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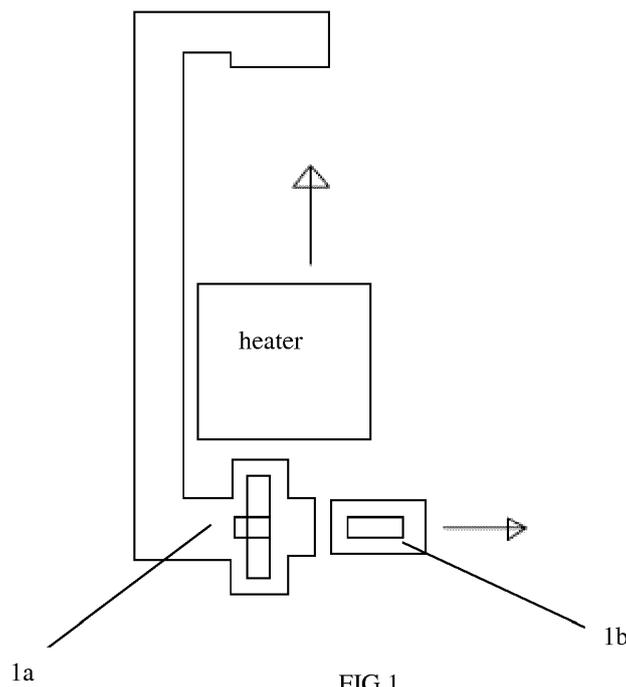
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(54) **SAUNA INDOOR CLIMATE ADJUSTING DEVICE AND METHOD FOR ADJUSTING**

(57) The invention provides a sauna indoor climate adjusting device with a salt generator, which enables to compensate for the discomfort in the steam room of the sauna and to create an effect of a salt 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 and with salt ions are flinged into steam room by a salt generator, which creates the effect of a salt sauna. 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 and enables to have a personal salt sauna.



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## 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 with salt generator, which allows to adjust/harmonize the internal temperature, the CO<sub>2</sub> level, humidity inside of a sauna steam room, and creates saline environment by flinging salt ions into sauna steam room air.

### State of the art

**[0002]** Devices for adjusting and harmonizing the temperature of a sauna and salt saunas, where salt is placed on whichever basis, 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 CO<sub>2</sub> 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 uncontrollable and the CO<sub>2</sub> level may therefore exceed the healthy limit.

**[0008]** Salt chambers are known in the prior art, but there is no solution for flinging salt ions inside sauna steam room. Halo generators (salts generators) used in salt chambers are crashing rock salt into dry, micrometer-size particles, which are ionized and flinged into air. Common salt chambers do not use steam of a sauna steam room to fling salt ions.

**[0009]** So far, there is no solution, which would distribute steam evenly in a sauna steam room and would also create an effect of a salt sauna by flinging salt ions using steam.

### Summary of the invention

**[0010]** The present invention relates to a sauna indoor climate adjusting device with a salt generator and use thereof, with which salt sauna is generated and the climate of the sauna is made more comfortable. In 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.

**[0011]** The sauna indoor climate adjusting device comprises a salt generator with a salt container and by driving steam through the salt generator, steam is mixed with salt ions, which are further directed to the sauna steam room. A salty environment, which is beneficial for respiratory track, is generated by salt container. The level of salt can be regulated.

**[0012]** 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 CO<sub>2</sub> 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 breath-

ing. Due to the air renewal controlled with the CO<sub>2</sub> sensor, a healthy microclimate is also ensured in the sauna, therefore being in the steam room of the sauna is safer.

**[0013]** 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.

**[0014]** A private salt chamber can be generated with a salt generator at minimum cost by a user in a home sauna steam room to avoid infections in public salt chambers.

**[0015]** Also, compared to public salt chambers, which may be too hot or too cold, the device of the invention allows enjoying sauna at preferred temperature and salt regime.

### List of figures

**[0016]** Preferred embodiments of the invention are described by referring to the accompanying figures, whereby the figures represent the following:

FIG 1: Scheme of a sauna indoor climate adjusting device with a salt generator and a heater.

FIG 2: Scheme of the portable device.

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

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

FIG 4: General view of the sauna steam room with the portable device.

FIG 5: Scheme of the integrated device.

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

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

FIG 7: General view of the sauna steam room with the integrated device.

FIG 8: General view of the salt generator.

FIG 9: General view of the salt generator grate.

