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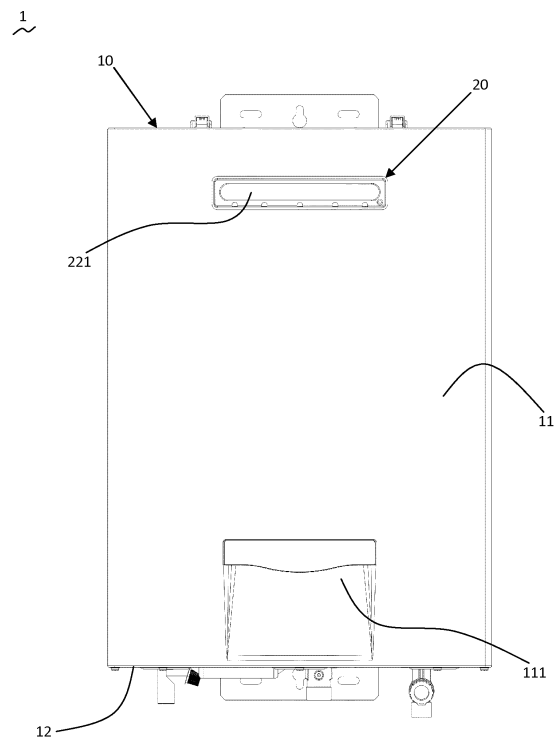
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(54) **Gas water heating appliance with air pressure switch**

(57) The present invention discloses a gas water heating appliance including a housing, a burner, a heat exchanger, an air supply fan, and an air pressure switch. The burner is disposed in the housing to generate heat. The heat exchanger is adapted for absorbing the heat and transferring the heat to water passing therethrough. The air supply fan is disposed in the housing for supplying air to the burner. The air pressure switch has a negative pressure port and a positive pressure port; wherein the negative pressure port is connected to the air supply fan via a first tube, and the positive pressure port is connected to atmosphere via a second tube. Since the pressure exerted by the adverse winds can also be detected at the positive pressure port, the pressure change at the negative pressure port is counterbalanced by the pressure change at the positive port, therefore, the air pressure switch would not be affected by adverse winds, and the misoperation to the appliance caused by adverse winds can be avoided.



**Fig. 1**

## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates to a gas water heating appliance employing an air pressure switch which would not be affected by adverse wind.

### BACKGROUND OF THE INVENTION

**[0002]** Gas water heating appliances generally include gas water heaters and gas boilers. A typical gas water heater can provide sanitary hot water for domestic usage, such as use in the kitchen, laundry, and bath. The water heater may include a gas burner for combustion of a gas-air mixture, heat exchanger coils for heating water as it flow therethrough, and hydraulic pipes connected with external plumbing for supplying hot water. A typical gas boiler is operable to heat water which is pumped around a boiler circuit. The boiler circuit is typically connected, via suitable valves to space heaters, such as radiators or under floor heating loop, so that the heat output from the boiler can be used for central heating purposes.

**[0003]** The appliances are often equipped with air supply fans and flue hoods. The air supply fan supplies air to the burner and urges combustion flue gas generated by the burner to flow into the flue hood to be discharged outdoors. When starting the appliance, the air supply fan runs first to check if exhaust of gas works properly, if yes, the appliance will be start-up. An air pressure switch is employed to check the situation of the exhaust of gas, moreover, it can activate the shut-off of the appliance in case there exists a blockage of the gas exhaust.

**[0004]** An air pressure switch typically has a positive pressure port and a negative pressure port respectively connects to a positive pressure chamber and a negative pressure chamber separated by a membrane. Where there is a pressure change, the membrane will be pushed by the pressure difference to activate a switch on or off. Usually, the air pressure switch has the negative pressure port to be connected with the air supply fan to detect the negative pressure generated by the fan.

**[0005]** On initiating the appliance, if the air supply fan runs properly, the air pressure switch will detect at its negative pressure port a pressure value which is smaller than a preset threshold. However, if the flue gas exhaust is blocked, the air pressure switch will detect a pressure value which is larger than the preset threshold, then the appliance will not be start up. For an outdoor gas water heating appliance, the appliance may suffer an adverse wind which exerts a wind pressure via the flue hood on the air supply fan, thus a higher pressure value is sensed by the air pressure switch, which results in that the appliance could not be start up or the running appliance has to be shut off. Obviously, this is not desired for designers because there is no blockage to the flue gas exhaust and the flue gas still can be discharged.

**[0006]** A Chinese Utility Model CN2913943Y discloses an outdoor gas water heater which is able to work properly even it encounters an adverse wind. Wherein, a temperature sensing switch is used to replace the air pressure switch. For example, when the exhaust of flue gas is blocked, the temperature inside of the water heater inevitably increases, and once the temperature exceeds a predetermined threshold, the switch will sense it and activate shut-off of the water heater. However, the temperature rise inside of the water heater may result from a lot of different factors, in other words, the appliance can be shut off by a misoperation.

### SUMMARY OF THE INVENTION

**[0007]** It is an object of present invention to provide a gas water heating appliance employing an air pressure switch which would not be affected by an adverse wind, thereby ensuring the appliance works properly even it encounters the adverse wind.

**[0008]** According to one aspect of the present invention there is provided a gas water heating appliance including a housing, a burner, a heat exchanger, an air supply fan, and an air pressure switch. The burner is disposed in the housing to generate heat. The heat exchanger is adapted for absorbing the heat and transferring the heat to water passing therethrough. The air supply fan is disposed in the housing for supplying air to the burner. The air pressure switch has a negative pressure port and a positive pressure port; wherein the negative pressure port is connected to the air supply fan via a first tube, and the positive pressure port is connected to atmosphere via a second tube.

**[0009]** Preferably, the housing defines an air inlet at a lower portion thereof; wherein the second tube has an air intake end, and the air intake end is located adjacent to the air inlet to receive air passing through the air inlet.

**[0010]** Preferably, the air intake end is disposed at a position lower than that of the positive pressure port of the air pressure switch along a vertical direction.

**[0011]** Preferably, the air intake end is disposed in the middle area of the air inlet along a lateral direction.

**[0012]** Preferably, the air inlet is defined in a front plate of the housing, and the front plate is provided with a shield plate having a bottom edge which forms a top edge of the air inlet; wherein the air intake end is disposed behind the shield plate.

**[0013]** Preferably, the shield plate is formed with a deflector extending horizontally inwardly, and the air intake end is disposed below the deflector.

**[0014]** Preferably, the appliance further includes a flue hood disposed in the housing for receiving combustion flue gas generated by the burner, wherein the flue hood has a front end defining an gas exhaust port therein for discharging the flue gas outdoors.

**[0015]** In an alternative embodiment, a first air intake hole is disposed at the front end of the flue hood, and the second tube is connected between the positive pressure

port and the first air intake hole.

**[0016]** Preferably, a second air intake hole is disposed in the front end of the flue hood and above the first air intake hole; wherein the second tube comprise a connection tube section connected between the first and the second air intake holes and an extension tube section extending from the connection tube section and connected with the positive pressure port, and said extension tube section is at least partly located above the second air intake hole.

**[0017]** Preferably, the second tube defines a venting hole in its body.

**[0018]** Since the pressure exerted by the adverse winds can also be detected at the positive pressure port, the pressure change at the negative pressure port is counterbalanced by the pressure change at the positive port, therefore, the air pressure switch would not be affected by adverse winds, and the misoperation to the appliance caused by adverse winds can be avoided.

**[0019]** The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0020]** For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a planar view showing a gas water heating appliance in accordance with an embodiment of the present invention;

Fig. 2 is an perspective view showing the appliance of Fig. 1 with a front plate being removed;

Fig. 3 is a planar view showing the appliance of Fig. 1 with a side plate being removed;

Fig. 4 is a perspective view showing a flue hood in accordance with an embodiment of the present invention;

Fig. 5 is a front view showing the flue hood of Fig. 4;

Figs. 6A to 6C are cross sectional views taken along line A-A of Fig. 5, wherein Figs. 6A, 6B, 6C respectively show a first position, a second position, and a third position of a movable baffle of the flue hood.

Fig. 7 is a perspective view showing a rain shield of the appliance of Fig. 1;

Fig. 8 is a top view of the rain shield of Fig. 7;

Fig. 9 is a side view of the rain shield of Fig. 7;

Fig. 10 is similar to Fig. 5, which shows a flue hood in accordance with another embodiment of the present invention;

Fig. 11 is similar to Fig. 6A, which is a cross sectional view of the flue hood of Fig. 10;

Fig. 12 is a perspective view showing a gas water heating appliance in accordance with another embodiment of the present invention, wherein the front plate together with the side plate and the rain shield are removed;

Fig. 13 is a front view showing the appliance of Fig. 12 with the rain shield being added;

Fig. 14 is a side view showing the appliance of Fig. 13.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0021]** Reference will now be made to the drawing figures to describe the preferred embodiments of the present invention in detail. However, the embodiments can not be used to restrict the present invention. Changes such as structure, method and function obviously made to those of ordinary skill in the art are also protected by the present invention.

