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(54) **PORTABLE GAS BURNER**

(57) The present invention comprises a bent pipe in which a fuel injection pipe for injecting fuel from the outside is formed, and a fuel tank connected to said bent pipe for injecting fuel into said fuel injection pipe. Said bent pipe includes a first portion in which said fuel injection pipe is disposed and an air inlet extending longitudinally along the lower part of said fuel injection pipe is formed, a second portion spaced apart from said first portion and having a gas discharge opening formed therein, and a third portion formed at the lower end of said first and second portions and connecting said first and second portions. A nozzle for injecting fuel into said first portion is formed at the end of said fuel injection pipe within said first portion. and an air inlet opening for air inflow from the outside is provided below said nozzle in said first portion, thereby providing a portable gas burner.

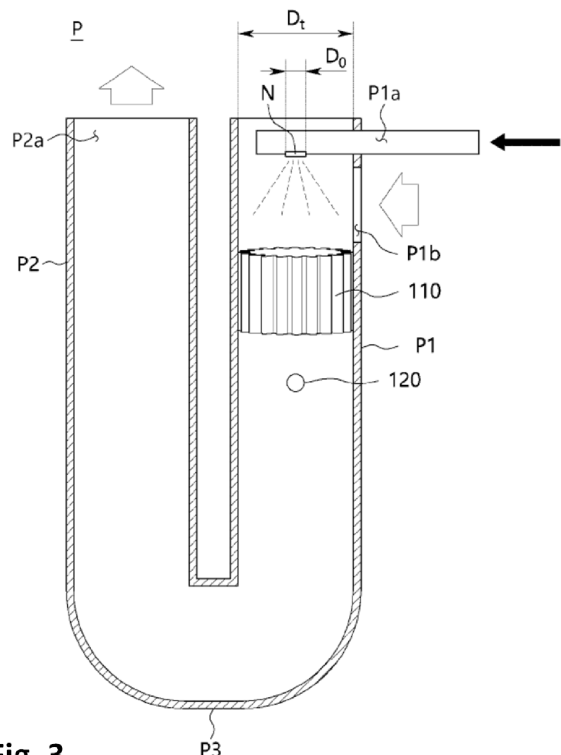


Fig. 3

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Description

Technical Field

[0001] The present invention relates to a portable gas burner, and more particularly to a portable gas burner for combusting a fuel-air mixture.

Background Art

[0002] Typically, a portable gas burner is used by placing a pot on top of the main body and igniting the gas. In particular, a burner body forming a burner port is located in the center of the case, a grilling plate or a pot is placed on the burner body, and a gas cylinder mounting portion is provided for removing a butane gas cylinder by operating a lever.

[0003] Then, by operating the fuel supply/ignition switch placed on the front of the gas cylinder mounting portion, fuel is supplied from the butane gas cylinder, and a piezoelectric element generates a spark to release the fuel into the burner port and ignite the flame simultaneously.

[0004] However, portable gas burners like this are rather large and heavy for portable use, and require additional tools such as pots, kettles, and roasting plates. Also, these portable gas burners are made of metal to withstand the flame, which increases weight, and folding structures for downsizing are rarely adopted.

[0005] On the other hand, immersion burners have also been used, where the heating element is submerged in a liquid such as water and then heated by flame.

[0006] However, immersion burners have inadequate air intake, resulting in incomplete combustion of the fuel, which produces carbon monoxide (CO). In addition, immersion burners are constructed as compact products, which can cause the flame to backfire between one pipe and the other, completely eliminating the air that would otherwise be drawn between the two pipes, resulting in large amounts of carbon monoxide (CO).

[0007] As such, insufficient air volume results in incomplete combustion of the fuel, and incomplete combustion reduces the heat efficiency of the fuel transferred to the burner.

Description of the Invention

Technical Problem

[0008] The present invention is directed to solving the above problems, and aims to provide a portable gas burner in which an air inlet is disposed adjacent a nozzle from which fuel is ejected, so that fuel and air are mixed for substantially complete combustion.