### Detailed description of the invention

**[0017]** Sauna indoor climate adjusting device, which is schematically shown on FIG 1, comprises a sauna indoor climate adjusting device 1a and a salt generator 1b. Sauna indoor climate adjusting device is shown on FIGs

2-6 and comprises 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, as shown on FIG 2. 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. The salt generator 1b comprises a body and a grate 12 inside the body on which salt are placed. In alternative solutions, rods, through which salt blocks are stabbed, may be used.

**[0018]** The salt generator can be connected with sauna indoor climate adjusting device outlet channel, where mixed air carries salt ions from salt surface within. The temperature of the steam and flow are controlled with electronic controller.

**[0019]** 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.

**[0020]** 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 CO<sub>2</sub> 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.

**[0021]** 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.

**[0022]** 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.

**[0023]** 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.

**[0024]** 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.

**[0025]** 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 (CO<sub>2</sub>/temperature difference up-down/humidity percentage).

**[0026]** 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> content in the steam room lower than 900 PPM and/or in the range of 800 to 900 PPM. If the CO<sub>2</sub> 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 CO<sub>2</sub> concentration exceeds 900 PPM, additional fresh air will be taken outside of the steam room until a normal healthy CO<sub>2</sub> concentration is recovered, which is lower than 900 PPM and/or in the range of 800 to 900 PPM.

**[0027]** 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 CO<sub>2</sub> sensor and a safe oxygen level is guaranteed with an inflow of fresh air.

**[0028]** 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.

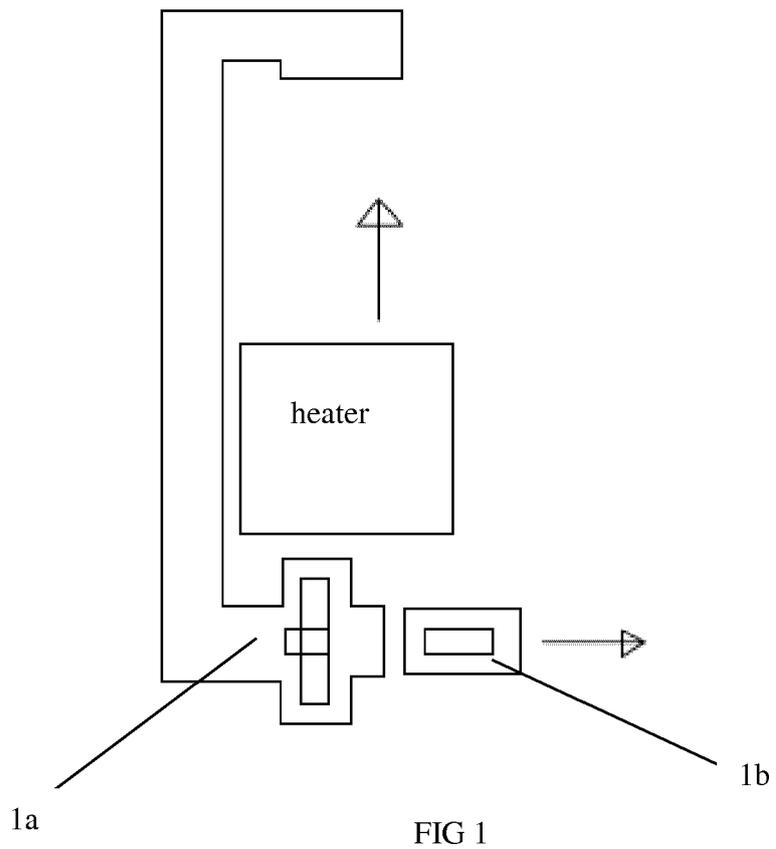
**[0029]** Depending on the character and size of the sauna steam room, heater type and positioning, height of the platform and preferences of the sauna user, it is possible to combine an optimally comfortable sauna mode with the sauna indoor climate adjusting device, by adjusting the rotations of the ventilator fan and positioning of the lower inlet channel 3, i.e., cooler air, valve accordingly.

