



Europäisches
Patentamt
European
Patent Office
Office européen
des brevets



(11)

EP 3 167 864 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.05.2017 Bulletin 2017/20

(51) Int Cl.:
A61H 33/00 (2006.01)
A61H 33/06 (2006.01)

A61H 33/02 (2006.01)

(21) Application number: 15194177.0

(22) Date of filing: 11.11.2015

(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
Designated Validation States:
MA MD

(71) Applicant: **Saunum Group OÜ**
10913 Tallinn (EE)

(72) Inventor: **Vare, Andrus**
10913 Tallinn (EE)

(74) Representative: **Nelsas, Tõnu**
AAA Patendibüroo OÜ
Tartu mnt, 16
10117 Tallinn (EE)

Remarks:

Amended claims in accordance with Rule 137(2)
EPC.

(54) SAUNA INDOOR CLIMATE ADJUSTING DEVICE AND METHOD FOR ADJUSTING

(57) The invention provides a sauna indoor climate adjusting device, which enables to compensate for the discomfort in the steam room of the sauna. The invention enables to direct a portion of steam vapour into the lower air layers of the steam room and to mix with air taken from the lower air layers of the steam accordingly. The invention also mixes the air layers in the steam room, which creates a more extensive feeling of comfort in the

steam room by decreasing the temperature differences between the air layers; the invention also allows to create a steam sauna effect in the steam room by making the cooling of steam vapour more efficient by combining the openness of the cold air valve and adjusting the rotation of the ventilation fan. The sauna indoor climate adjusting device saves the energy needed for heating the sauna.

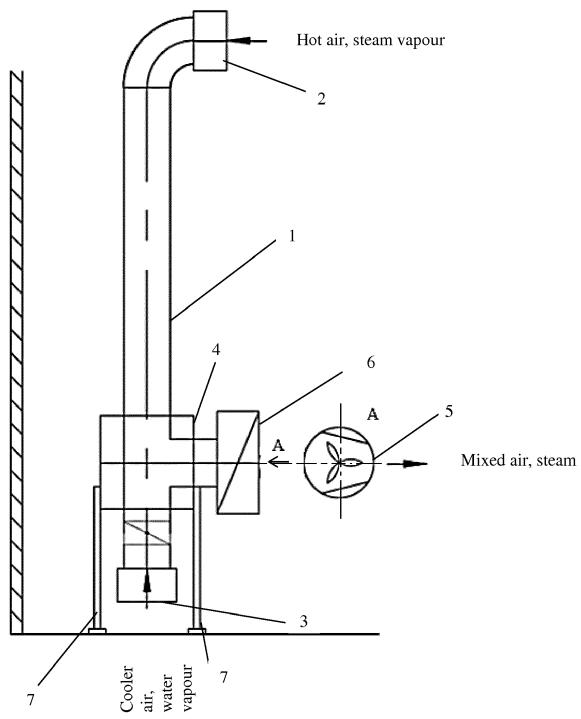


FIG 1

Description

Field of the invention

[0001] The invention relates to the field of sanitary engineering, and more specifically sauna technology. The invention is a sauna indoor climate adjusting device, which allows to adjust/harmonize the internal temperature and/or the CO₂ level and/or humidity inside of a sauna steam room, and the different methods of making the sauna indoor climate more comfortable for the user.

State of the art

[0002] Devices for adjusting and harmonizing the temperature of a sauna are known from the state of the art. Common devices, however, do not enable a harmonious adjustment of the steam room temperature, as the hot steam collects to the upper air layers of the steam room, leaving the bottom air layers cooler.

[0003] Korean patent application KR20100106076 discloses a ventilation fan for the circulation of hot air in a steam room, whereby the ventilation fan is steam-powered. The device provided, however, generates a rapid circulation of hot air, or wind, in the steam room, which burns when being exposed to the body.

[0004] Finnish patent FI102514 discloses a sauna heater, which directs hot steam vapour downward, unlike known sauna heaters. While the result is a more evenly heated steam room, the device provided does not mix the cooler lower air layers with the upper air layers.

[0005] Finnish patent FI90820 discloses a device that consists of a collector above the heater as well as pipes which direct the hot steam to the sauna benches. The device provided does not heat both the lower and upper air layers, and that is the reason why the temperatures of the lower and upper air layers are different, causing discomfort.

[0006] In order to achieve an overall uniform temperature and feeling of comfort, the hot air from the upper air layers of the sauna steam room must be directed into the lower air layers of the steam room, by mixing these, and in a manner that would avoid causing discomfort due to the so-called hot wind, cool and mix the air with cooler air from the lower layers before discharging it into the "targeted spot (or spots)". Existing solutions in accordance with the state of the art do not enable mixing of the air layers.

[0007] As known from the state of the art, the oxygen used by people for breathing in the steam room, and the resulting heightened CO₂ level in the steam room, are compensated by continuously ventilating with ambient air. This occurs while human beings are in the room as well as when no one is in the room that is being heated. Such a process requires additional heating to maintain the temperature balance, and is not energy efficient. Known sauna steam room solutions are not very healthy, because the process of increasing fresh air is uncontrol-

lable and the CO₂ level may therefore exceed the healthy limit.

Summary of the invention

[0008] The present invention is related to a sauna indoor climate adjusting device and method for adjusting it, through which the climate of the sauna is made more comfortable. With most saunas, there is a so called discomfort while enjoying the pleasures of the sauna in the steam rooms, which means that because the head is located in the hottest part of the steam room and the feet in the coolest part, in most cases, the sauna steam is too sudden and sharp for a person, causing stress in the body and along with that, tedium and fatigue. The device provided with the invention allows adjusting the climate of a sauna and compensating for the feeling of discomfort. With the device provided, it is easy to direct a portion of the steam vapour to the lower air layers of the steam room by adjusting the output of the ventilation fan and mix (cool) steam vapour with air from the lower air layers as desired/needed. With the device, it is also possible to mix the air layers of the steam room, which creates a feeling of comfort in the steam room, which means that as a result, the temperature difference of the layers is considerably lower, and the temperature difference between the location of the head and the feet is smaller. As desired, the device enables to increase and decrease the efficiency of the device by adjusting the capacity of the ventilation fan, and change the temperature of the steam vapour, or water vapour by adjusting openness of the lower air valve, wherein the vapour is directed to the lower section of the steam room.