Technical Solution

[0009] According to one embodiment of the present

invention, the portable gas burner comprises: a bent pipe in which a fuel injection pipe, into which fuel is supplied from the outside, is formed; and a fuel tank connected to said bent pipe and configured to inject fuel into said fuel injection pipe. The bent pipe includes: a first part in which the fuel injection pipe is disposed and in which an air inlet opening extending longitudinally is formed in a lower portion of the fuel injection pipe; a second part spaced apart from the first part and in which a gas outlet opening is formed; and a third part formed at the lower portions of said first and second parts and connecting the first and second parts. A nozzle configured to inject fuel into the first part is formed at an end of the fuel injection pipe within the first part and an air inlet through which air is introduced from the outside is formed at a lower portion of said nozzle of the first part.

[0010] According to the portable gas burner of the present invention, the portable gas burner may further comprise a decelerating portion disposed inside the first part, wherein the decelerating portion is configured to decelerate a flow velocity of a mixed gas, which is formed by mixing fuel injected from the nozzle and air introduced through the air inlet, while the mixed gas flows within the first part.

[0011] According to the portable gas burner of the present invention, wherein said decelerating portion may comprise a plurality of semicircularly shaped pipes connected in succession, adjacent semicircularly shaped pipes being convexly disposed in different directions, said decelerating portion being inserted so as to be in contact with the outer wall of said first part, and wherein said decelerating portion, when inserted into said first part, may form a central opening through which said mixed gas flows into the inner side of said decelerating portion and a plurality of side openings through which said mixed gas flows between said first part and said decelerating portion.

[0012] According to the present invention, the portable gas burner may further comprise an igniter arranged downstream of said decelerating portion and causing combustion of a mixed gas formed from fuel injected from said nozzle.

[0013] According to the portable gas burner of the present invention, the portable gas burner may further comprise a height adjustment portion for adjusting the distance between said nozzle and said decelerating portion, connected to the one end of said decelerating portion and movably fixed to said first part, said height adjustment portion comprising a body connected to said decelerating portion, extending from said end and bent so as to be disposed on the outside of said first part, and a fixing member by which said body is movably coupled to said first part.

[0014] According to the portable gas burner of the present invention, the portable gas burner may further comprise a heat insulation portion disposed between said first and second parts and which reduces the temperature drop of the flame ignited from said combustion

gases.

[0015] According to the portable gas burner of the present invention, the portable gas burner may further comprise a bypass pipe from said third part directly to the intermediate portion of said second part.

[0016] According to the portable gas burner of the present invention, the portable gas burner may further comprise an exhaust extension arranged to wrap around an end of said second part and adjustable in length for a flow path of combustion gases discharged from said second part, said exhaust extension further comprising a plurality of retaining clips contactable with an outer peripheral surface of said second part, and an exhaust extension pipe secured by said plurality of retaining clips and arranged to wrap around said second part and movable up and down.

[0017] According to the portable gas burner according to the invention, a gap may be formed between said exhaust extension pipe and said second part through which air is introduced from the outside.

[0018] According to the portable gas burner of the present invention, the portable gas burner may further comprise a flashback prevention portion disposed above said decelerating portion and formed in a grid shape to extinguish the flame by reducing the flame temperature when the ignited flame travels in the reverse direction.

[0019] According to the portable gas burner of the present invention, said first part may comprise an upper region in which said fuel injection pipe is disposed, and a lower region extending downwardly from said upper region, in which said decelerating portion and igniter are disposed, and which is formed with an inner diameter larger than said upper region.

[0020] According to the portable gas burner of the present invention, the portable gas burner may comprise a vortex generator formed by a plurality of blades, installed on the inner circumference of said lower region, disposed adjacent the igniter, and configured to cause vortices of said fuel and air.