**[0022]** Gas water heaters and gas boilers could be fired with combustible gas, such as natural gas, city gas, liquefied petroleum gas, methane, etc., thereby supplying hot water and/or heating living space for domestic sanitary usage and heating purpose. The embodiments to be described below take a gas water heater as an example, however, the present invention is not limited to this, and it can also be applied on gas boilers

**[0023]** First referring to Figs. 1 to 3, a gas water heating appliance 1 in accordance with one embodiment of present invention is adapted to be mounted outdoors, which includes a housing 10, a flue hood 20, a heat exchanger 107, a burner 104, an air supply fan 105, an air pressure switch 30, and an inlet tube 101, an outlet tube 102, a gas supply pipe 103 extending out of the housing 10.

**[0024]** The housing 10 may be composed of a number of plates, such as a front plate 11, a back plate, a top plate, a bottom plate 12, and a pair of side plates. In this embodiment, the back plate and the bottom plate 12 are integrally formed in a first piece, and the front plate 11, the top plate, the pair of side plates are integrally formed in a second piece. In course of assembling the appliance, the components can be first mounted on the first piece, then the second piece is mounted on the first piece to

complete the assembling. In this way, the assembling can be more simple. When the appliance is installed on a wall, the back plate faces the wall, and an air inlet is provided in the plates different from the back plate. The air inlet can be defined in the front plate 11, the side plate, or even in the bottom plate 12, and in this embodiment, the air inlet 111 is defined at a lower portion of the front plate 11.

**[0025]** The burner 104 has a casing and a number of burner blades (not shown) arranged side by side in the casing. Each burner blade generally defines therein a gas-air mixture passage for mixing fuel gas supplied from the gas supply pipe 103 and combustion air supplied by the air supply fan 105, and delivering the gas-air mixture to top thereof for being ignited and burning. As the configuration and arrangement of the burner blades are well known in the art, a detailed description is omitted for purpose of brevity and simplicity.

**[0026]** The heat exchanger 107 is placed above the burner 104. The heat exchanger 107 may include multiple heat absorbing fins and a heat absorbing pipe passing through the multiple heat absorbing fins. The heat absorbing pipe is connected with an upstream water supply channel and a downstream hot water delivering channel. Water passing through the inlet tube 101 and the upstream water supply channel is then heated in the heat exchanger 107 by heat interchanging with combustion exhaust gas of the burner 104. Heated hot water is fed to the downstream hot water delivering channel and further passes through the outlet tube 102 for domestic sanitary use, such as drinking, showering, or bathing.

**[0027]** In this embodiment, the air supply Fan 105 is provided below the burner 104, which is operated to supply outside air to the burner 104 as combustion air, also, force the flue gas to flow into the flue hood 20 and further to be discharged outdoors.

**[0028]** The flue hood 20 is mounted upon the heat exchanger 107 for collecting the combustion gas containing carbon monoxide and nitric oxides and expelling it outdoors. With reference to Fig. 4, Fig. 5, and Figs. 6A to 6C, the flue hood 20 has a shell, in this embodiment, along the exhaust direction of the flue gas, the shell sequentially includes a back part 23, a front part 21, and a projection part 22 projected from the front part 21. When the flue hood 20 is mounted in the housing 10, the projection part 22 is exposed outside of the housing 10.

**[0029]** The back part 23 is retained on top of the heat exchanger 107, and its bottom is opened to define a gas intake port 231. The projection part 22 defines a gas exhaust port 221 at a front end thereof, and a number of drainage holes 222 are defined at the bottom of the front end. The flue hood 20 defines therein a flue gas channel 232 between the gas intake port 231 and the gas exhaust port 221. The front part 21 has a bottom wall extending between the gas intake port 223 and the gas exhaust port 221, and at least a part of the bottom wall extends obliquely upwardly from the gas exhaust port 201, which is able to hinder external winds and rains entering the

appliance through the gas exhaust port 221 to some extent. Even if external rains pass through the gas exhaust port 221 and enter the flue hood, the oblique bottom wall can guide the rains downstream and flow out via drainage holes 222.

**[0030]** A movable baffle 242 is provided in the flue gas channel 232 for the purpose of changing an opening size in a cross section of the flue gas channel. In this embodiment, the movable baffle 242 is pivotably disposed in the back part 23, which includes a vertical portion 2421 and a bending portion 2422 bending from a top of the vertical portion 2421. A fixed plate 241 is mounted in the flue gas channel 232. The fixed plate 241 has a horizontal section 2411 fixedly mounted on a top wall of the flue gas channel 232 by means of soldering or riveting, and an upright section 2412 perpendicular to the horizontal section 2411 providing a pivot 243 at a distal end thereof. The pivot 243 is connected to the movable baffle 242 at a junction of the vertical portion 2421 and the bending portion 2422, so that the movable baffle 242 is pivotable on this pivot 243.

**[0031]** In this embodiment, the movable baffle 242 is engaged with the fixed plate 241 to change the opening size in the cross section of the flue gas channel 232. The fixed plate 241 and the movable baffle 242 together occupy the cross section of the flue gas channel 232 where they are located. To ensure the movable baffle is able to move smoothly, there may exist clearance between the lateral sides of the fixed plate 241 and the movable baffle 242 and side walls of the flue gas channel 232, and the clearance distance can be equal or less than 1 mm. In course of a pivotal movement of the movable baffle 242, a gap exists between the bottom of the movable baffle 242 and the bottom wall of the flue gas channel 232, and this gap can define the opening in the cross section of the flue gas channel 232.

**[0032]** Figs. 6A-6C show the movable baffle 242 is located in a first position, a second position, and a third position respectively. As shown in Fig. 6A, when there is no exhaust of flue gas, and no incoming of external winds and/or rains, the movable baffle 242 is located at a first position where it is in a suspending state. At this time, the vertical portion 2421 of the movable baffle is flush with the upright section 2412 of the fixed plate, and the bending portion 2422 of the movable baffle and the upright section 2412 of the fixed plate forms an angel with respect to each other. In the first position, the opening in the cross section of the flue gas channel 232 has the smallest size, and the bottom of the movable baffle 242 just contacts the bottom wall of the flue gas channel 232. Preferably, in this position, there exists a first gap between the bottom of the movable baffle 242 and the bottom wall of the flue gas channel 232, and the distance d1 of the first gap is around 1.2mm. In this way, once external rains splash on the movable baffle 242 in the cold weather, the rains can drip on bottom wall of the flue gas channel 232 and drain out, otherwise, a frozen might be formed between the bottom of the movable baffle 242

and the bottom wall of the flue gas channel 232 and cause a blockage of the flue gas channel 232.

**[0033]** As indicated by arrows shown in Fig. 6B, when there is an exhaust of flue gas, or there are both an exhaust of flue gas and an incoming of external winds and the flue gas is stronger than the external winds, the movable baffle 242 is pushed to the second position by the gas flow. In this position, each of the vertical portion 2421 and the bending portion 2422 forms an angle with respect to the upright section 2412 of the fixed plate, and a second gap is defined between the bottom of the movable baffle 242 and the bottom wall of the flue gas channel 232. The second gap has a gap distance  $d_2$  which is larger than the first gap distance  $d_1$ , in other words, at this position, the opening in the cross section of the flue gas channel 232 is larger than that in the first position, and the size of the second gap distance depends on the force exerted by the gas flow.

**[0034]** As indicated by arrows shown in Fig. 6C, when there is an incoming of external winds, or there are both an exhaust of flue gas and an incoming of external winds and the external winds is stronger than the flue gas, the movable baffle 242 is pushed to the third position by the external winds. The third position and the second position are located at opposite sides of the first position. At the third position, a third gap is defined between the bottom of the movable baffle 242 and the bottom wall of the flue gas channel 232. In most cases, the third gap has a gap distance  $d_3$  which is larger than the first gap distance  $d_1$  but smaller than the second gap distance  $d_2$ , in other words, in this position, the opening in the cross section of the flue gas channel 232 is larger than that in the first position but smaller than in the second position, and the size of the third gap distance depends on the force exerted by the external winds. The embodiment of Fig. 6C shows a largest size of the third gap distance, at this time, the bending portion 2422 of the movable baffle abuts against the upright section 2412 of the fixed plate, and the vertical portion 2421 of the movable baffle and the upright section 2412 of the fixed plate forms an angle with respect to each other. In this way, even there exists both an exhaust of flue gas and an incoming of external winds and the external winds is stronger than the gas flow, the flue gas is still able to be discharged out through the third gap.