**[0030]** 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.

## Claims

1. A sauna indoor climate adjusting device (1a), **characterized in that** the device comprises hot air and

- steam vapour inlet channel (2) for hot air; and cooler air and water vapour inlet channel (3) for cooler air and water vapour; mixing chamber (4) for mixing hot air, cooler air and water vapour; and an outlet channel (6) for releasing the mixed air and vapour from the mixing chamber (4); and salt generator.
2. A device (1a) 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 device (1a) according to claims 1 and 2, **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 device (1a) according to claim 1, **characterized in that** the salt generator (1b) comprises a body and a grate (12) or salt rods.
  5. A device (1) according to claims 1-3, **characterized in that** the end of cooler air and water vapour inlet channel (3) is located outside or inside of the steam room.
  6. A device (1a) according to claim 1-5, **characterized in that** the device is a portable and/or the device comprise support legs (7) or the device is built in.
  7. A device (1a) according to claims 1-6, **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 device (1a) according to claim 1-7, **characterized in that** ventilation fan (5) comprises a speed regulator.
  9. A device (1a) according to claims 1-8, **characterized in that** the speed regulator of ventilation fan (5) is manually or automatically controllable.
  10. A device (1a) according to claims 1-9, **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 CO<sub>2</sub> sensors (11).
  11. A device (1a) according to claims 1-9, **characterized in that** the speed regulator of ventilation fan (5) is timer controlled.
  12. A device (1a) according to claims 1-11, **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.
  13. Method for adjusting the sauna indoor climate **characterized in that** in sauna indoor climate adjusting device (1a), 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).
  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 (1a) 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 into outlet channel (6).
  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 (1a) are adjusted in a way that the CO<sub>2</sub> concentration is lower than of 900 PPM and/or in the range of 800 to 900 PPM, wherein if the CO<sub>2</sub> 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 CO<sub>2</sub> 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.



