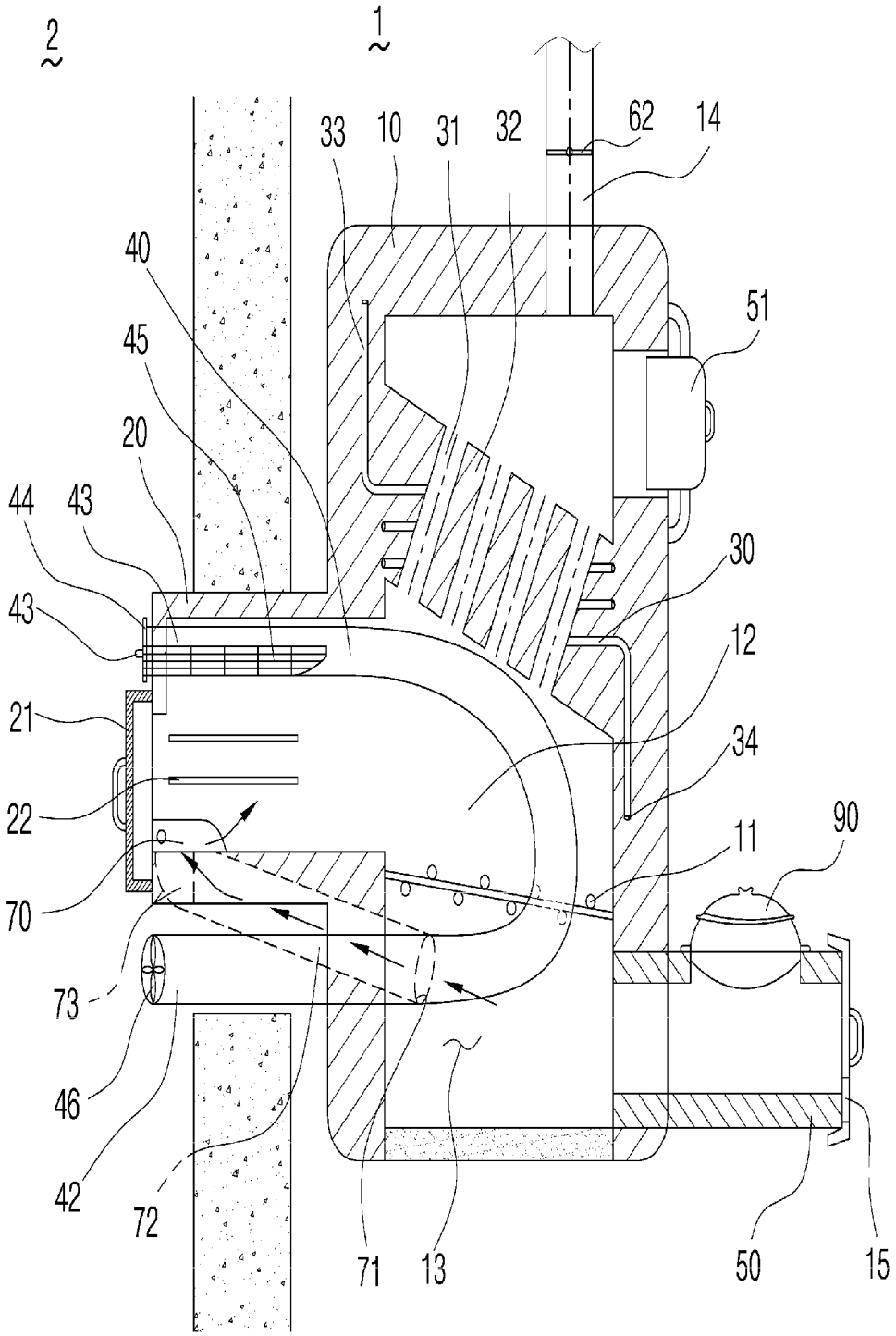
[Fig. 5]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