**[0035]** As the embodiments shown above, when there is incoming external winds and/or rains, the movable baffle is able to engage with the fixed plate to restrict the opening size in the cross section of the flue gas channel thereby resisting the winds and/or rains, on the other side, when there is exhaust of flue gas, the movable baffle can be pushed by the gas flow to enlarge the opening size in the cross section of the flue gas channel to allow the flue gas to be discharged out smoothly. In addition, since the movable baffle employs a bending portion, even the incoming winds and discharged flue gas both exist and the winds is stronger than the gas flow, the opening in the cross section of the flue gas channel still has a small size

to ensure the flue gas can be discharged out. It would be apparent to those skilled in the art that, the bending portion of the movable baffle can be omitted, and in such case, the movable baffle does not have the third position.

Moreover, the movement of the movable baffle is not restricted to a pivotal motion, it can move along a linear direction in other embodiments. For example, the movable baffle can be disposed on the oblique part 221 of the bottom wall of the flue gas channel 232, and the opening in the cross section is defined by a top of the movable baffle and the top wall of the flue gas channel 232, whose size can be adjusted by a linear motion of the movable baffle on the oblique part 221 of the bottom wall.

**[0036]** Refer back to Fig. 2, an air pressure switch 30 is mounted in the housing 10, and it has a negative pressure port 301 and a positive pressure port 302. The negative pressure port 301 is connected to the air supply fan 105 via a first tube 31 for sensing the negative pressure generated by the fan 105, and the positive pressure port 302 is connected to the atmosphere through a second tube 32. In the state of art, when adverse winds enter the appliance via the gas exhaust port 221 of the flue hood 20, the pressure switch 30 will sense the negative pressure changes caused by speed changes of the fan 405, which may result in a shut-off of the appliance. However, in this invention, since the pressure exerted by the adverse winds can also be detected at the positive pressure port 302, the pressure change at the negative pressure port 301 is counterbalanced by the pressure change at the positive port 302, therefore, the air pressure switch 30 would not be affected by adverse winds, and the misoperation to the appliance caused by adverse winds can be avoided.

**[0037]** With reference to Figs. 4, 5, and 6A to 6C, in order to ensure the pressure detected at the positive pressure port 301 is as close as possible to the pressure exerted by adverse winds, a first air intake hole 223 is provided adjacent to the gas exhaust port 221, and the second tube 32 is connected between the first air intake hole 223 and the positive pressure port 301. By this means, the adverse winds passing through the gas exhaust port 221 can reach the positive pressure port 301 via the first air intake hole 223 and the second tube 32. In a preferred embodiment, the first air intake hole 223 is defined in a front end of the projection part 22 of the flue hood 20.

**[0038]** In the embodiments aforementioned, as rains invade the flue hood 20 via the gas exhaust port 221, the rains can flow into the second tube 32 through the first air intake hole 223 and reach the positive pressure port 302, which may cause a damage the air pressure switch if the rains contact electronic parts. Figs. 10 and 11 illustrate a further embodiment, a second air intake hole 224 is provided adjacent to the gas exhaust port 221, preferably, the air intake hole 224 is defined in the front end of the projection part 22, and it is located above the first air intake hole 223. The second tube 32 includes a connection tube section 322 connected between the first and

the second air intake holes 223, 224, and an extension tube section 323 is connected between the connection tube section 322 and the positive pressure port 302 of the air pressure switch. Wherein, the connection tube section 322 is U shaped, and the extension tube section 323 is at least partly located above the second air intake hole 224.

**[0039]** In this way, when external rains enter the connection tube section 322 through the first air intake hole 223 and/or the second air intake hole 224, the rains will not enter the extension tube section 323 because the extension tube section 323 is at least partly located above the second air intake hole 224, then the rains drain out through the first air intake hole 223. When external winds enter the connection tube part 322 through the first hole 223 and the second hole 224, the two flow of winds converge and enter the extension tube part 323. Referring to Fig. 4, in a preferred embodiment, a venting hole 321 is provided in the extension tube section 323, in order to make the positive pressure port 302 to communicate with the atmosphere in case the first and the second air intake holes 223, 224 are jammed. Of course, in other embodiments, the first and the second air intake holes 223, 224 can be replaced by the venting hole 321 to establish air connection between the positive pressure port 302 and the atmosphere.

**[0040]** Referring again to Fig. 2, in conjunction with Fig. 7 to Fig. 9, a rain shield 40 is provided in the housing 10 and adjacent to the air inlet 111 to prevent rains from entering inside of the appliance. The rain shield 40 includes a main panel 41, a top panel 411, a bottom panel 412, and a pair of side panels 42, 43.

**[0041]** The main panel 41 faces to the air inlet 111. The top panel 411 is bended from top of the front panel 41, and extends obliquely downwardly toward the air inlet 111. The bottom panel 412 is perpendicularly bended from bottom of the main panel 41 and extends toward the air inlet 111 as well. The pair of side panels 42, 43 is perpendicularly bended from opposite sides of the main panel 41 and extends away from the air inlet 111. At least one of the side plates is provided with a number of openings, and in a preferred embodiment, both of the side panels 42, 43 has the openings 421, 431. By this means, rains splashed into the appliance via the air inlet 111 can be resisted mainly by the main panel 41, and the openings 421, 431 defined in the side panels allow air to come inside of the appliance for combustion purpose.

**[0042]** A number of rain resisting tabs 422, 432 are provided near the openings 421, 431 on the side panels 42, 43. Each rain resisting tab 422, 432 has an inclined portion 4221, 4321 extending obliquely from one edge of the opening 421, 431, and a parallel portion 4222, 4322 extending from the inclined portion and in parallel with the side panels 42, 43. This configuration is able to further avoid the rains splashing into the appliance.

**[0043]** The rain shield 40 is mounted in the housing 10 by its bottom panel 412 being connected to the bottom plate 12 through screw means. The bottom panel 412 of

the rain shield 40 defines a number of drain ports 4121 therein, and the bottom plate 12 of the housing 10 is provided with a number of drain slots 122 corresponding to the drain ports 4121. In this way, the rains resisted by the main panel 41 can drain out of the appliance through the drain ports 4121 and the drain slots 122. In addition, the bottom plate 12 is provided with a step 121 located adjacent to a mounting position of the rain shield 40 on the bottom plate 12, and this step can act as an obstruction to prevent the rains resisted by the main panel 41 from entering at the mounting position.

**[0044]** Figs. 12 to 14 show another embodiment of the gas water heating appliance in accordance with present invention, and the main difference with respect to previous embodiments is the position of the second tube. In present embodiment, the second tube 33 has one end connected with the positive pressure port 302 of the air pressure switch 30, and the other end, namely the air intake end 331 located adjacent to the air inlet 111. The air intake end 331 is disposed at a position lower than that of the positive pressure port 302 along a vertical direction. By this means, even if external rains splash into or condensing water is formed in the second tube 33, the fluid would not flow into the air pressure switch 30. In addition, the air intake end 331 is disposed in the middle area of the air inlet 111 along a lateral direction, which can ensure the positive pressure port to sense adverse wind incoming from the air inlet directly.

**[0045]** Referring to Fig. 14, the front plate 11 is provided with a shield plate 112 having a bottom edge which defines a top edge of the air inlet 111. The air intake end 331 of the second tube is disposed behind the shield plate 112, and this arrangement can prevent external rains from splashing into the second tube 33 through the air intake end 331. In addition, the shield plate 112 is provided with a deflector 1121 extending horizontally inwardly, and the air intake end 331 is disposed below the deflector 1121. In this way, adverse winds can be guided into the second tube 33 so that the pressure detected at the positive pressure port 302 is as close as possible to the wind pressure at the air inlet 111.

**[0046]** Similar to the previous embodiments, the second tube 33 defines a venting hold 322 to make the positive pressure port 302 to communicate with the atmosphere in case the air intake end 331 of the second tube 33 is jammed.

**[0047]** It is to be understood, however, that even though numerous, characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosed is illustrative only, and changes may be made in detail, especially in matters of number, shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broadest general meaning of the terms in which the appended claims are expressed.

**Claims****1.** A gas water heating appliance (1) comprising:

a housing (10);  
 a burner (104) disposed in the housing to generate heat;  
 a heat exchanger (107) for absorbing the heat and transferring the heat to water passing there-through;  
 an air supply fan (105) disposed in the housing for supplying air to the burner; and  
 an air pressure switch (30) having a negative pressure port (301) and a positive pressure port (302), said negative pressure port being connected to the air supply fan via a first tube (31), and said positive pressure port being connected to atmosphere via a second tube (32, 33).

**2.** A gas water heating appliance according to claim 1, wherein the housing defines an air inlet (111) at a lower portion thereof; wherein the second tube (33) has an air intake end (331), and said air intake end is located adjacent to the air inlet to receive air passing through the air inlet.

**3.** A gas water heating appliance according to claim 2, wherein said air intake end (331) is disposed at a position lower than that of the positive pressure port (332) of the air pressure switch along a vertical direction.

**4.** A gas water heating appliance according to claim 2, wherein said air intake end (331) is disposed in the middle area of the air inlet (111) along a lateral direction.

**5.** A gas water heating appliance according to claim 2, wherein said air inlet (111) is defined in a front plate (11) of the housing, and said front plate is provided with a shield plate (112) having a bottom edge which forms a top edge of the air inlet; wherein the air intake end (331) is disposed behind the shield plate (112).