[0009] In one preferred embodiment of the invention, the device provided is portable, and in a second preferred embodiment of the invention, the device is integrated, which can be used as technical solutions when building new sauna steam rooms, as well as in existing steam rooms.

[0010] Energy necessary to heat the sauna can be saved with the device. The sauna indoor climate adjusting device provided with the invention has an accompanying CO₂ sensor, which allows the device to take as much fresh air from the outside as needed to compensate the oxygen used by the people in the room while breathing. Due to the air renewal controlled with the CO₂ sensor, a healthy microclimate is also ensured in the sauna, therefore being in the steam room of the sauna is safer.

[0011] The device can also be used to generate a steam sauna effect, where by continuously cooling/mixing/directing down the steam vapour at a higher capacity, it is possible to fill the steam room with warm humid steam.

55 List of figures

[0012] Preferred embodiments of the invention are described by referring to the accompanying figures, where-

by the figures represent the following:

FIG 1: Scheme of the portable device.

FIG 2a: Top view of the sauna steam room with the portable device.

FIG 2b: Side view of the sauna steam room with the portable device.

FIG 3: General view of the sauna steam room with the portable device.

FIG 4: Scheme of the integrated device.

FIG 5a: Top view of the sauna steam room with the integrated device.

FIG 5b: Side view of the sauna steam room with the integrated device.

FIG 6: General view of the sauna steam room with the integrated device.

Detailed description of the invention

[0013] Sauna indoor climate adjusting device 1, which is schematically shown in Figures 1 to 6, contains a hot air and steam vapour inlet channel 2, which is vertical and located in the upper section of the device and the sauna steam room, a cooler air and water vapour inlet channel 3, which is horizontal and which is located in the lower section of the device and the sauna steam room. In an alternative embodiment of the invention, the hot air and steam vapour inlet channel 2 is horizontal and the cooler air and water vapour inlet channel 3 is vertical. Both inlet channels 2 and 3 contain an adjusting valve (not shown in the figures). Inlet channels 2 and 3 are connected with mixing chamber 4, which, in turn, includes ventilation fan 5 and a mixing valve (not shown in the figures) and is connected to outlet channel 6. Ventilation fan 5 in mixing chamber 4 is controllable with a speed regulator.

[0014] Sauna indoor climate adjusting device 1 has support legs 7, which allow placing the device onto a suitable surface. As shown in Figures 1 to 3, in one embodiment, the device is not permanently fixed to the steam room, which means that the device is portable. In an alternative embodiment of the invention, the sauna indoor climate adjusting device 1 is used as a technical solution when building new sauna steam rooms, whereas in such a case the device is integrated, as shown in Figure 4 to 6, and the device has an additional inlet channel 8 for taking cooler air from outside of the steam room.

[0015] In a preferred embodiment of the invention, sauna indoor climate adjusting device 1 includes a controller for adjusting the device. In one embodiment of the invention, the speed regulator of the ventilation fan is manually

controllable and in another embodiment of the invention automatically controlled. As shown in Figure 4, the automatically controlled device has one or several thermo sensors 9, humidity sensor 10 and/or CO₂ sensor 11 connected with the regulator via electronic circuit for the adjustment of the rotations of the controller, which is used to adjust the rotations of ventilation fan 4 and the position of the mixing valve according to the prescribed temperature and parameters in order to achieve the desired comfort and prescribed temperature according to the parameters in the steam room.

[0016] In another alternative embodiment of the invention, the speed regulator has a timer (not shown in the figures), which is used to adjust the temperature of the steam room to the desired temperature for a desired period. Alternatively, ventilation fan 5 has a controller, which switches the ventilation fan on according to the prescribed temperature schedule and adjusts the rotations of the ventilation fan/position of the valves according to the selected parameters.

[0017] In an alternative embodiment of the invention, portable sauna indoor climate adjusting device 1 is equipped with a battery and a direct current motor ventilation fan, which eliminates the need for an electrical connection in the steam room.

[0018] In another alternative embodiment of the invention, the opening of inlet channel 2 is non-vertical and the opening of inlet channel 3 is non-horizontal (not shown in the figures). Additionally, the openings of the inlet channels in the alternative embodiments are funnel shaped, which specifies more clearly the section of the steam room from which the inlet air and steam vapour is pulled into inlet channel 2 or 3. In an alternative embodiment, the invention also has more than 1 of outlet channels 6, so that several outlet channels are linkable parts of a pipe system, which can be used to direct the mix of vapour and air, and distribute it to different sections of the sauna.

[0019] To adjust the sauna indoor climate, hot steam vapour is directed to hot air and steam vapour inlet channel 2, cooler air and water vapour from the lower layers of the steam room are directed into inlet channel 3. Hot air and steam vapour from the upper layers as well as cooler air from the lower layers of air is directed into the mixing chamber 4 where the initial mixing of the air flows takes place. The initially mixed air is pulled from the mixing chamber 4 through the ventilation fan, which is used to perform the final mixing of the air flow, and the cooled mix of water vapour and air is directed into the outlet channel.

[0020] In an alternative use of the invention, the cooler air and water vapour inlet channel 3 is closed and adjustable with a valve. In this case, the device can be used to generate circulation of air and water vapour in the steam room. Alternatively, the end of cooler air inlet channel 3 is outside of the steam room and the inlet air is taken outside of the steam room, or the end of the inlet channel is partly outside of the steam room, partly inside

and the inlet air is taken partly from the inside and partly from the outside, and adjusted with an distributing valve according to the settings provided in the controller. Air taken outside or outside and inside of the steam room is automatically mixed with an automatic flap valve, which is adjusted with a controller according to the prescribed settings (CO₂/temperature difference up-down/humidity percentage).