[0021] According to a portable gas burner of the present invention, wherein the specific gravity (S) of the fuel supplied to said fuel injection pipe is S, the inner diameter of said nozzle is D_0 , the inner diameter of said first part is D_t , and the ratio of air entering said bent pipe to the amount of fuel ejected from said nozzle is R, i.e., the mixed gas, satisfies

$$R = S^{1/2} \left(\frac{D_t}{D_0} - 1 \right)$$

, where R has a value required for complete combustion of the fuel used.

[0022] According to the portable gas burner of the present invention, said fuel tank may comprise a storage portion for storing said fuel therein, connected to said fuel inlet pipe for injecting said fuel into said fuel inlet pipe, a switch for directing said fuel to be injected, formed along

the length of said storage portion and connected to said nozzle, and a regulating lever for regulating the amount of fuel injected, formed on an outer side of said storage portion.

[0023] According to the portable gas burner of the present invention, the portable gas burner may comprise a locking mechanism for rotating said storage portion and securing said rotated storage portion to said bent pipe when said switch is used to instruct said nozzle to spray fuel.

[0024] According to the portable gas burner of the present invention, the portable gas burner may comprise a first pipe disposed on an inner side of said first portion and formed spaced apart from an inner wall of said first portion, and a barrier disposed between said third portion and said first portion, wherein an end of said first pipe faces the third portion and is formed to seal between the third portion and the first portion.

[0025] According to one embodiment of the present invention, the portable gas burner comprises a first pipe, a second pipe formed to enclose a lower region of said first pipe, a fuel injection pipe inserted inside said first pipe and formed with a nozzle for injecting fuel in a direction toward said second pipe, and an air inlet disposed between said first pipe and said second pipe, through which air miscible with the fuel injected inside said first pipe is formed.

[0026] According to one embodiment of the present invention, an inner diameter of said first pipe may be formed equal to or smaller than an inner diameter between an outer circumference of said second pipe and an outer circumference of said first pipe.

Advantageous Effects

[0027] According to one embodiment of the present invention, by arranging a single bent pipe, a nozzle through which fuel is injected and an air inlet through which air is injected are arranged adjacent to each other, so that sufficient air is drawn into the nozzle side to enable sufficient mixing of fuel and air.

[0028] The sufficiently mixed gas is completely combusted at the igniter to maintain a high temperature, so that the flame can be maintained even when immersed in a cold liquid.

Brief Description of Drawings

[0029]

FIG. 1 is a perspective view of a portable gas burner according to one embodiment of the present invention.

FIG. 2 is a perspective view of the usage in FIG. 1. FIG. 3 is a cross-sectional view of the schematic state of the bent pipe of FIG. 1.

FIG. 4 is a top view of the bent pipe from FIG. 1.

Each of FIGS. 5 to 10 is a cross-sectional view

showing a bent pipe according to different embodiments of the present invention.

FIG. 11 is a diagram showing a portable gas burner according to another embodiment of the present invention.

FIG. 12 is a cross-sectional view of a portable gas burner according to another embodiment of the present invention.

Description of Embodiments

[0030] The invention has been described with reference to the embodiments shown in the drawings, which are exemplary only, and those having ordinary skill in the art will understand that various modifications and other equally valid embodiments are possible. Therefore, the true technical scope of the present invention should be defined by the technical spirit of the appended claims.

[0031] FIG. 1 is a perspective view of a portable gas burner (1) according to one embodiment of the present invention, FIG. 2 is a perspective view of a portable gas burner (1) in a state of use according to one embodiment of the present invention, FIG. 3 is a cross-sectional view of a schematic state of a bent pipe P of the portable gas burner (1) according to one embodiment of the present invention, and FIG. 4 is a plan view of the bent pipe (P) of the portable gas burner (1) according to one embodiment of the present invention.

[0032] Hereinafter, with reference to FIGS. 1 to 4, a portable gas burner 1 according to one embodiment of the present invention will be described. Said portable gas burner (1) includes a bent pipe (P), a fuel tank (T), a decelerating portion (110) and an igniter (120).