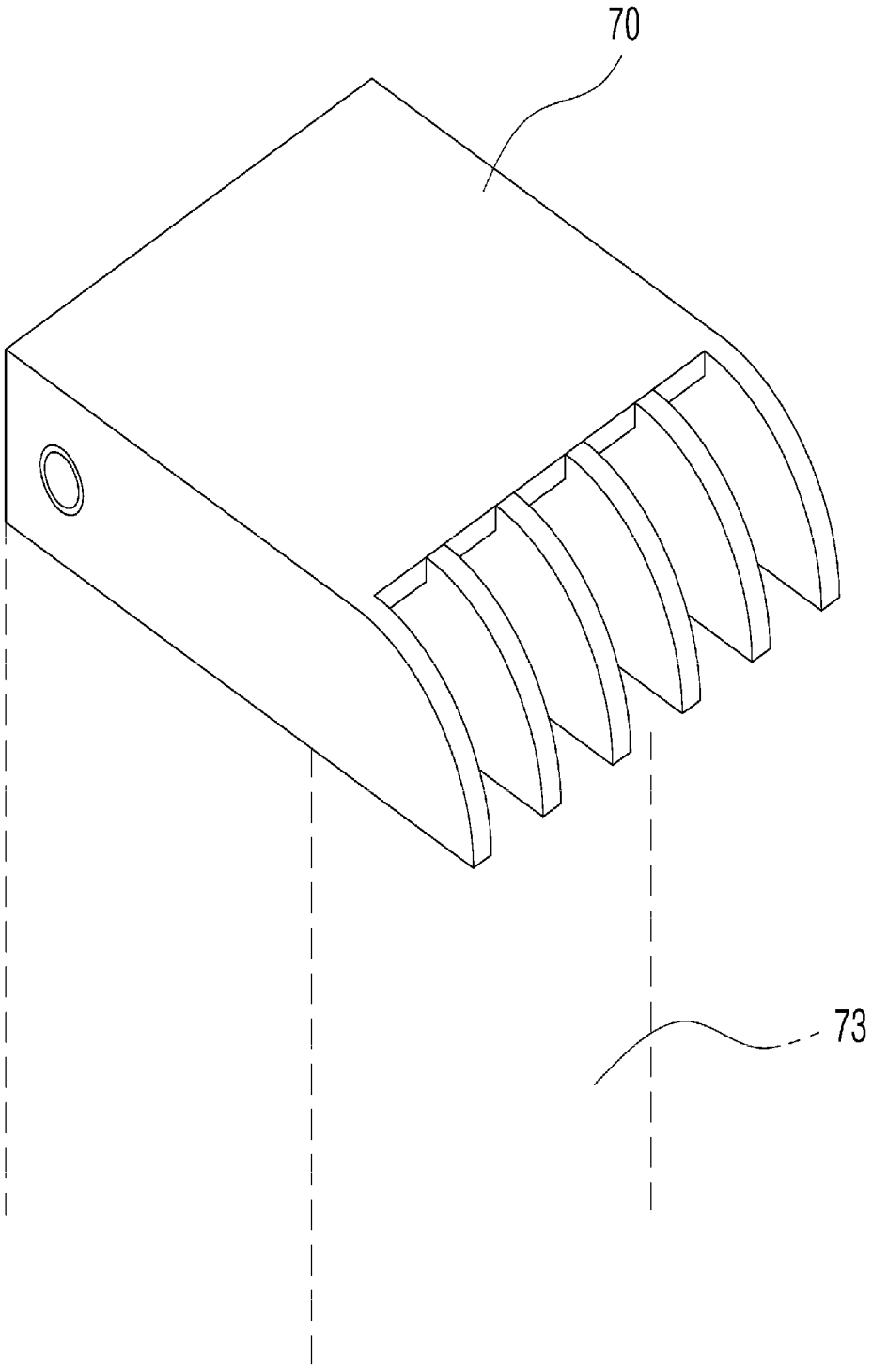