**6.** A gas water heating appliance according to claim 5, wherein said shield plate (112) is formed with a deflector (1121) extending horizontally inwardly, and the air intake end (331) is disposed below the deflector.

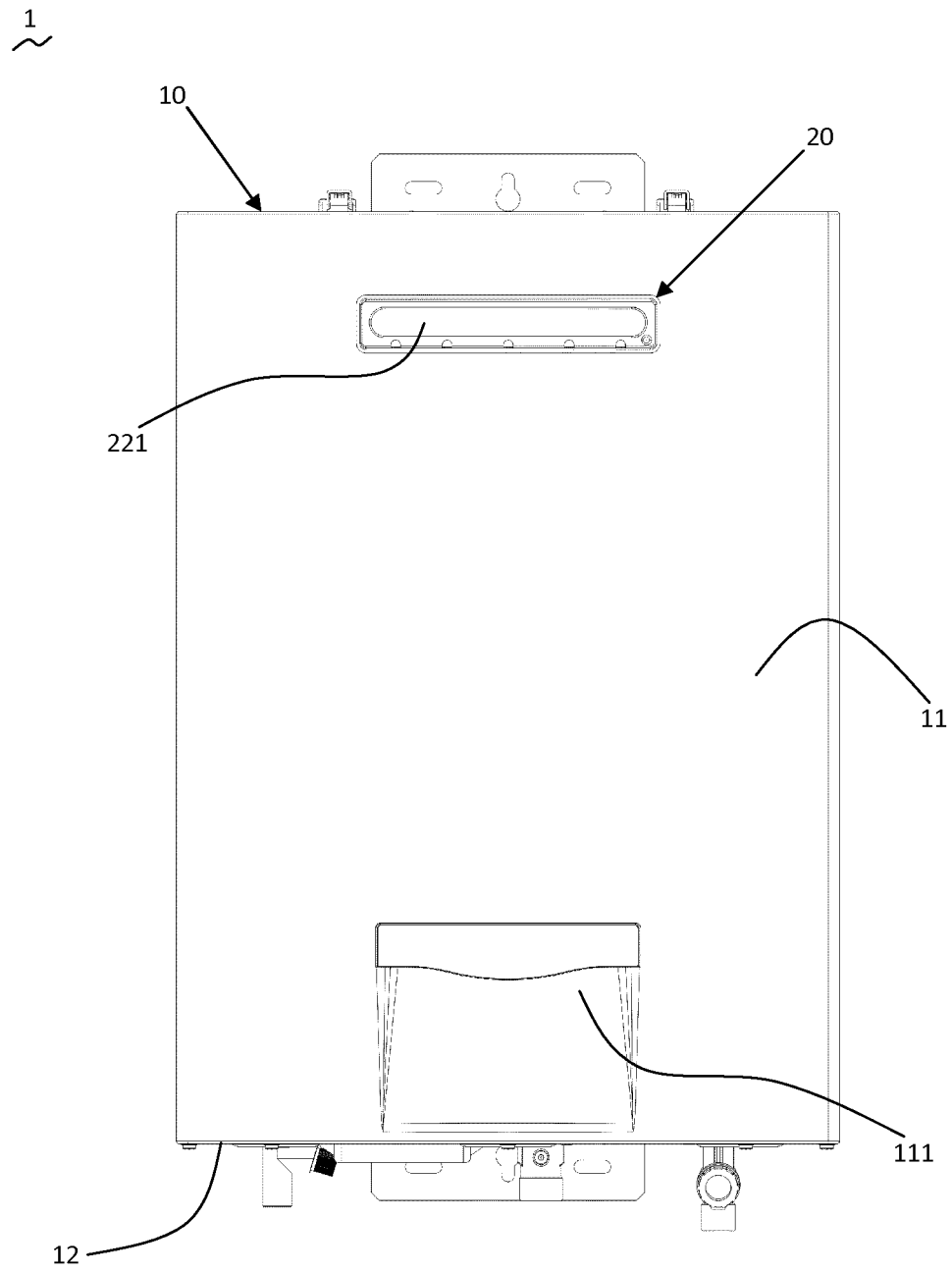
**7.** A gas water heating appliance according to claim 1, further comprising a flue hood (20) disposed in the housing for receiving combustion flue gas generated by the burner, wherein said flue hood has a front end defining an gas exhaust port (221) therein for discharging the flue gas outdoors.

**8.** A gas water heating appliance according to claim 7,

wherein a first air intake hole (223) is disposed at the front end of the flue hood, and the second tube (32) is connected between the positive pressure port (302) and the first air intake hole (223).

**9.** A gas water heating appliance according to claim 8, wherein a second air intake hole (224) is disposed in the front end of the flue hood and above the first air intake hole (223); wherein the second tube comprise a connection tube section (322) connected between the first and the second air intake holes and an extension tube section (323) extending from the connection tube section (322) and connected with the positive pressure port (302), and said extension tube section (323) is at least partly located above the second air intake hole (224).

**10.** A gas water heating appliance according to claim 1, wherein said second tube (32, 33) defines a venting hole (321, 332) in its body.