[0033] Said bent pipe (P) is formed as an integral pipe formed in a U shape and includes a first part (P1), a second part (P2), and a third part (P3) formed integrally with each other.

[0034] Said first part (P1) is arranged with a fuel injection pipe (P1a) through which fuel is injected from the outside, and an air inlet (P1b) extending along a longitudinal direction is formed at the lower end of the fuel injection pipe (P1a).

[0035] More specifically, on the end side of said fuel injection pipe (P1a) in said first part (P1), a nozzle (N) is configured to inject fuel into the interior of said first part (P1). In the lower portion of said nozzle (N) of the first part (P1), an air inlet (P1b) is opened through which air is introduced from the outside. Therefore, the nozzle (N) through which fuel is injected and the air inlet (P1b) through which air is injected are arranged adjacent to each other, so that the gas jet injected from the nozzle (N) has the effect of drawing in sufficient air from the side due to the Venturi effect.

[0036] Referring now to FIG. 3, air may be drawn in through the air inlet (P1b) or through an opening opened upwardly of the first part (P1). In addition, the air drawn into the first part (P1) utilizes the Venturi principle, which means that the air required for combustion can be drawn

in using only the pressure of the gas injected from the nozzle (N).

[0037] In contrast to industrial immersion gas burners, the portable gas burner of the present invention relates to a portable gas burner, which is a miniaturized gas burner that allows sufficient air absorption only through the Venturi effect. This is unlikely to happen with industrial immersion gas burners.

[0038] The second part (P2) is spaced apart from the first part (P1), and a gas outlet opening (P2a) is formed at the upper portion. In this case, the gas outlet opening (P2a) and the air inlet at the upper portion of the first part (P1) may be at different angles toward each other. In particular, the direction of discharge from the gas outlet opening (P2a) and the direction of air inflow into the first part (P1) may be angled to each other. This prevents the exhaust gas from the gas outlet opening (P2a) and the air entering the first part (P1) from mixing with each other.

[0039] Furthermore, the angle formed by the first part (P1) and the gas outlet opening (P2a) may be adjusted so that the exhaust gas discharged from the gas outlet opening (P2a) does not enter the air inlet (P1b) or the upper portion of the first part (P1), or the position of the air inlet (P1b) may be adjusted. This minimizes the effect of exhaust gas from the gas outlet opening (P2a) being mixed with air from the upper portion of the first part (P1) or air from the air inlet (P1b).

[0040] The third part (P3) is formed below the first part (P1) and the second part (P2), and connects the first part (P1) and the second part (P2). In this case, the third part (P3) may extend at least partially curved to account for the flow of the mixed gas. In this case, the space of the third part (P3) can be more than just the space connecting the two ends of the first part (P1) and the second part (P2). In particular, the third part (P3) may form a space having an inner diameter of at least three times the inner diameter of the first part (P1).

[0041] The fuel tank (T) is connected to the bent pipe (P), injects fuel into the fuel injection pipe (P1a), and includes a storage portion (T1), a switch (T2), a regulating lever (T3), and a locking mechanism (T4). In this case, the fuel tank (T) can serve as a handle for the portable gas burner. However, an additional handle (not shown) may be provided to grip the heater during operation or when it is overheated. Such a handle may be used to lift the entire portable gas burner. On the other hand, the fuel tank may be formed to allow the user to refill it directly. Further, the fuel tank may be formed as a replaceable cartridge.

[0042] Said storage portion (T1) stores the fuel inside and is connected to the fuel injection pipe (P1a) to inject the fuel toward the fuel injection pipe (P1a). Here, the fuel stored inside the storage portion (T1) may be in a liquid state, and may be vaporized when injected into the interior of the first part (P1) through the fuel injection pipe (P1a), and may be injected into the first part (P1) in a gas state. On the other hand, the ignition can be aided by installing a valve to inject fuel into the fuel injection pipe (P1a) and a valve to adjust the amount of air intake. In

particular, a valve for adjusting the amount of fuel being injected and an air inlet control valve for adjusting the amount of air being inhaled may be arranged.