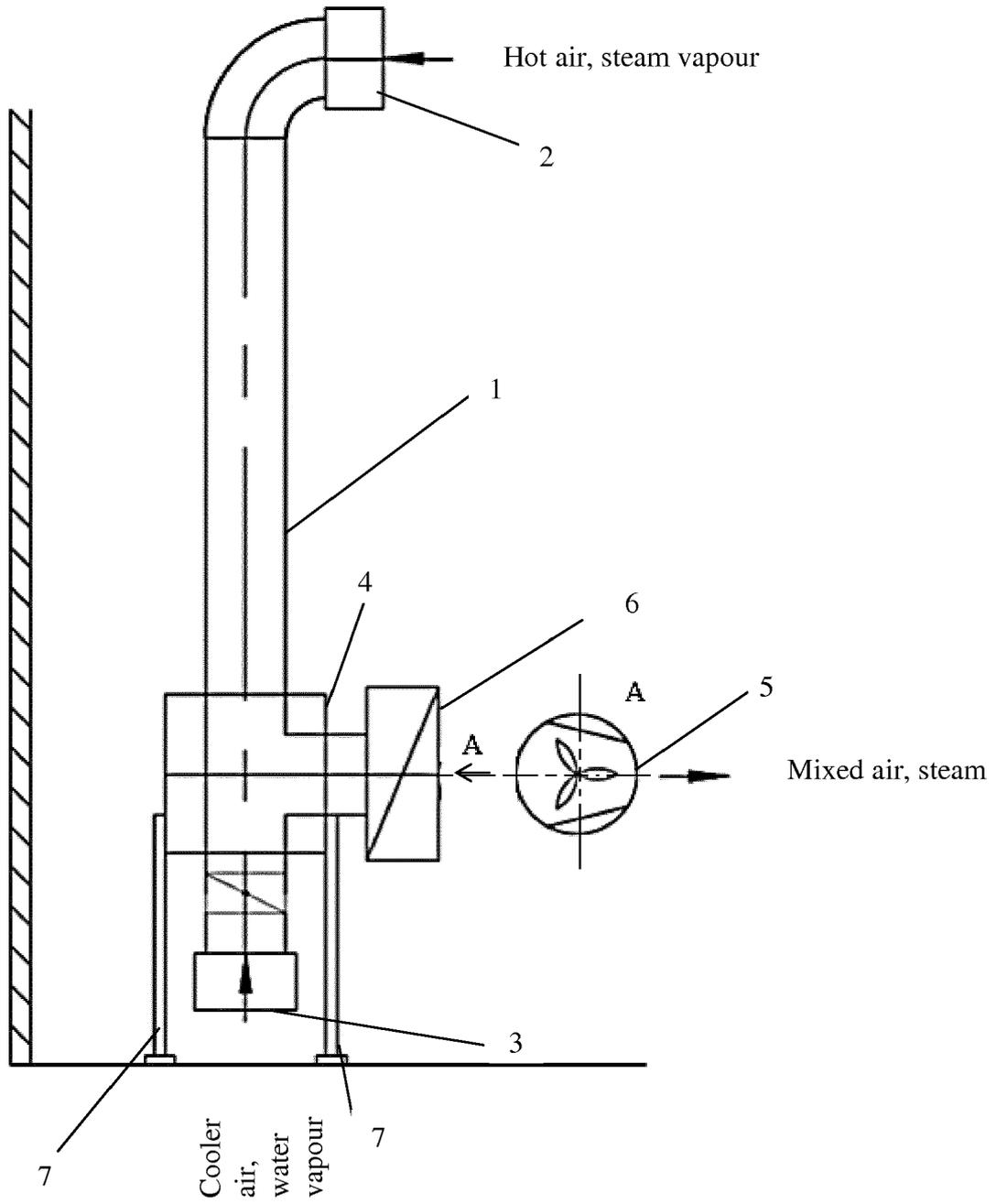


FIG 2

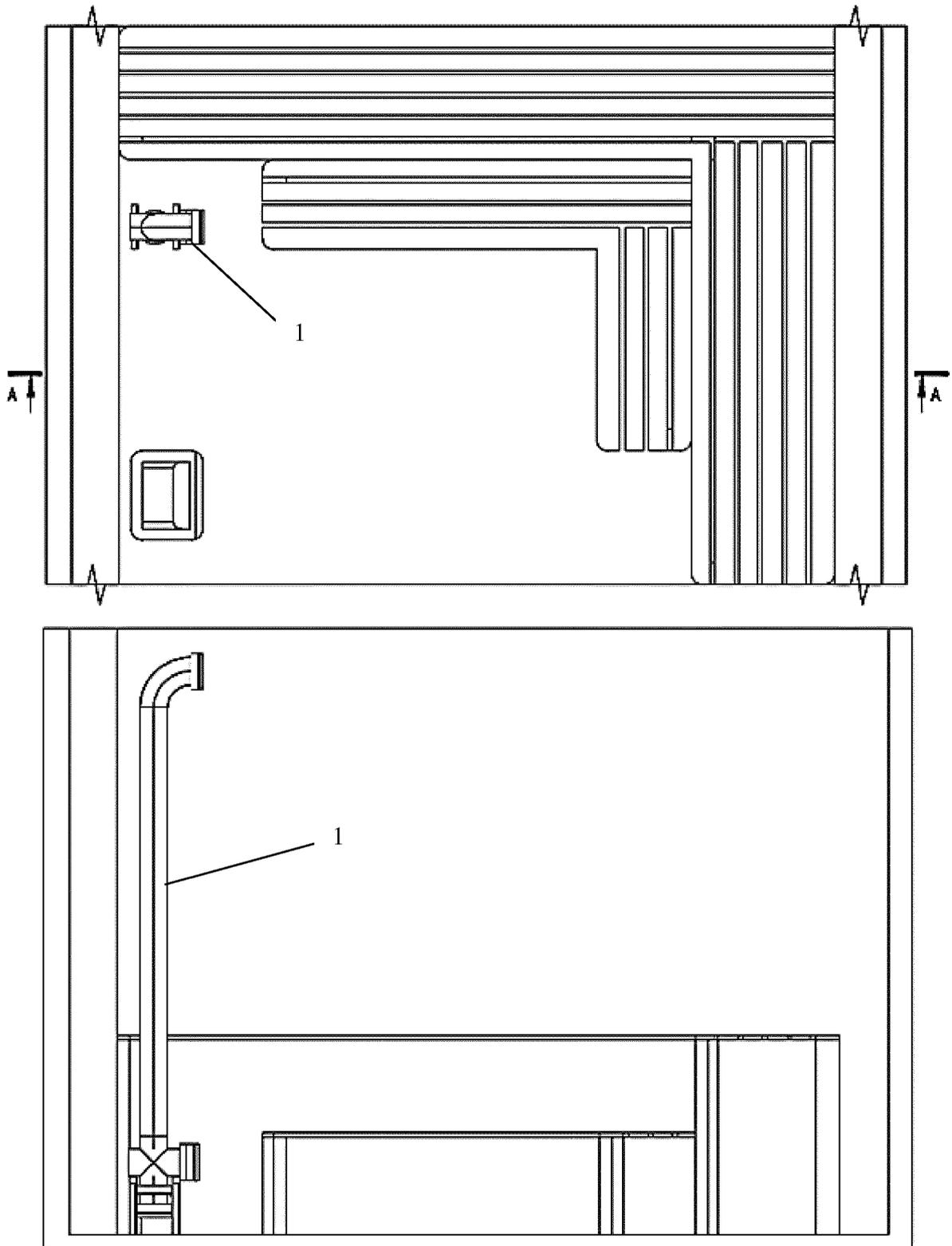