**Fig. 1**



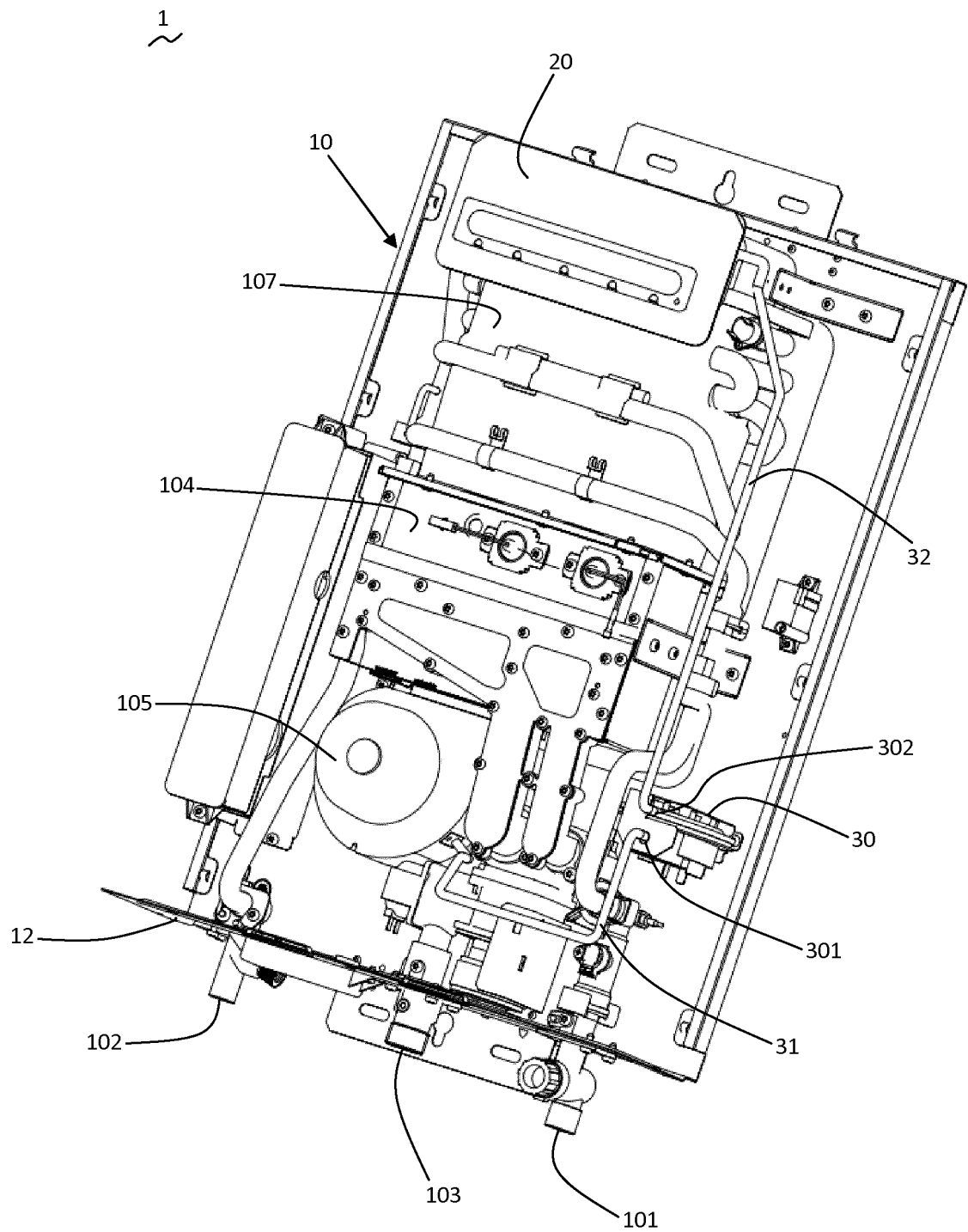
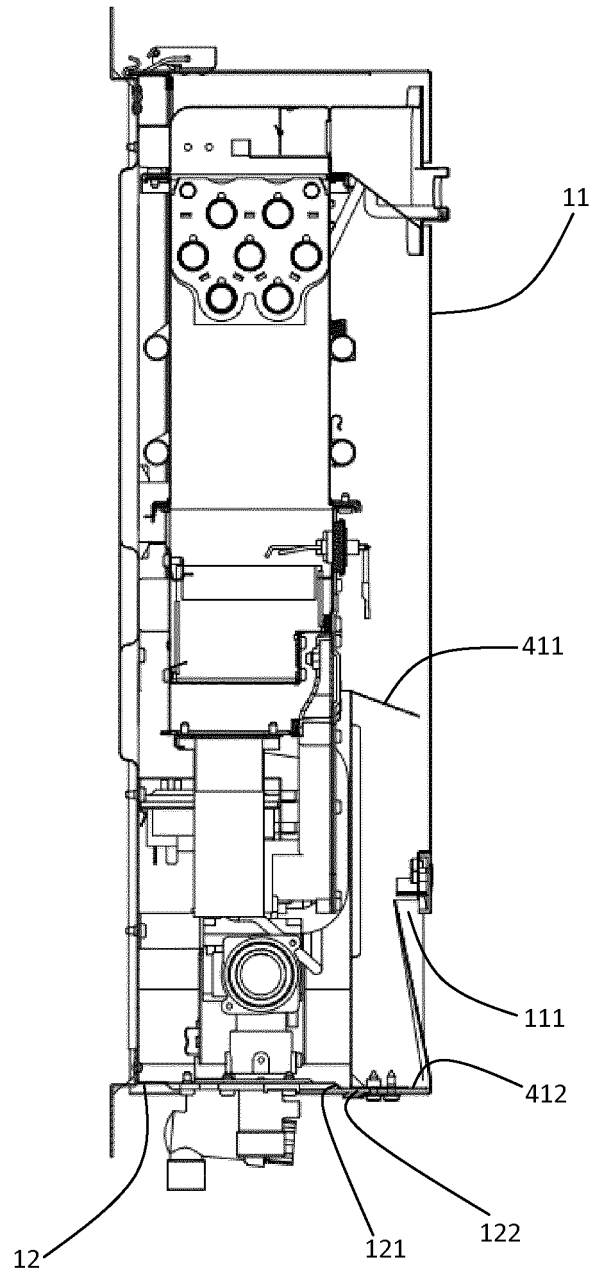
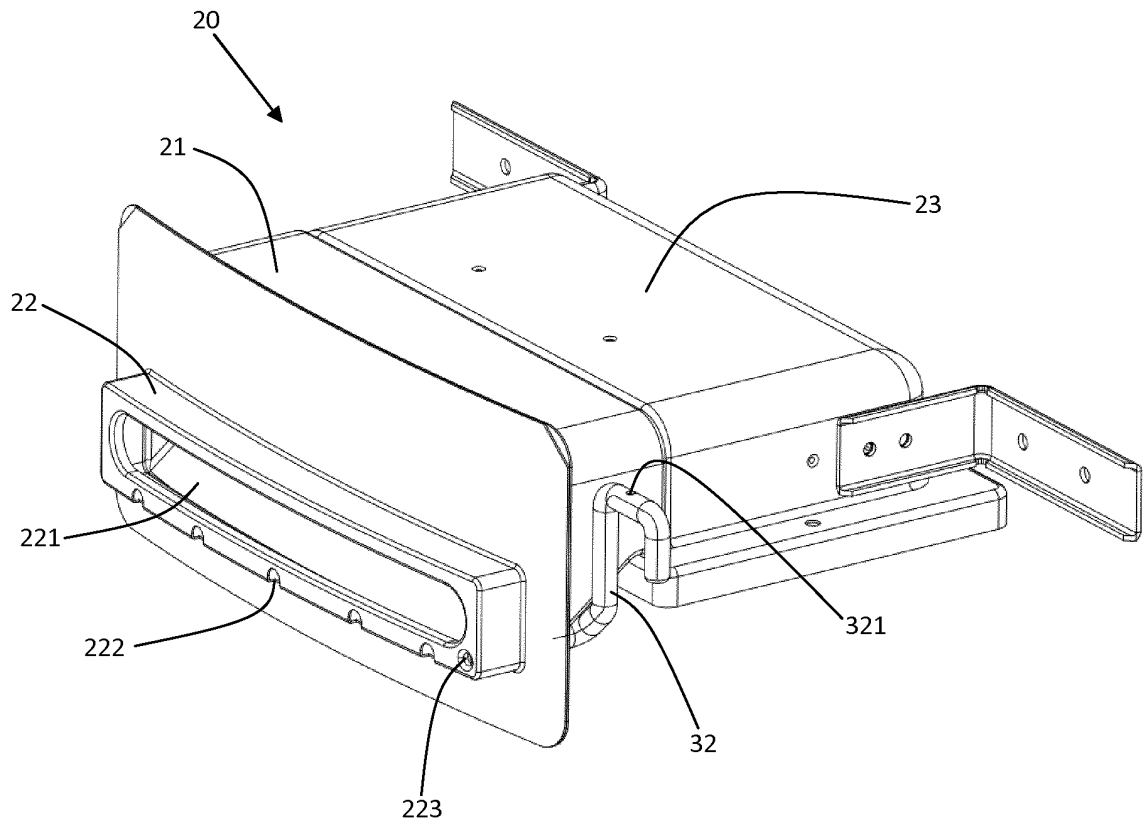


Fig. 2

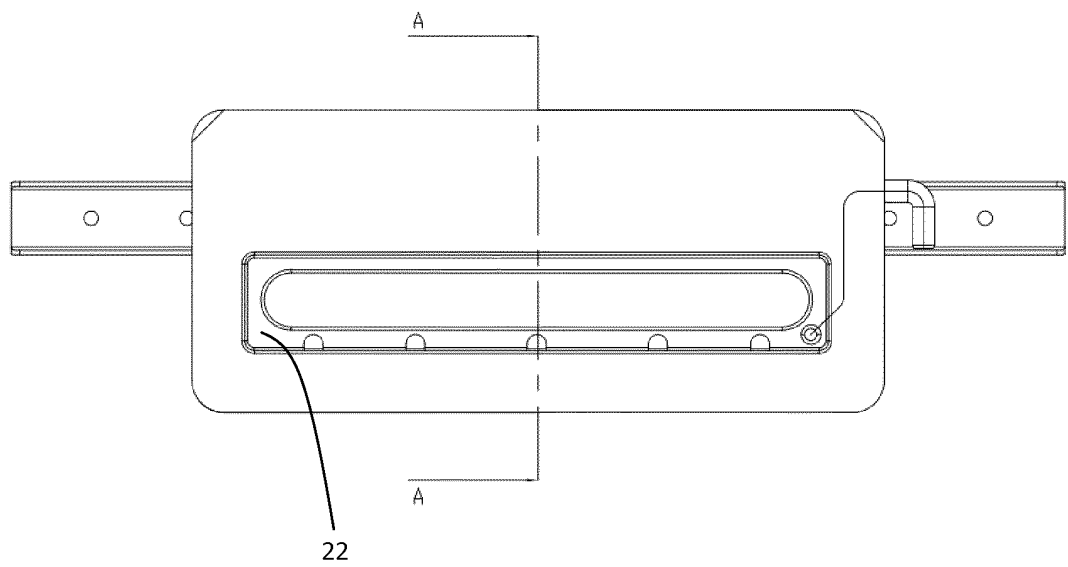
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**Fig. 3**