[0021] The rotating speed of a ventilation fan of sauna indoor climate adjusting device 1 and openness of the adjusting valves of inlet channels 2, 3, 8 are adjusted in a way that an optimal oxygen level would be constantly ensured in the sauna steam room, and according to the indication of the CO₂ sensor, an optimal quantity of ambient air would be constantly added into the sauna steam room, which ensures a healthy (optimal) heating mode, and thus, necessary heat energy for heating the sauna steam room is saved. Adjusting in the steam room is as follows: if, according to the sensor, the CO₂ concentration exceeds 900 PPM, the adjusting valve of lower cooler air inlet channel 3, which is inside of the steam room, is closed and the adjusting valve of outside cooler air inlet channel 8 is opened at its maximum capacity, which means that all the mixed cooler air is taken from outside of the steam room. The aim is to keep the CO₂ content in the steam room lower than 900 PPM and/or in the range of 800 to 900 PPM. If the CO₂ content is lower than 900 PPM and/or in the range of 800 to 900 PPM, only internal air circulation is operational and there is no need to take additional fresh air outside of the steam room, which means that ventilation is switched off, i.e., the adjusting valve of cooler air inlet channel 8 is closed and the adjusting valve of cooler air inlet channel 3, which is inside of the steam room, is open. Such a mode saves energy, because the steam room requires a smaller heating effort. If the CO₂ concentration exceeds 900 PPM, additional fresh air will be taken outside of the steam room until a normal healthy CO₂ concentration is recovered, which is lower than 900 PPM and/or in the range of 800 to 900 PPM.

[0022] In addition to breathing, a lack of oxygen in the sauna steam room is also caused by the conversion process where a portion of the oxygen is burned while air comes into contact with scorching metal surfaces, e.g. electrical heating elements, furnace surfaces of the heater, etc. The integrated version of the sauna indoor climate adjusting device, in which cooler air is taken from outside of the steam room, ensures a safer and healthier time spent in the steam room, as the process is controlled with a CO₂ sensor and a safe oxygen level is guaranteed with an inflow of fresh air.

[0023] The sauna indoor climate adjusting device 1 can be used to generate a steam sauna (so-called Turkish sauna) effect in the steam room, by combining the rotations of the ventilation fan and openness of inlet channel 3, i.e., the cooler air valve. As a result, it is possible to collect the majority of the steam vapour from the upper layers of the sauna, and cool it with the air from lower

layers. This process can be performed manually as well as automatically.

[0024] Depending on the character and size of the sauna steam room, heater type and positioning, height of the platform and preferences of the sauna user, it is possible to combine an optimally comfortable sauna mode with the sauna indoor climate adjusting device, by adjusting the rotations of the ventilator fan and positioning of the lower inlet channel 3, i.e., cooler air, valve accordingly.

[0025] According to the different sizes of steam rooms, sauna indoor climate adjusting device 1 includes ventilation fans of different capacities and air channels of different diameters.

15

Claims

1. A sauna indoor climate adjusting device 1, characterized in that the device comprises hot air and steam vapour inlet channel 2 for hot air and steam vapour from the upper section of the steam room; and
cooler air and water vapour inlet channel 3 for cooler air and water vapour from the lower section of the steam room;
mixing chamber 4 for mixing hot air, steam vapour, cooler air and water vapour; and an outlet channel 6 for releasing the mixed air and vapour from the mixing chamber 4.
2. A sauna indoor climate adjusting device 1 according to claim 1, characterized in that mixing chamber 4 comprises a ventilation fan 5 and the outlet channel comprises a mixing valve and/or the opening of the outlet channel is funnel shaped.
3. A sauna indoor climate adjusting device 1 according to claim 1, characterized in that hot air and steam vapour inlet channel 2 is vertical, and cooler air and water vapour inlet channel 3 is horizontal and/or vertical.
4. A sauna indoor climate adjusting device 1 according to claims 1 and 3, characterized in that the end of cooler air and water vapour inlet channel 3 is located outside or inside of the steam room.
5. A sauna indoor climate adjusting device 1 according to claim 1, characterized in that the device is a portable and/or the device comprise support legs 7.
6. A sauna indoor climate adjusting device 1 according to claim 1, characterized in that the device is integrated into the steam room.
7. A sauna indoor climate adjusting device 1 according to claims 1, 3 and 4, characterized in that the device

is adapted to share steam vapour and air from the outlet channel to the upper and lower layers of the steam room evenly.

8. A sauna indoor climate adjusting device 1 according to claim 2, **characterized in that** ventilation fan 5 comprises a speed regulator. 5

9. A sauna indoor climate adjusting device 1 according to claims 2 and 8, **characterized in that** the speed regulator of ventilation fan 5 is manually or automatically controllable. 10

10. A sauna indoor climate adjusting device 1 according to claims 2, 8 and 9, **characterized in that** for controlling the ventilation fan 5 and mixing valve, the device 1 comprises a controller, which is connected to one or several thermo-sensors 9, humidity sensors 10 and/or CO₂ sensors 11. 15

11. A sauna indoor climate adjusting device 1 according to claims 2, 8 and 9, **characterized in that** the speed regulator of ventilation fan 5 is timer controlled. 20

12. A sauna indoor climate adjusting device 1 according to claims 1, 3, 4 and 7, **characterized in that** cooler air and water vapour inlet channel 2 and/or hot air and steam vapour inlet channel 3 have an adjusting valve and/or the opening of the inlet channel is funnel shaped. 25

13. Method for adjusting the sauna indoor climate **characterized in that** in sauna indoor climate adjusting device 1, hot steam vapour is directed into the hot air and steam vapour inlet channel 2, cooler air and water vapour from the lower layers of the steam room are directed into cooler air and water vapour inlet channel 3; both hot air and steam vapour from inlet channel 2 and cooler air from inlet channel 3 are directed into mixing chamber 4, where the initial mixing of the air flows is performed; from mixing chamber 4, the initially mixed air flow is directed through ventilation fan 5, which is used to perform the final mixing of the air flow, and the mix of mixed steam vapour and air is directed into outlet channel 6. 30

14. Method for adjusting the sauna indoor climate according to claim 13, **characterized in that** the rotations of the ventilation fan and openness of adjusting valves of inlet channels 2 and 3 of sauna indoor climate adjusting device 1 are adjusted in a way that from the upper layers of the steam room the majority of the steam vapour and hot air is collected, and from the lower layers of the steam room water vapour and cooler air are collected, and steam vapour, hot air, water vapour and cooler air are mixed and directed 35