[0043] In this case, said switch (T2) is formed longitudinally of the storage portion (T1), is connected to the nozzle (N) and is directed to inject fuel, and the regulating lever (T3) is formed on the outside of the storage portion (T1) and is adjustable to adjust the amount of fuel injected from the nozzle (N).

[0044] Further, if the switch (T2) is used to direct the nozzle (N) to inject fuel, the storage portion (T1) is rotated and a locking mechanism (T4) is installed to secure the rotated storage portion (T1) to the bent pipe (P).

[0045] The locking mechanism (T4) is slidably formed on the upper side of said fuel tank (T) and, when the portable gas burner (1) is used, the fuel tank (T) is rotated as shown in FIG. 2 and subsequently secured by inserting it into a groove (not shown) formed in the side of the bent pipe (P).

[0046] Next, a decelerating portion (110) that controls the flow speed inside the first part (P1) and an igniter (120) that causes combustion in the mixed gas that has passed through the decelerating portion (110) will be described.

[0047] Said decelerating portion (110) is disposed inside the first part (P1). Fuel injected from the nozzle (N) and air drawn in from the air inlet (P1b) are mixed and flowed as a mixed gas. Said decelerating portion (110) slows down the flow rate of the mixed gas as it flows within the first part (P1).

[0048] Further, the decelerating portion (110) may comprise a plurality of semicircularly shaped pipes connected in succession, the adjacent semicircularly shaped pipes being convexly disposed in different directions, and the decelerating portion (110) may be inserted so as to be in contact with the outer wall of the first part (P1). In particular, referring to FIG. 4, the decelerating portion (110) may be shaped as a semi-circular series of pipes staggered and connected to each other.

[0049] When the decelerating portion (110) is inserted into the first part (P1), a central opening (H1) through which the mixed gas flows inwardly of the decelerating portion (110) and a plurality of side openings (H2) through which the mixed gas flows between the first part (P1) and the decelerating portion (110) may be formed.

[0050] Further, the decelerating portion (110) may be inserted and disposed in the first part (P1), and further, the decelerating portion (110) may be disposed in the second part (P2) or third part (P3).

[0051] When the inner diameter of the first part (P1) is formed to be small in order to inhale only the amount of air necessary for combustion, combustion is not possible in the first part (P1) due to the high velocity of the mixed gas. As a result, the inner diameter of the second part (P2) may be enlarged, and the decelerating portion (110) may be disposed on a side of the enlarged inner diameter to induce combustion. In addition, the enlarged inner diameter can slow down the flame, increasing combustion

efficiency.

[0052] Said igniter (120) is disposed downstream of the decelerating portion (110). This creates a spark in the gas mixture that has passed through the decelerating portion (110), causing the gas mixture to combust.

[0053] In the following, the method of mixing the fuel injected from the nozzle (N) and the air injected through the air inlet (P1b) to form a mixed gas and igniting it will be described.

[0054] First, fuel is injected in a gaseous state from the nozzle (N), and air is introduced through the air inlet (P1b). The fuel and air are then mixed to form a mixed gas. The mixed gas passes through the central opening (H1) and the side opening (H2). In this case, the width of the side opening (H2) is relatively narrow compared to the opening width of the central opening (H1), so the velocity of the mixed gas passing through the side opening (H2) is relatively reduced.

[0055] The mixed gas flowing without resistance through the central opening (H1) of the decelerating portion (110), and a portion of the mixed gas that does not flow into the central opening (H1) passes through a plurality of side openings (H2), thereby reducing the velocity of the portion of the mixed gas.