**Fig. 4**



**Fig. 5**

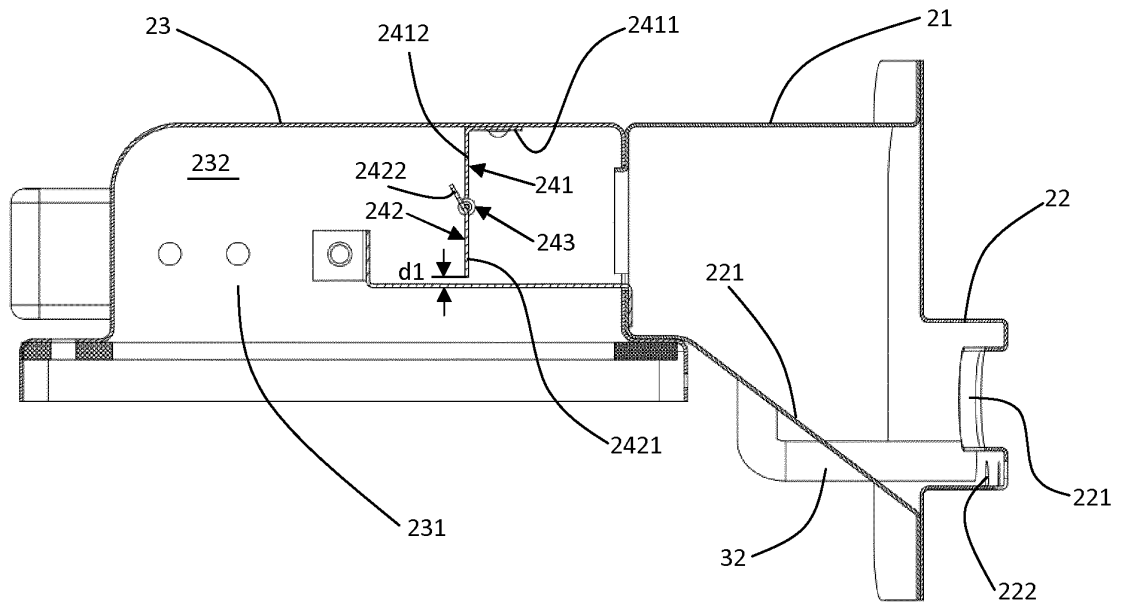


Fig. 6A

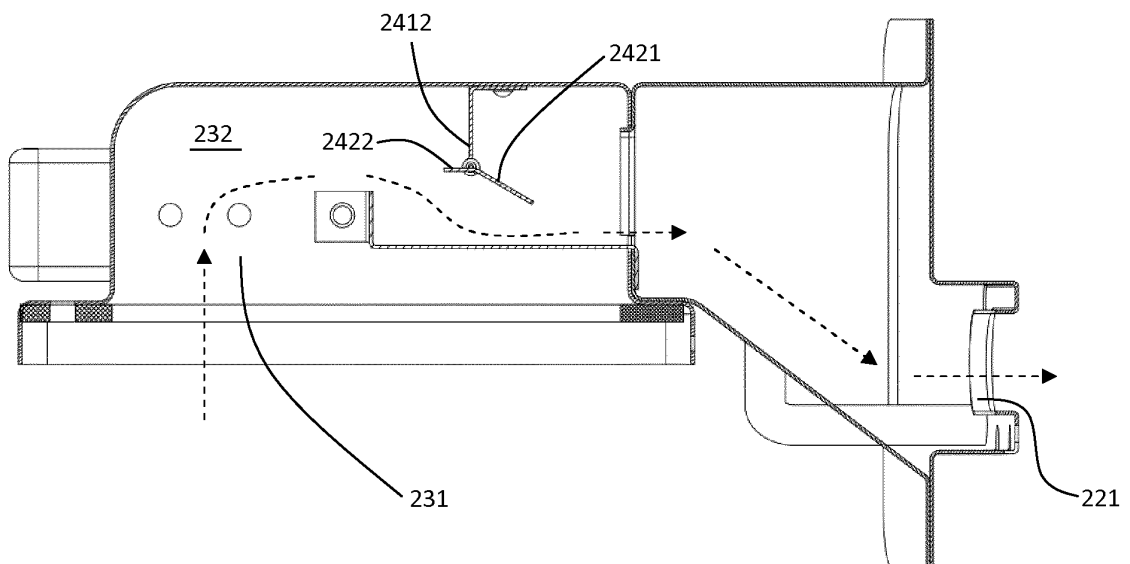


Fig. 6B

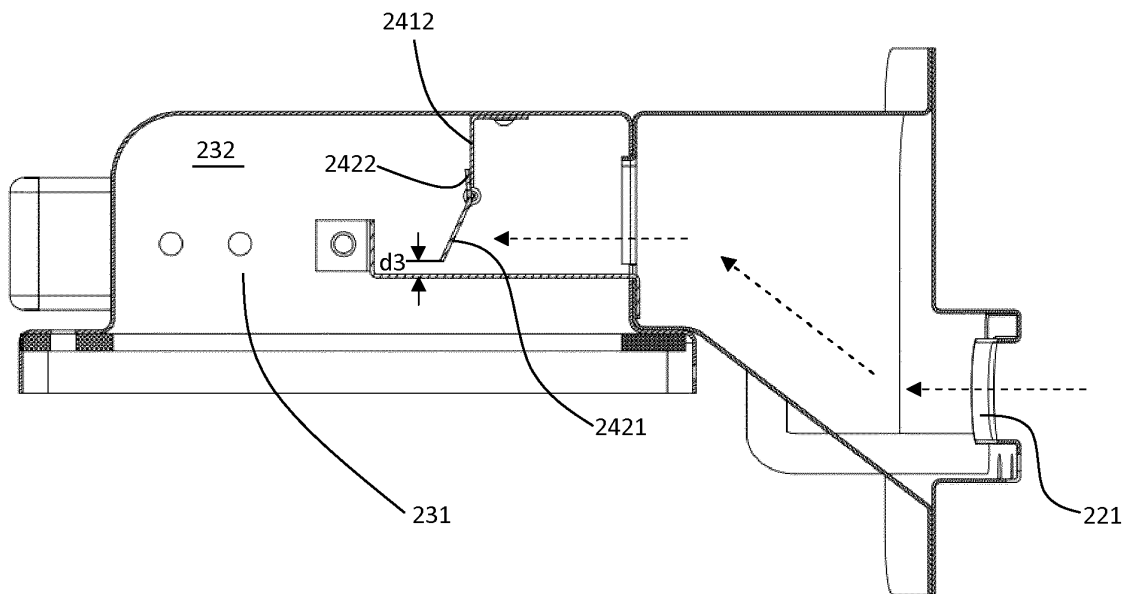