15. Method for adjusting the sauna indoor climate according to claims 13 and 14, **characterized in that** the rotations of the ventilation fan and openness of adjusting valves of inlet channels 2, 3 and 8 of sauna indoor climate adjusting device 1 are adjusted in a way that the CO₂ concentration is lower than of 900 PPM and/or in the range of 800 to 900 PPM, wherein if the CO₂ concentration is higher than 900 PPM, the adjusting valve of the inlet channel 3 inside the steam room is closed and the adjusting valve of the outside cooler air inlet channel 8 is opened at its maximum capacity and all the cooler air to be mixed is taken outside of the steam room; if the CO₂ concentration is lower than 900 PPM and/or in the range of 800 to 900 PPM, the adjusting valve of outside cooler air inlet channel 8 is closed and the adjusting valve of inlet channel 3 inside the steam room is opened, and only the internal air is circulated and no additional fresh air is taken from outside of the steam room. 40

25 **Amended claims in accordance with Rule 137(2) EPC.**

1. A sauna indoor climate adjusting device (1), **characterized in that** the device comprises hot air and steam inlet channel (2) for hot air and steam ; and cooler air inlet channel (3) for cooler air ; mixing chamber (4) for mixing hot air, steam, cooler air and water vapour; and an outlet channel (6) for releasing the mixed air and vapour from the mixing chamber (4). 45

2. A sauna indoor climate adjusting device (1) according to claim 1, **characterized in that** mixing chamber (4) comprises a ventilation fan (5) and the outlet channel comprises a mixing valve and/or the opening of the outlet channel is funnel shaped. 50

3. A sauna indoor climate adjusting device (1) according to claim 1, **characterized in that** hot air and steam vapour inlet channel (2) is vertical, and cooler air and water vapour inlet channel (3) is horizontal and/or vertical. 55

4. A sauna indoor climate adjusting device (1) according to claims 1 and 3, **characterized in that** the end of cooler air and water vapour inlet channel (3) is located outside or inside of the steam room.

5. A sauna indoor climate adjusting device (1) according to claim 1, **characterized in that** the device is a portable and/or the device comprise support legs 7.

6. A sauna indoor climate adjusting device (1) accord-

ing to claim 1, **characterized in that** the device is integrated into the steam room.

7. A sauna indoor climate adjusting device (1) according to claim 2, **characterized in that** ventilation fan (5) comprises a speed regulator. 5

8. A sauna indoor climate adjusting device (1) according to claims 2 and 7, **characterized in that** the speed regulator of ventilation fan (5) is manually or automatically controllable. 10

9. A sauna indoor climate adjusting device (1) according to claims 2, 7 and 8, **characterized in that** for controlling the ventilation fan (5) and mixing valve, the device 1 comprises a controller, which is connected to one or several thermo-sensors (9), humidity sensors (10) and/or CO₂ sensors (11). 15

10. A sauna indoor climate adjusting device (1) according to claims 2, 7 and 8, **characterized in that** the speed regulator of ventilation fan (5) is timer controlled. 20

11. A sauna indoor climate adjusting device (1) according to claims 1, 3 and 4, **characterized in that** cooler air and water vapour inlet channel (2) and/or hot air and steam vapour inlet channel (3) have an adjusting valve and/or the opening of the inlet channel is funnel shaped. 25

30

12. Method for adjusting the sauna indoor climate **characterized in that** in sauna indoor climate adjusting device (1), hot steam is directed into the hot air and steam inlet channel 2, cooler air and water vapour from the lower layers of the steam room are directed into cooler air and water vapour inlet channel (3); both hot air and steam from inlet channel (2) and cooler air from inlet channel (3) are directed into mixing chamber (4), where the initial mixing of the air flows is performed; 35

from mixing chamber (4), the initially mixed air flow is directed through ventilation fan (5), which is used to perform the final mixing of the air flow, and the mix of mixed steam and air is directed into outlet channel (6). 40

45

13. Method for adjusting the sauna indoor climate according to claim 12, **characterized in that** the rotations of the ventilation fan and openness of adjusting valves of inlet channels (2) and (3) of sauna indoor climate adjusting device 1 are adjusted in a way that from the upper layers of the steam room the majority of the steam and hot air is collected, and from the lower layers of the steam room water vapour and cooler air are collected, and steam, hot air, water vapour and cooler air are mixed and directed into outlet channel (6). 50

55

14. Method for adjusting the sauna indoor climate according to claims 12 and 13, **characterized in that** the rotations of the ventilation fan and openness of adjusting valves of inlet channels 2, 3 and 8 of sauna indoor climate adjusting device (1) are adjusted in a way that the CO₂ concentration is lower than of 900 PPM and/or in the range of 800 to 900 PPM, wherein if the CO₂ concentration is higher than 900 PPM, the adjusting valve of the inlet channel (3) inside the steam room is closed and the adjusting valve of the outside cooler air inlet channel (8) is opened at its maximum capacity and all the cooler air to be mixed is taken outside of the steam room; if the CO₂ concentration is lower than 900 PPM and/or in the range of 800 to 900 PPM, the adjusting valve of outside cooler air inlet channel (8) is closed and the adjusting valve of inlet channel (3) inside the steam room is opened, and only the internal air is circulated and no additional fresh air is taken from outside of the steam room.