[0056] The mixed gas that has passed through the central opening (H1) and the side openings (H2) is then combusted by the igniter (120). In particular, some of the gas mixture having a reduced velocity in the plurality of side openings (H2) may be ignited, ejected and added to the flame of the first gas mixture so that combustion is maintained continuously. In particular, it is difficult to maintain a flame when the velocity of the gas mixture exceeds about 40 cm/s. Some of the gas that has passed through the side openings (H2) is slowed down and ignited, and flame is continuously added to the large volume of rapidly mixing gas coming out of the central opening (H1) with the flame of the gas from the side openings (H2). The velocity of the gas mixture through the central opening (H1) is several m/s, making ignition difficult.

[0057] In order to properly control the gas mixture in the portable gas burner (1) of the present invention, it is necessary to design the bent pipe (P) to a suitable size. In particular, it is necessary to adjust the size of each configuration of the bent pipe (P) in order to ensure that the vaporized gas ejected from the nozzle (N) is mixed with sufficient air to make it completely combustible during its passage through said bent pipe (P).

[0058] The Prigg formula is as follows. When the specific gravity (S) of the fuel supplied to the fuel injection pipe (P1a) is S, the inner diameter of the nozzle (N) is D0, the inner diameter of the first part (P1) is Dt, and the ratio of air entering the bent pipe (P) to the amount of fuel ejected from the nozzle (N), that is, the fuel-to-air ratio of the mixed gas, is R, R is equal to

$$R = S^{1/2} \left(\frac{D_t}{D_0} - 1 \right)$$

[0059] Here, even if the same nozzle and Venturi tube are used (reducing the amount of gas ejected), the "ratio" of air inhaled remains the same, and only the ratio of the inside diameter of the nozzle bore to the inside diameter of the Venturi tube affects the gas mixture.

[0060] Therefore, the mixing ratio R has the value required for complete combustion of the fuel used. For example, if butane gas is used as fuel, it is characterized by having a value between 30 and 32. In addition, if liquefied petroleum gas (LPG) or natural gas (NG) is used as fuel, R can have a value between 11 to 13. In addition, the R value may be set to within approximately 5% above the theoretical value for complete combustion. The principle of air intake utilizes the Venturi effect.

[0061] Hereinafter, the bent pipe (Pa) of the portable gas burner (2) according to different embodiments of the present invention will be described. The aforementioned redundancy in the configuration of the portable gas burner (2) of the present invention will be omitted from the following description.

[0062] Referring to FIG. 5, a portable gas burner (2) according to different embodiments of the present invention includes a bent pipe (Pa), a fuel tank (T), a decelerating portion (110), an igniter (120), and a height adjustment portion (130).

[0063] Said height adjustment portion (130) is connected to one end of the decelerating portion (110) and is movably fixed to the first part (P1). The height adjustment portion (130) includes a body (131a) and a fixing member (131b). The height adjustment portion (130) can adjust the height of the decelerating portion within the first part by adjusting the height relative to the first part (P1). Accordingly, the height adjustment portion (130) adjusts the distance between the nozzle (N) and the decelerating portion (110).

[0064] Said body (131a) may be formed in an $\cap$ shape. One end of the body (131a) is connected to the decelerating portion (110), and a second end of the body (131a) extends upwardly from the end and is bent and disposed on the outside of the first part (P1). That is, one end of the body (131a) is disposed inside the first part (P1), the other end of the body (131a) is disposed outside the first part (P1), and the center side of the body (131a) passes through the air inlet (P1b). Accordingly, the body (131a) may be formed to span the air inlet (P1b).

[0065] Said fixing member (131b) is movably coupled to the body (131a) in the first part (P1).

[0066] In particular, the height of the decelerating portion (110) within the first part (P1) may be adjusted by means of the height adjustment portion (130) in order to adjust the gap between the nozzle (N) and the air inlet (P1b) and the decelerating portion (110). Through this, by adjusting the space in which the fuel injected from the nozzle (N) is mixed with the air injected through the air

inlet (P1b), a mixed gas fulfilling the R-value described above can be formed.

[0067] In particular, the decelerating portion (110) is intended to maintain the flame as it passes through the decelerating portion (110), as it is difficult to maintain a flame in a fast flowing mixed gas. That is, the flame may start as it passes the decelerating portion (110). Therefore, by adjusting the position of the decelerating portion (110), the starting position of the flame can be adjusted.