Fig. 6C

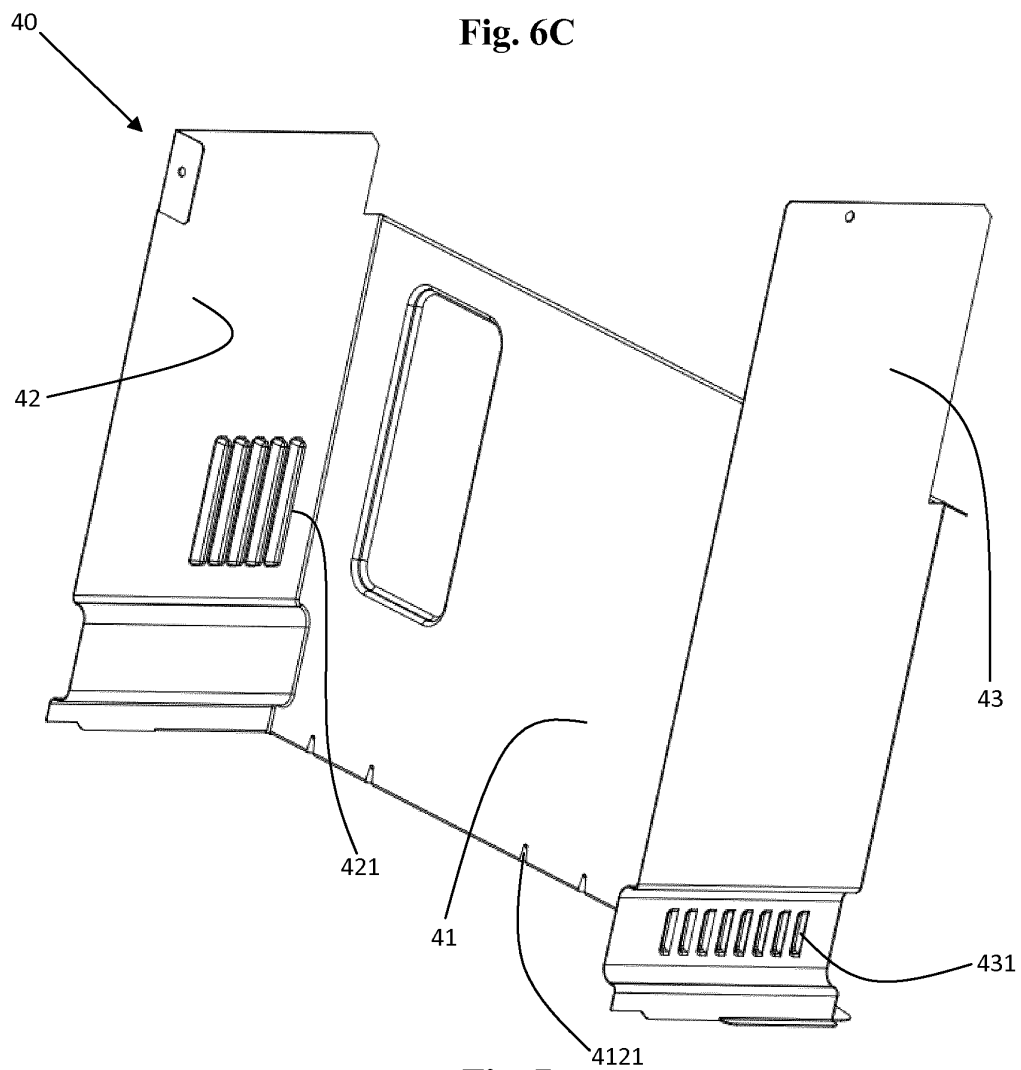
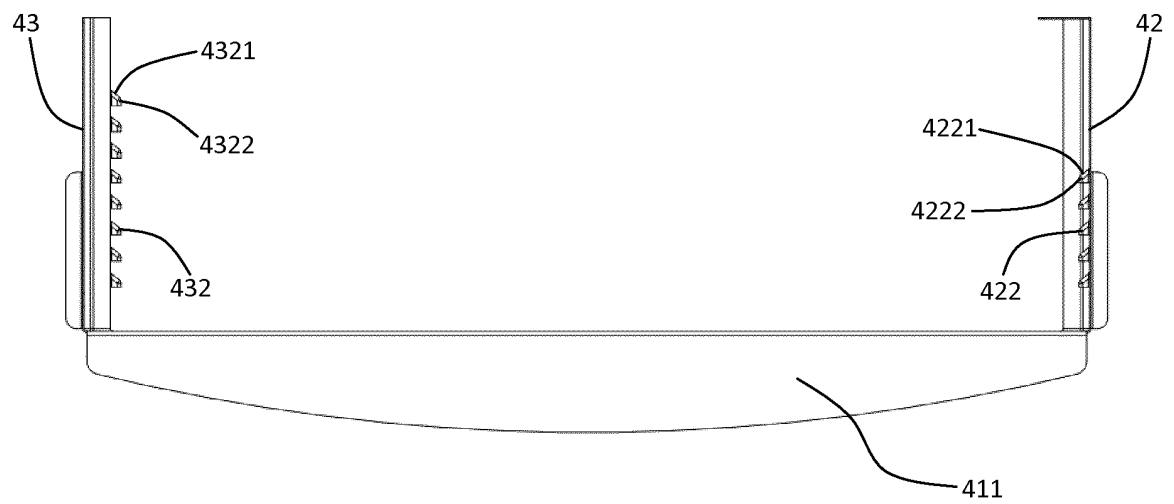
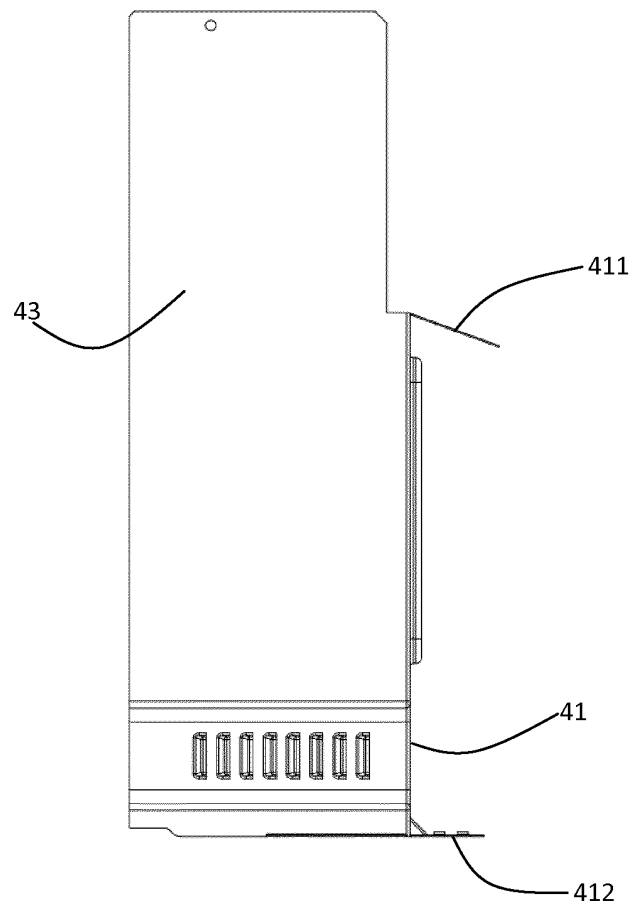