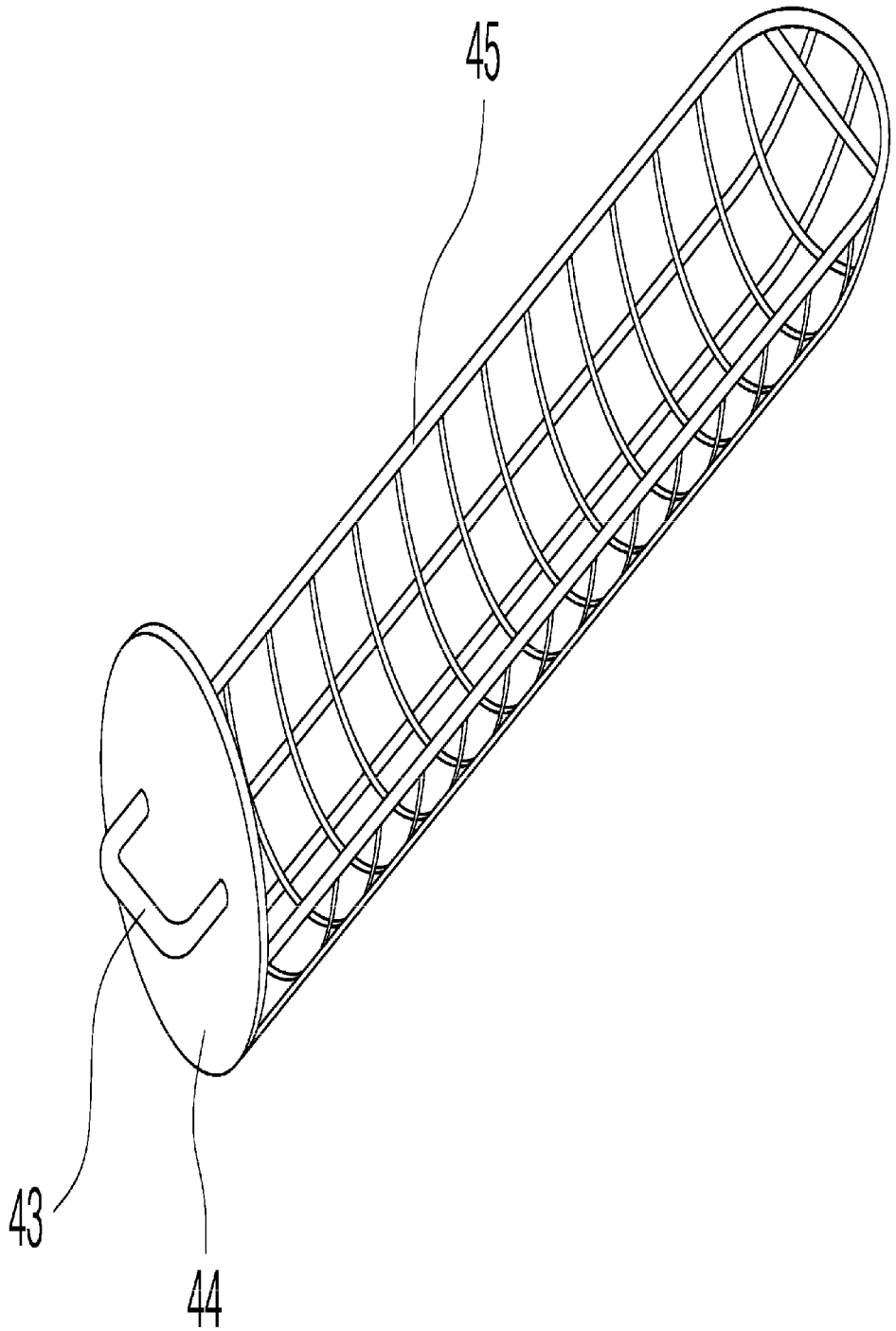
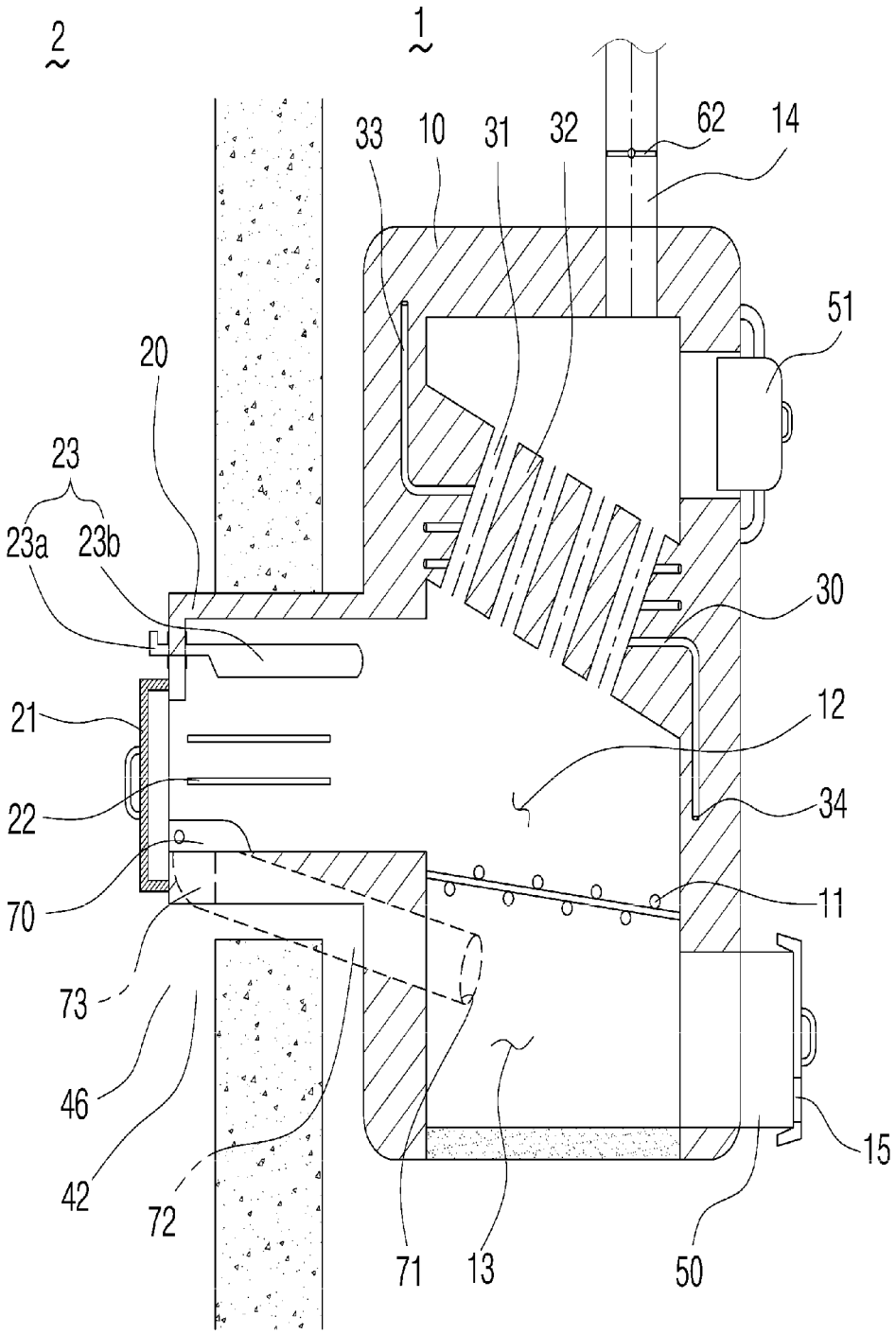
[Fig. 6]