FIG 3

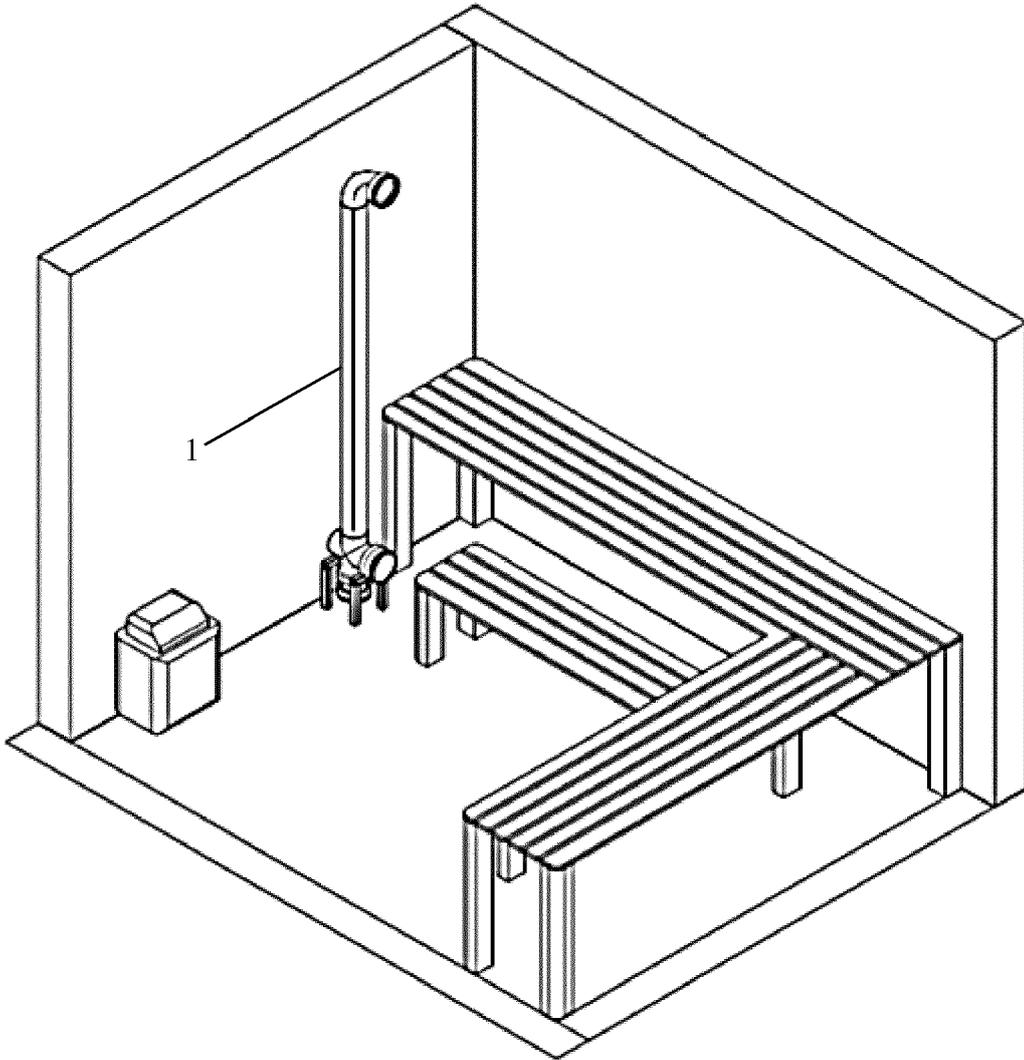


FIG 4

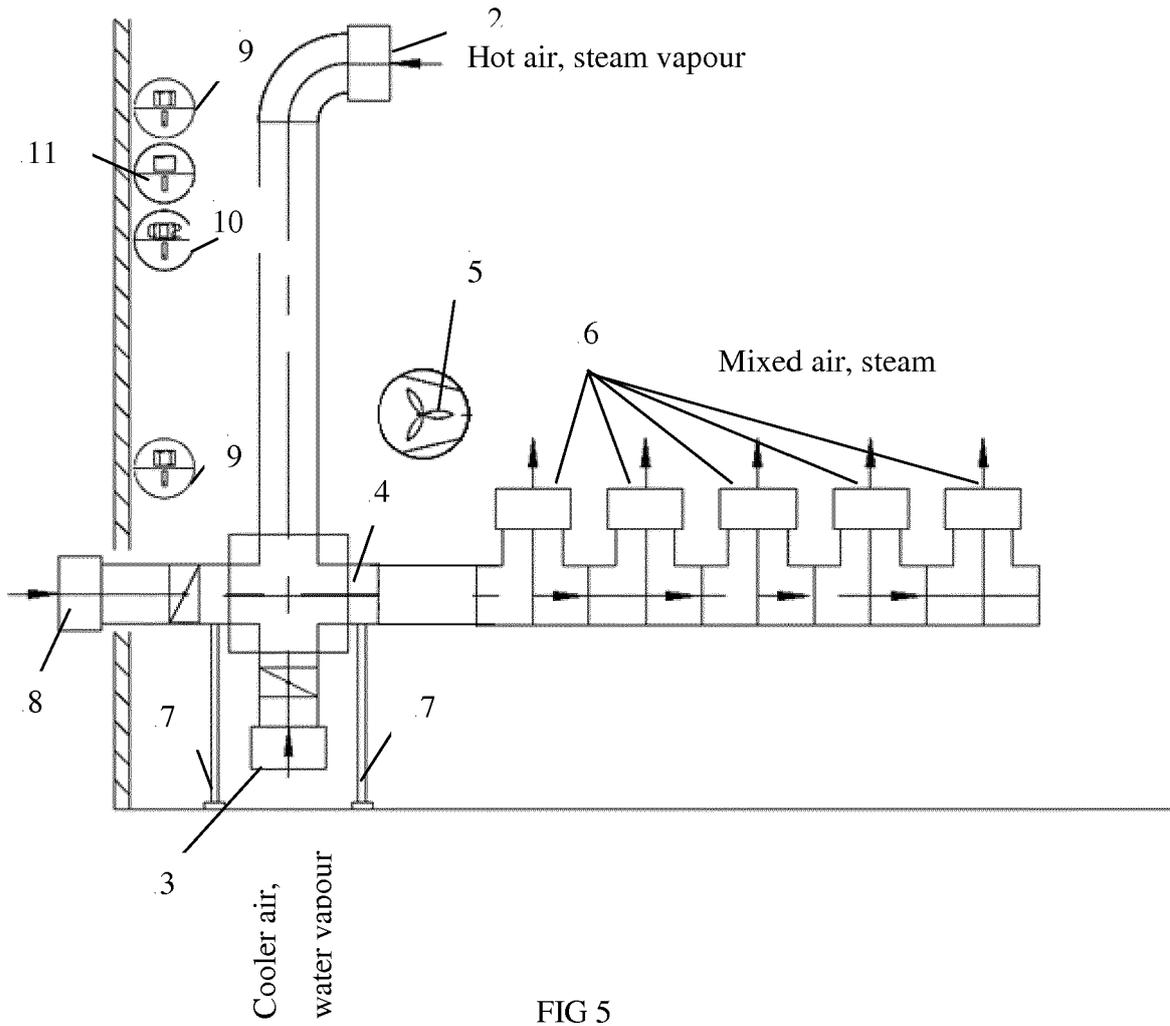