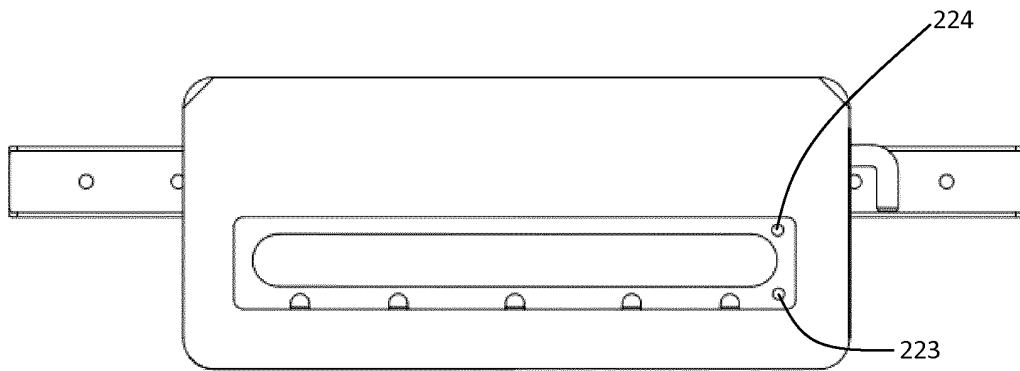
Fig. 7



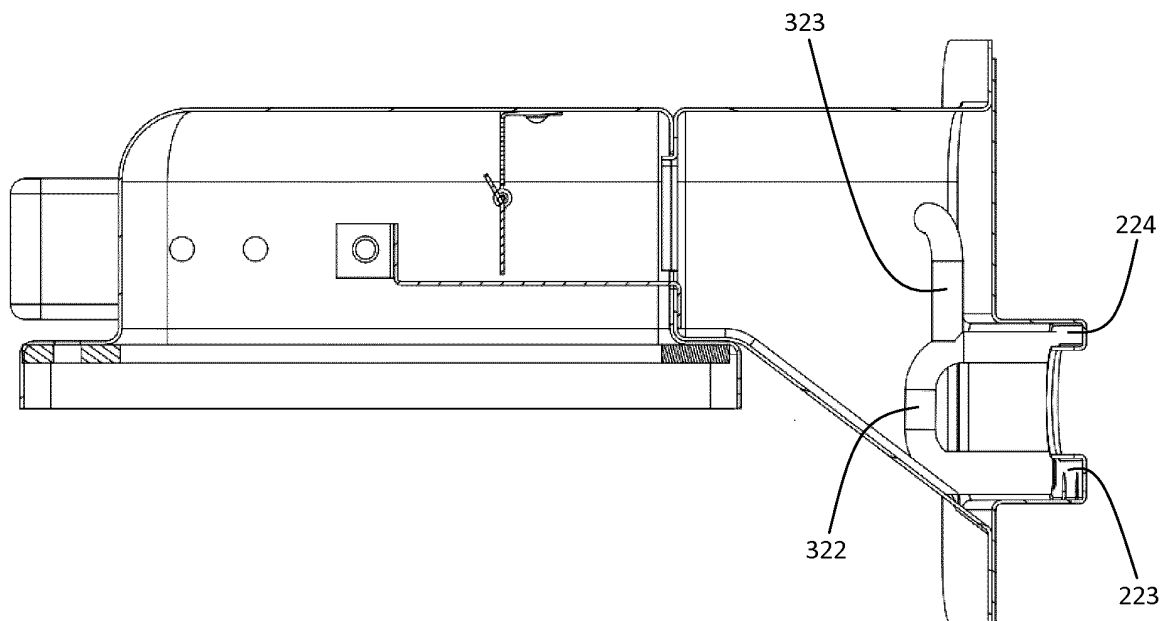
**Fig. 8**



**Fig. 9**

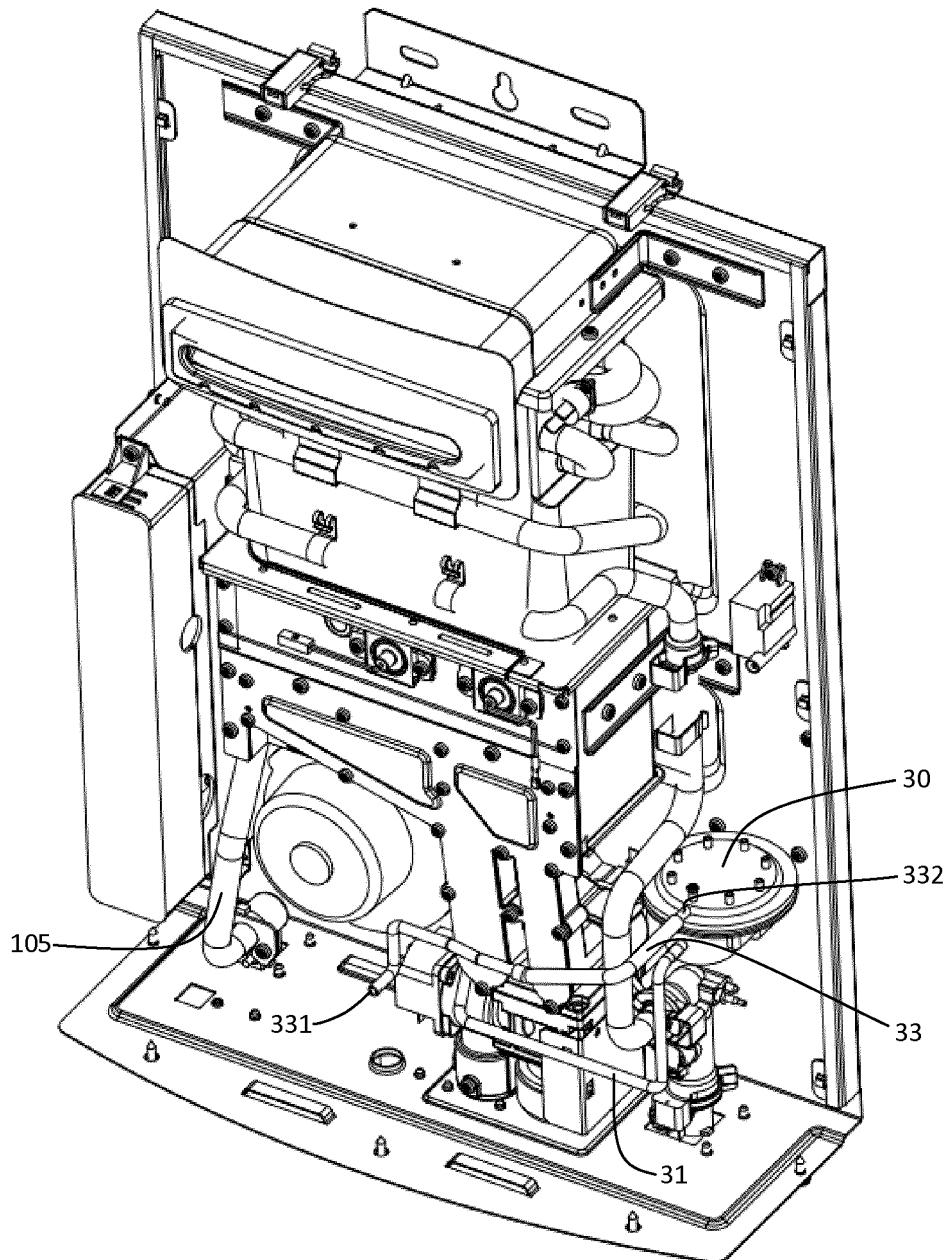


**Fig. 10**



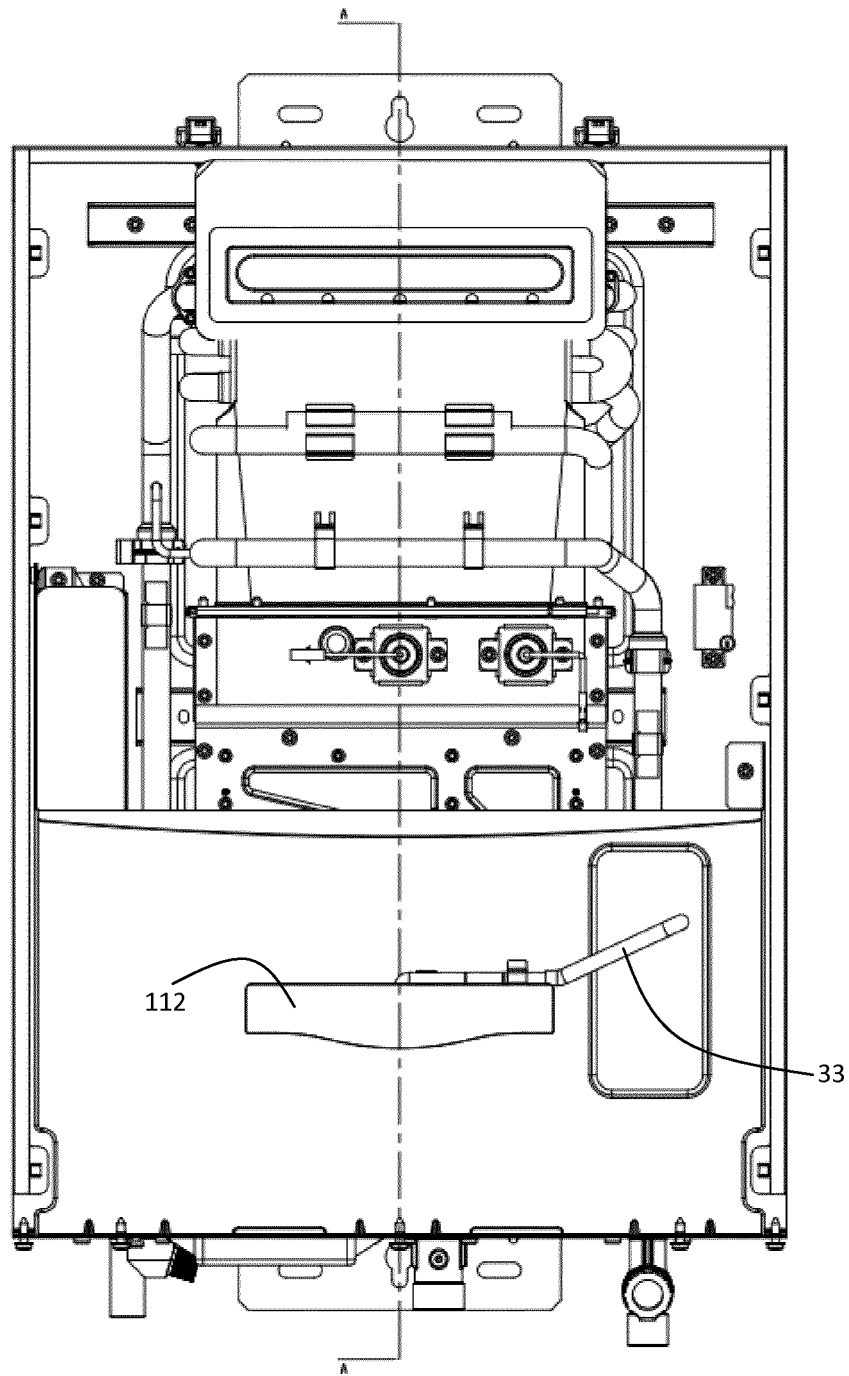
**Fig. 11**

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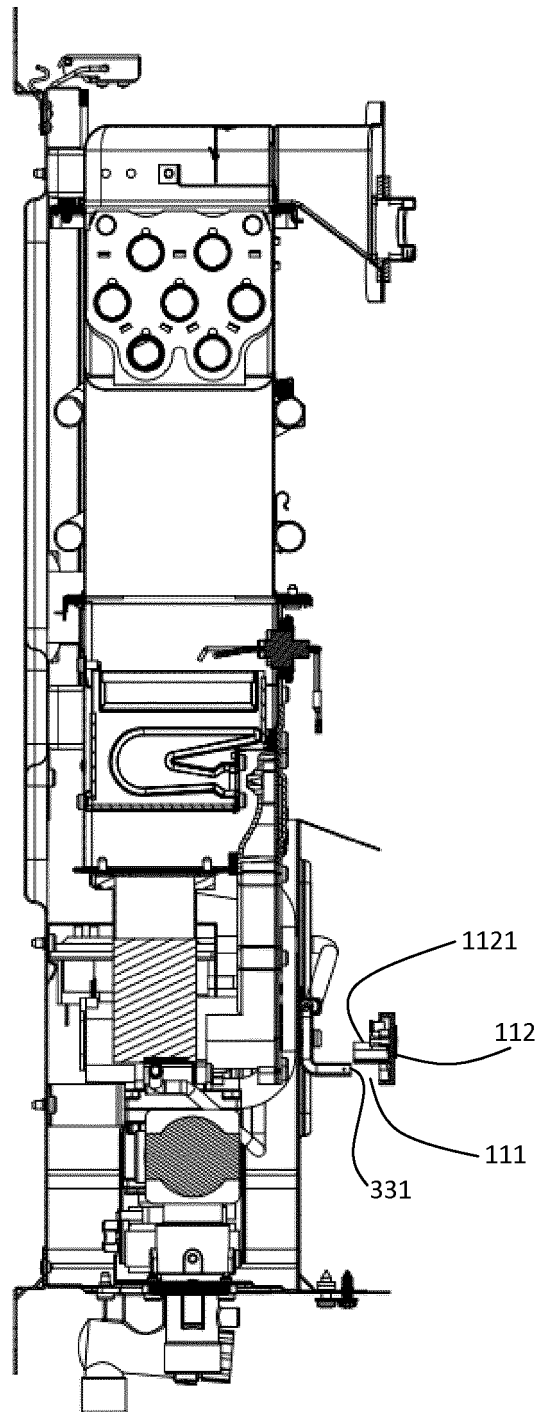


**Fig. 12**





**Fig. 13**



**Fig. 14**



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