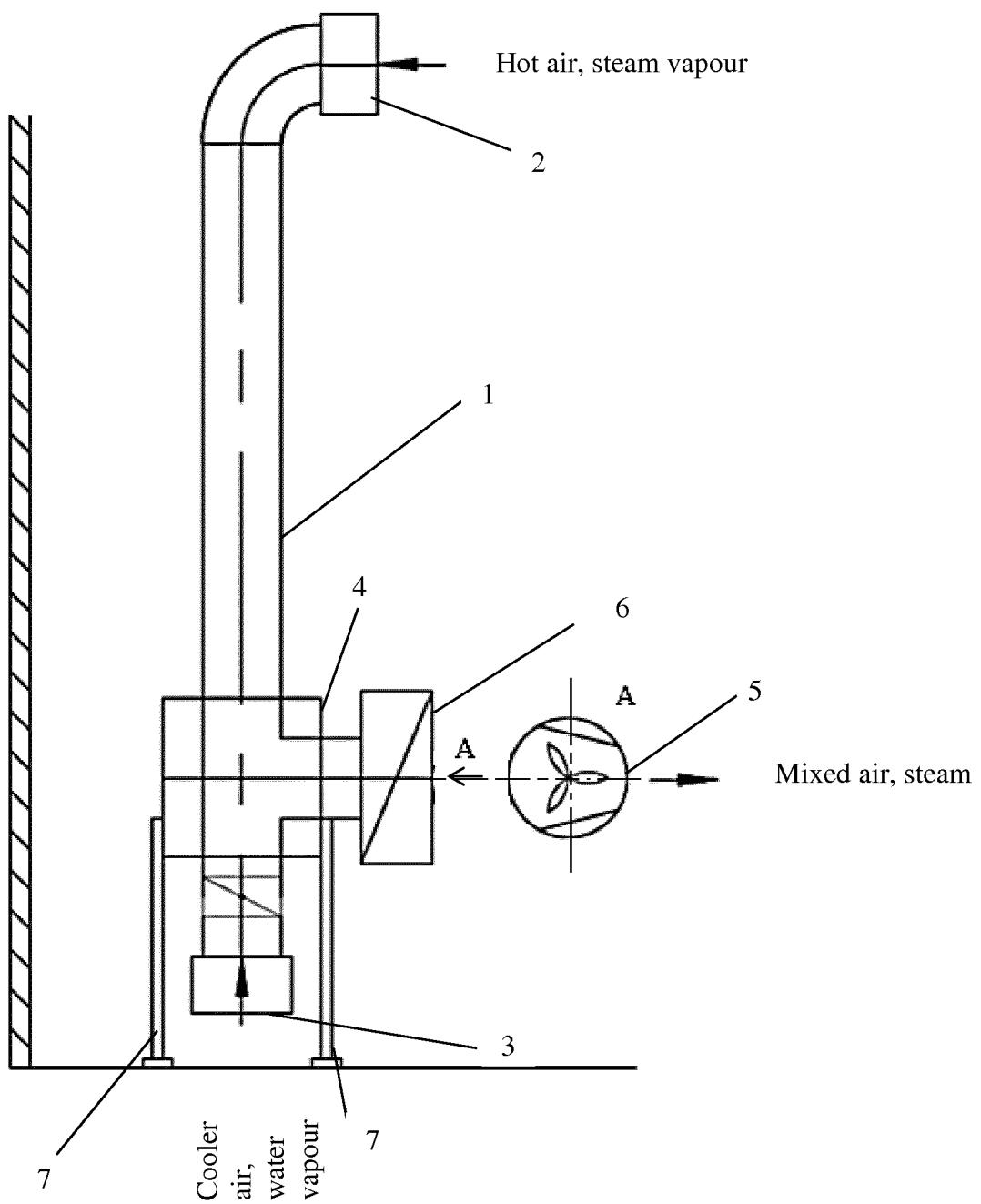


FIG 1

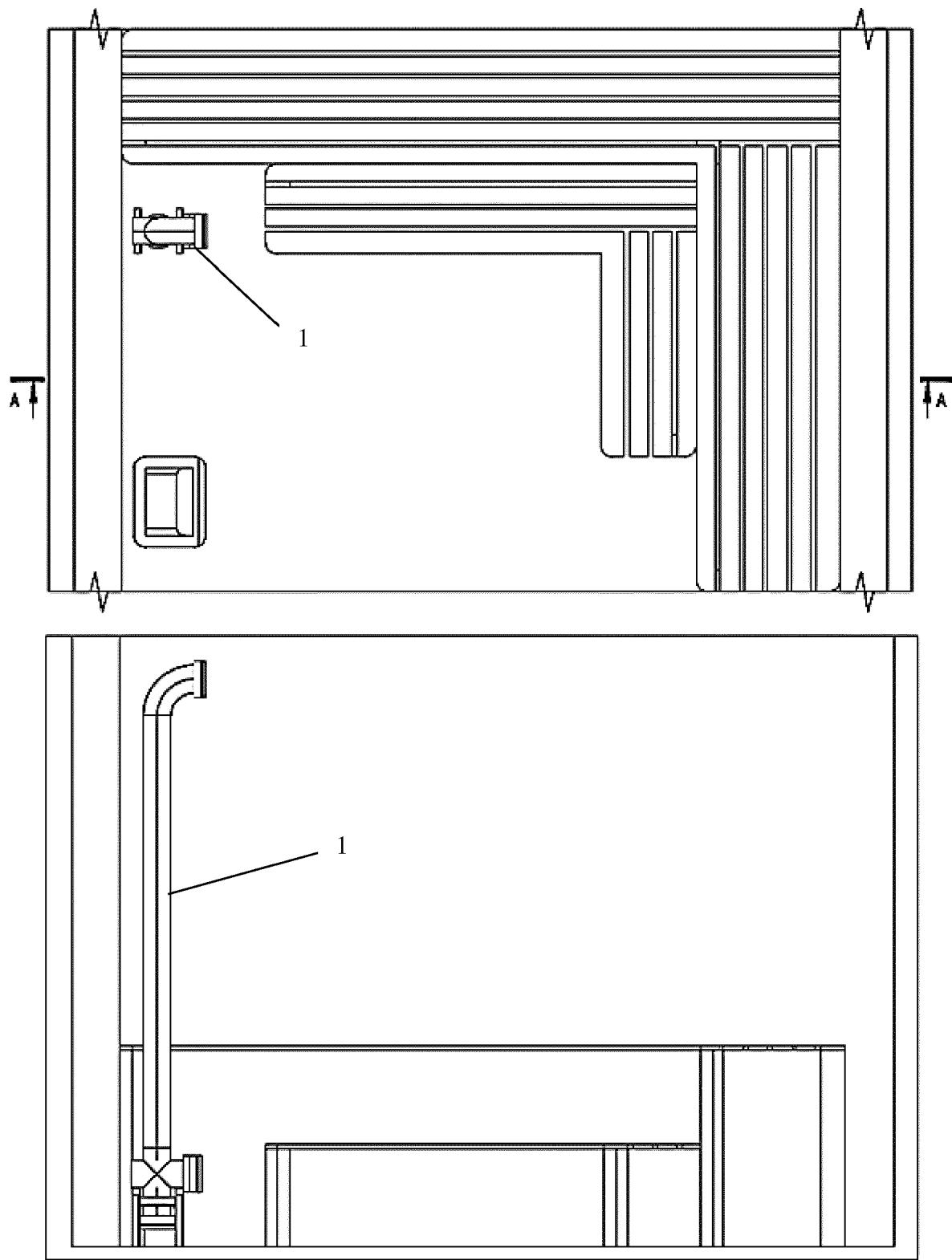


FIG 2

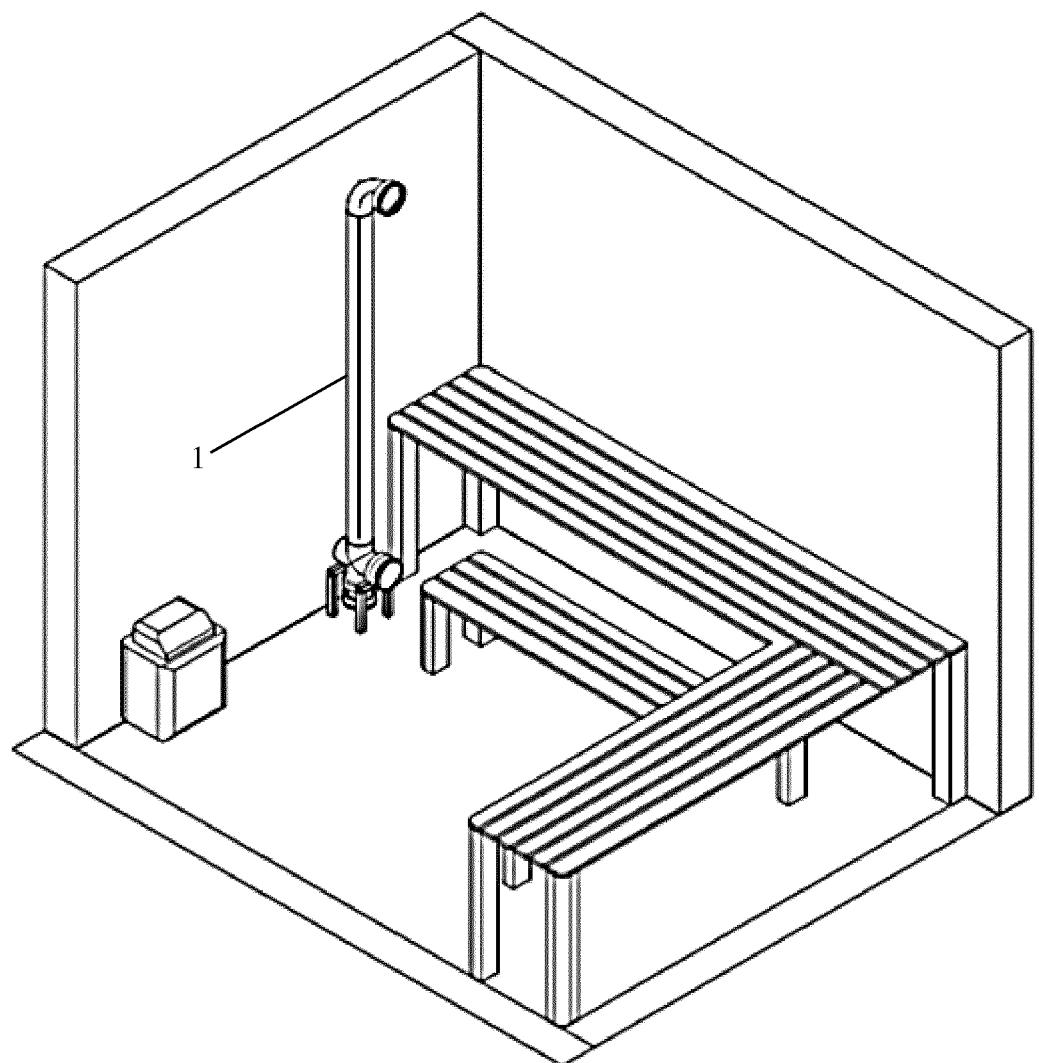


FIG 3

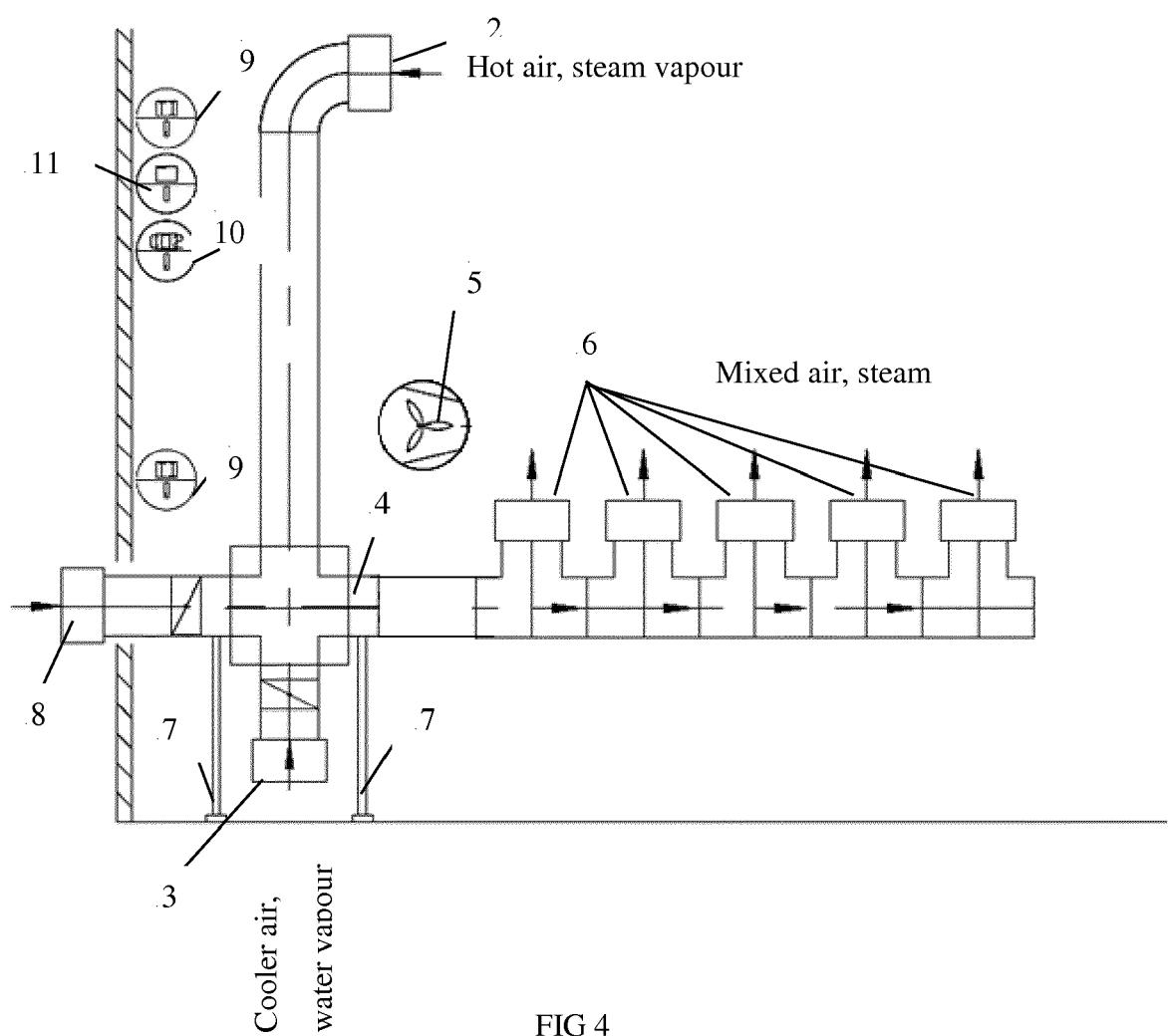


FIG 4

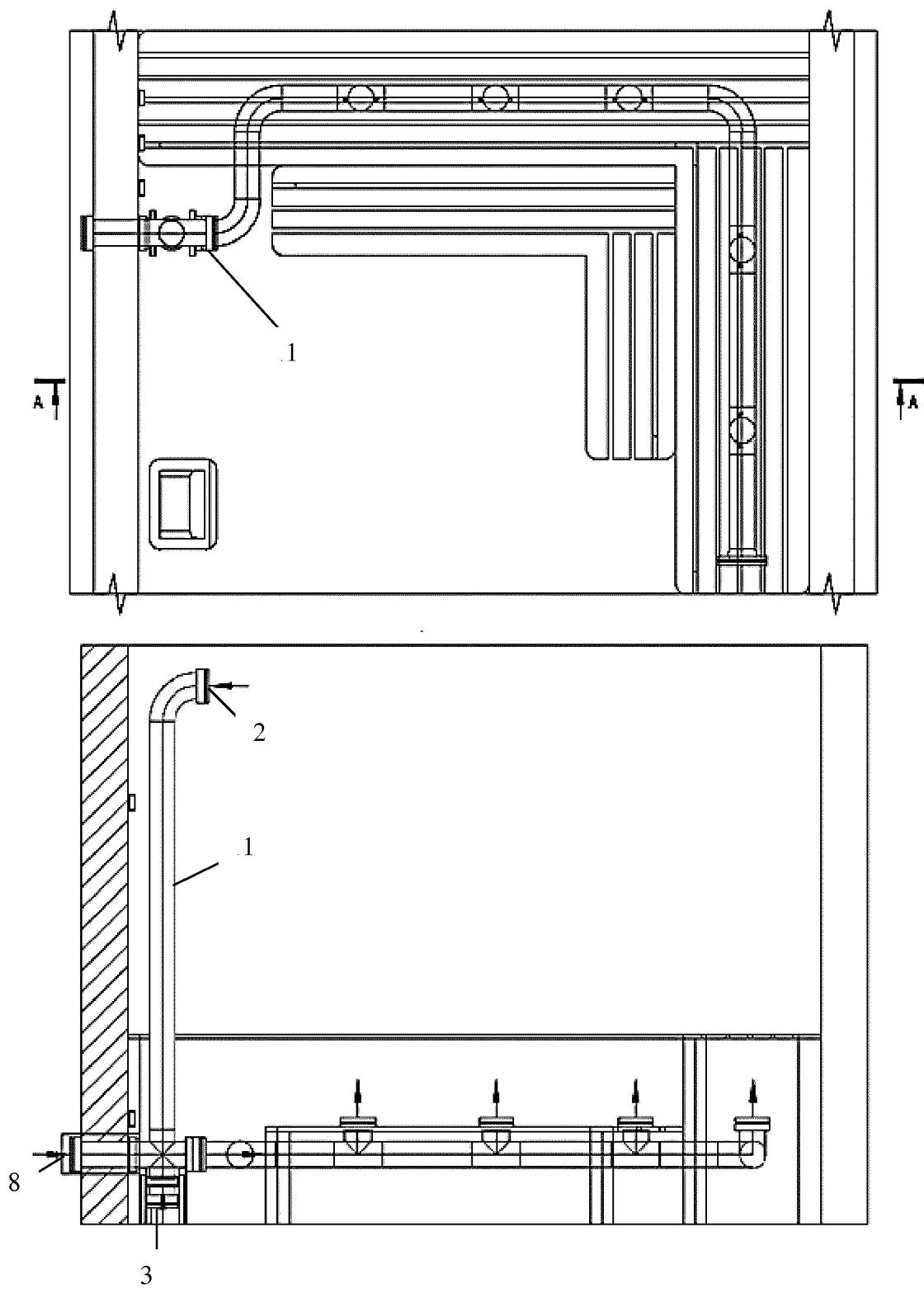


FIG 5

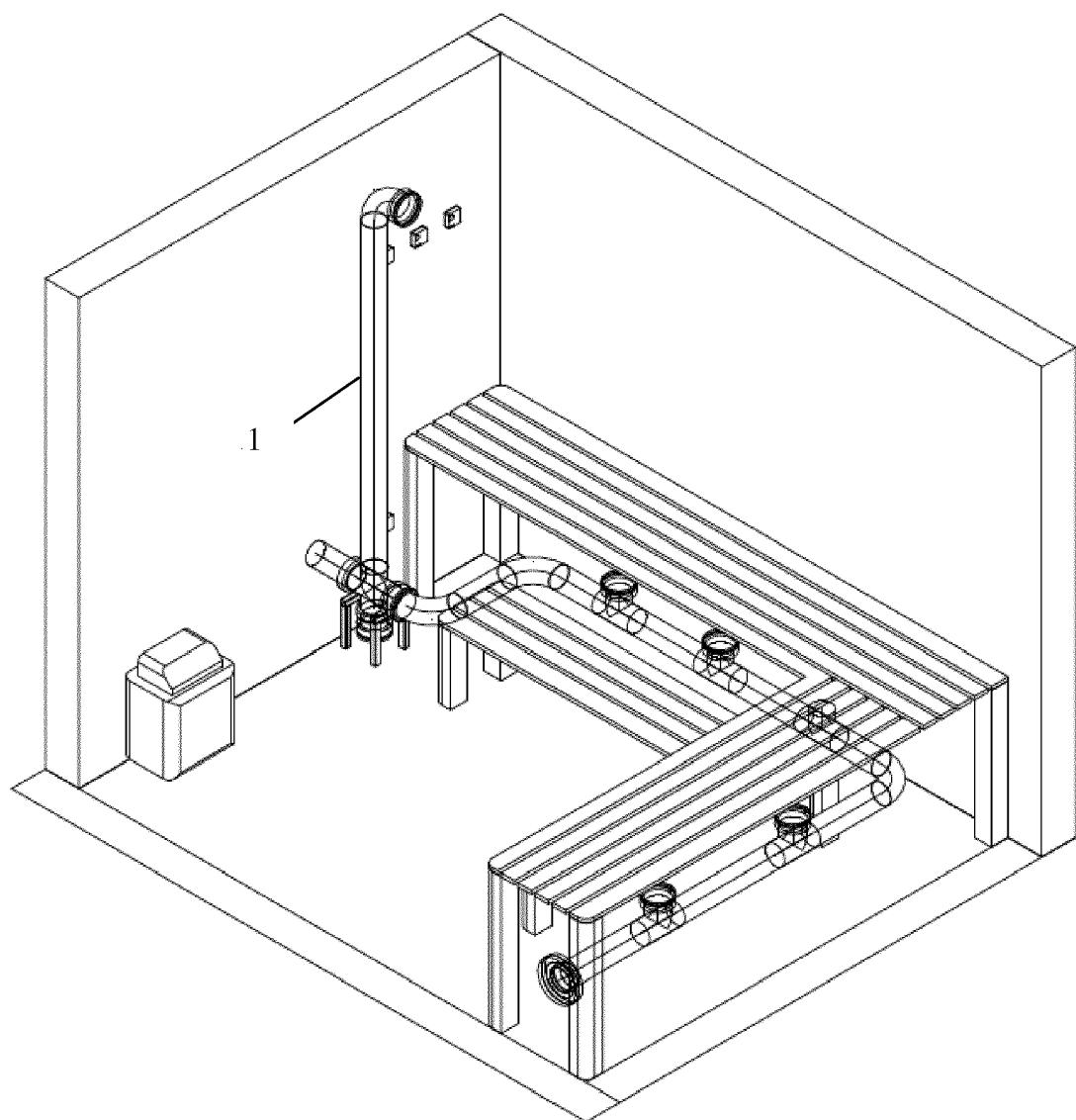


FIG 6



EUROPEAN SEARCH REPORT

Application Number

EP 15 19 4177

5

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
10	X EP 0 121 500 A2 (DELCO GUIDO) 10 October 1984 (1984-10-10) * pages 3,5,6; figure 3 * -----	1-7,10, 13-15	INV. A61H33/00 A61H33/02 A61H33/06