FIG 5

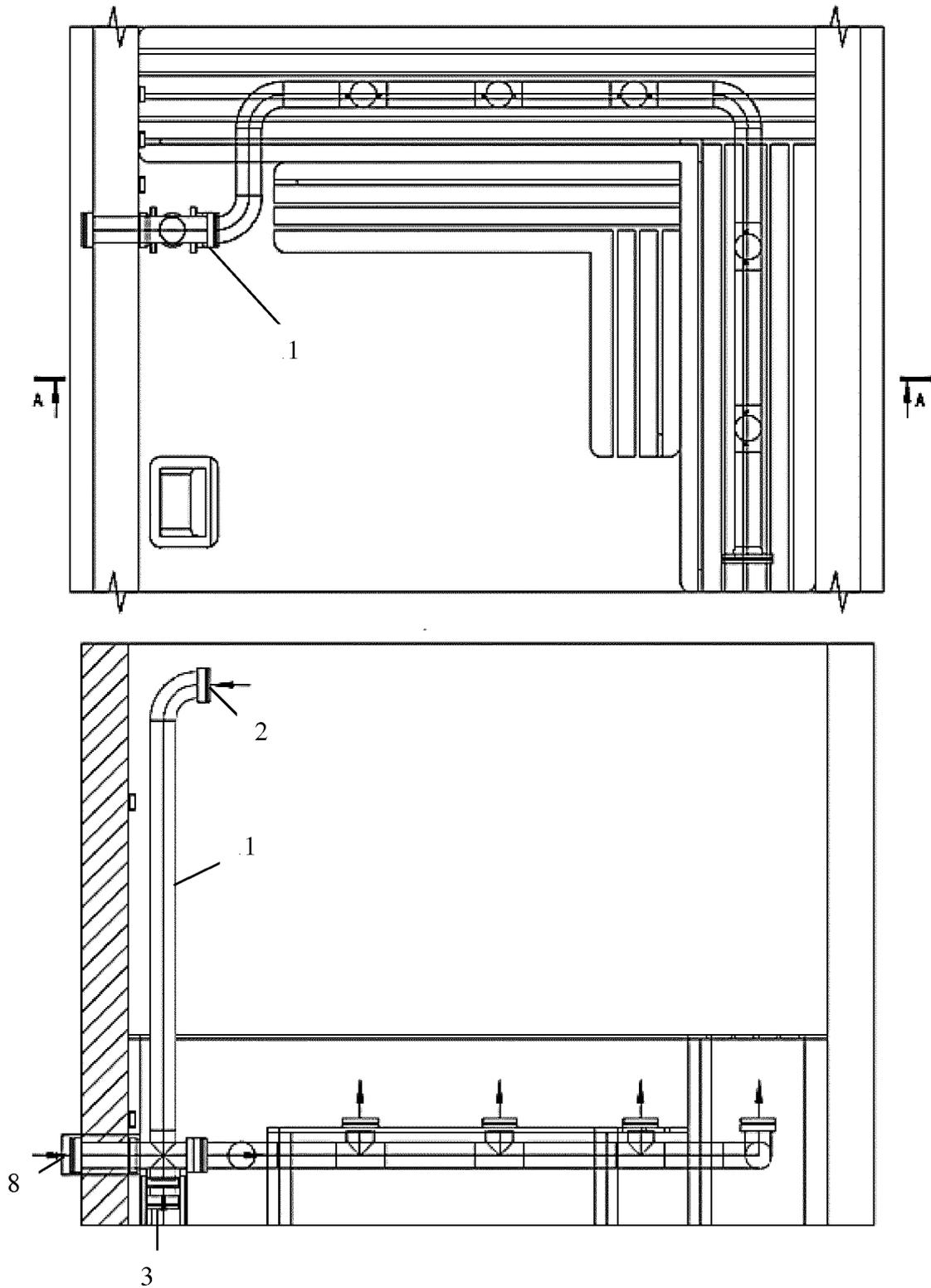


FIG 6

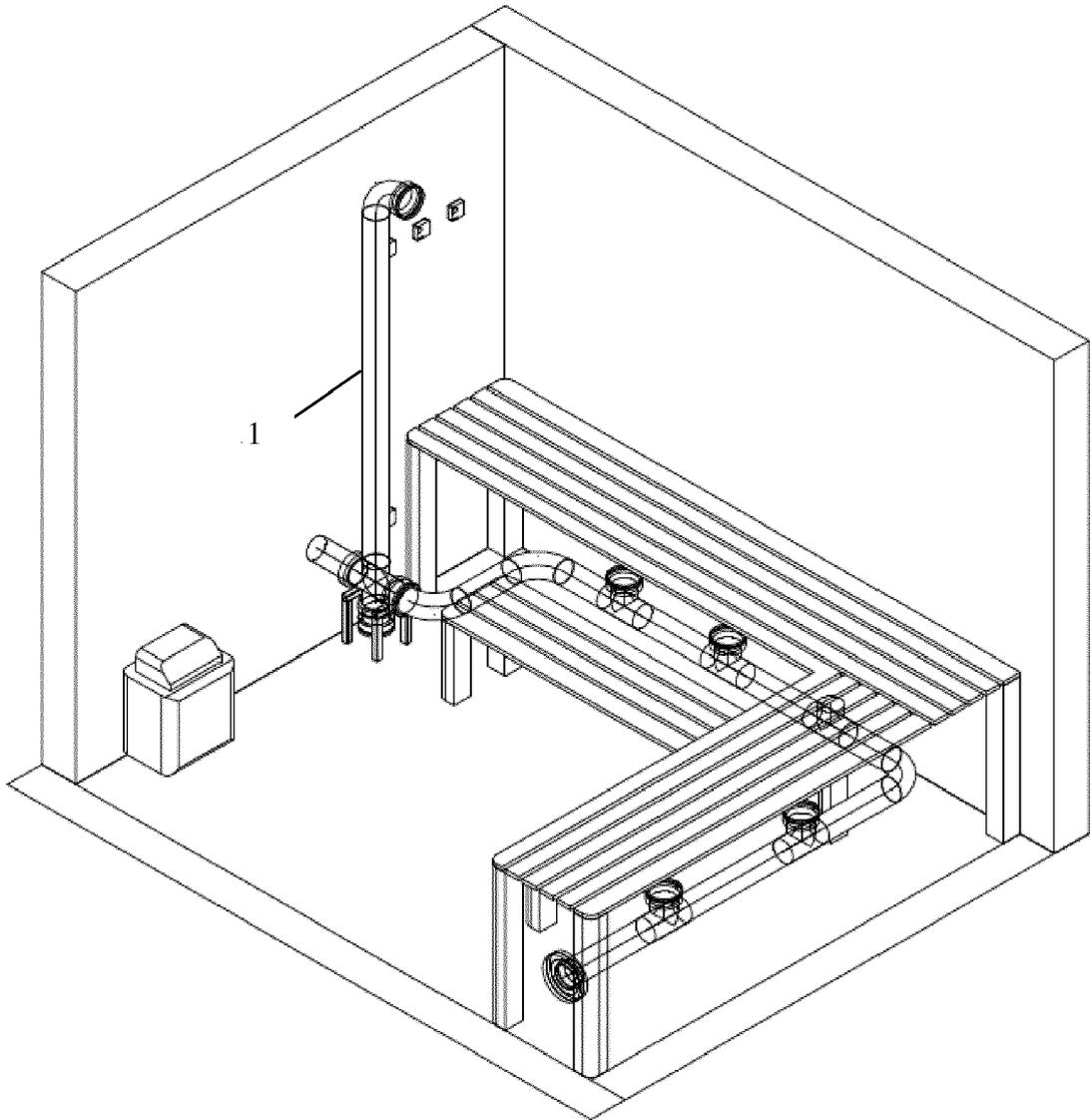