[Fig. 7]



[Fig. 8]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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/012376

A. CLASSIFICATION OF SUBJECT MATTER

F24B 1/18(2006.01)i, F24B 1/182(2006.01)i, F24B 1/183(2006.01)i, F24B 1/189(2006.01)i

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)

F24B 1/18; F24B 1/183; F24H 1/00; F24B 1/182; F24B 1/189

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: fireplace, external fuel intake, warm air circulating pipe

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2012-0108359 A (BAE, Yun Gee) 05 October 2012 See abstract, figure 1, paragraph [0008].	1-7
A	KR 20-1991-0002629 Y1 (HWANG, Yong Taek) 22 April 1991 See claim 1, figures 2-4.	1-7
A	KR 20-0249432 Y1 (SONG, Dong Gil) 16 November 2001 See abstract, claim 1, figure 2.	1-7
A	KR 10-2005-0071838 A (LEE, In - Gu) 08 July 2005 See abstract, figures 2-3.	1-7

☐ 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
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
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16 APRIL 2015 (16.04.2015)	**17 APRIL 2015 (17.04.2015)**
Name and mailing address of the ISA/**KR** Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2014/012376

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2012-0108359 A	05/10/2012	NONE	
KR 20-1991-0002629 Y1	22/04/1991	NONE	
KR 20-0249432 Y1	16/11/2001	NONE	
KR 10-2005-0071838 A	08/07/2005	KR 10-0582735 B1	07/06/2006

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 101192840 **[0007]**