15	X US 2010/024117 A1 (FUJII SATOSHI [JP] ET AL) 4 February 2010 (2010-02-04) * paragraphs [0090] - [0099]; figures * -----	1,2,4, 6-8, 10-14	
20	X EP 0 288 158 A2 (INAX CORP [JP]) 26 October 1988 (1988-10-26) * columns 4-9; figures * -----	1-4, 6-10, 12-15	
25	X JP 2013 165836 A (OSAKA GAS CO LTD) 29 August 2013 (2013-08-29) * paragraphs [0022] - [0038]; figures * -----	1,2,7-15	
30	X WO 86/02710 A1 (NORSK VIFTEFABRIKK AS [NO]) 9 May 1986 (1986-05-09) * page 11, lines 19-38 - page 12, lines 1-18; figure 1 * -----	1,4,6,7	TECHNICAL FIELDS SEARCHED (IPC)
35			A61H
40			
45			
50	1 The present search report has been drawn up for all claims		
55	Place of search Munich	Date of completion of the search 20 April 2016	Examiner Teissier, Sara
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			

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

EP 15 19 4177

5 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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-04-2016

10	Patent document cited in search report	Publication date		Patent family member(s)	Publication date
15	EP 0121500 A2 10-10-1984	DE DE EP	3462304 D1 8408077 U1 0121500 A2	12-03-1987 23-08-1984 10-10-1984	
20	US 2010024117 A1 04-02-2010	US WO	2010024117 A1 2008050647 A1	04-02-2010 02-05-2008	
25	EP 0288158 A2 26-10-1988	DE EP ES GR JP JP US	3865503 D1 0288158 A2 2026252 T3 3002995 T3 H0349468 B2 S63238864 A 4833739 A	21-11-1991 26-10-1988 16-04-1992 25-01-1993 29-07-1991 04-10-1988 30-05-1989	
30	JP 2013165836 A 29-08-2013	NONE			
35	WO 8602710 A1 09-05-1986	AU CA DE DK EP FI NO US WO	4967085 A 1263052 A 3575991 D1 306986 A 0199762 A1 862686 A 844320 A 4711162 A 8602710 A1	15-05-1986 21-11-1989 15-03-1990 27-06-1986 05-11-1986 24-06-1986 02-05-1986 08-12-1987 09-05-1986	
40					
45					
50					
55					

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 20100106076 [0003]
- FI 102514 [0004]
- FI 90820 [0005]