FIG 7

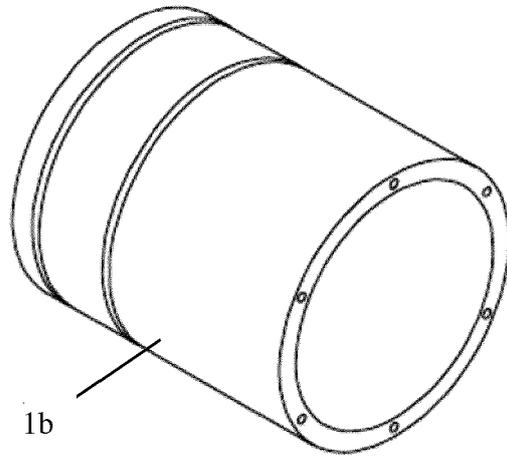


FIG 8

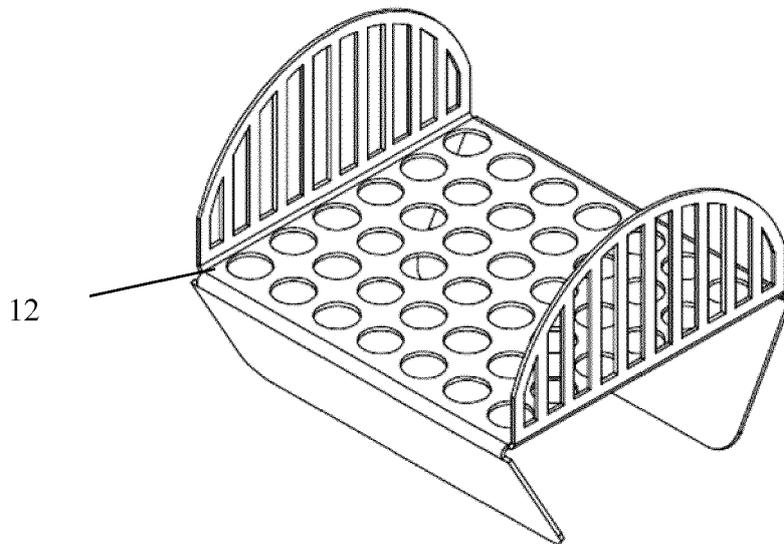


FIG 9



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