[0068] In this case, the reason for adjusting the starting position of the flame is as follows.

[0069] When the burner is put in water in a cup, the water may not be at a consistent height. For example, when boiling water in a pot, the flame is below the water so it doesn't overheat as long as there's water in the pot. However, if the amount of water is insufficient, the upper portion of the first part (P1), the area where the flame is present, may not be submerged. In this case, the upper portion of the first part (P1) can overheat. In particular, for a fully mixed gas, the highest temperature can be reached almost from the start of the flame. Therefore, by adjusting the position of the decelerating portion (110) according to the height of the water, the starting point of flame generation can be adjusted to be below the height of the water to avoid various problems associated with overheating.

[0070] Hereinafter, the bent pipe (Pb) of the portable gas burner according to different embodiments of the present invention will be described. The aforementioned redundancy in the configuration of the portable gas burner of the present invention will be omitted from the following description.

[0071] Referring to FIG. 6, a portable gas burner according to different embodiments of the present invention includes a bent pipe (Pb), a fuel tank (T), a decelerating portion (110), an igniter (120), and a heat insulation portion (140).

[0072] The heat insulation portion (140) prevents heat from the flame in the first part (P1) from being transferred to the second part (P2). In particular, the majority of the flame may reside inside the first part (P1). In this case, a short combustion length can be formed at 100% air mixing.

[0073] In this case, if the heat insulation portion (140) is a metal plate, the heat from the flame in the first part (P1) may be deposited on the heat insulation portion (140). The exhaust gas inside the second part (P2) can draw in heat from the heat insulation portion (140). Accordingly, the flame temperature of the first part (P1) may decrease. The greater the temperature difference between the water to be heated and the heating gas, the more efficient the heat transfer.

[0074] In the absence of the heat insulation portion (140), heat is transferred to the exhaust gas in the second part (P2), and the exhaust gas burning in the second part (P2) tends to be exhausted in a straight line without vortexing. Therefore, in the absence of the heat insulation portion (140), the heat emitted by the exhaust gas

from the second part (P2) is increased, and the efficiency of heat transfer from the first part (P1) to the water to be heated is significantly reduced.

[0075] Therefore, the heat insulation portion (140) is intended to maintain the high temperature of the flame inside the first part (P1) and to prevent the heat of the flame inside the first part (P1) from being transferred to the second part (P2).

[0076] In other words, when the heat of the first part (P1) is directly transferred to the second part (P2), the heat of the first part (P1) transferred to the second part (P2) heats the combustion gas having a low thermal conductivity and is discharged. As a result, the heat insulation portion (140) can be disposed between the first part (P1) and the second part (P2) to prevent heat from the first part (P1) from being transferred to the second part (P2).

[0077] Next, referring to FIG. 7, a portable gas burner according to different embodiments of the present invention includes a bent pipe (Pc), a fuel tank (T), a decelerating portion (110), an igniter (120), a heat insulation portion (140), and a bypass pipe (150).

[0078] Said bypass pipe (150) is directly connected from the third part (P3) to the intermediate portion in the second part (P2) to bypass the flame ignited from the combustion gas to the side of the second part (P2).

[0079] In particular, when the outside temperature is low, when melting ice or alpine snow, or when the temperature of the contents being heated is several tens of degrees below freezing, the flame ignited inside the portable gas burner is maintained, but when discharged from the first part (P1) and discharged into the second part (P2), the flame may be extinguished in a third part (P3), which is an intermediate point connecting the first part (P1) and the second part (P2). This is because the cold temperature causes the temperature of the flame to drop rapidly, which means that carbon monoxide can be generated and extinguished when the extinguishing point drops below about 600°C.

[0080] In this case, by arranging the bypass pipe (150), a flame can be directly delivered from the lower portion of the decelerating portion (110) towards the gas outlet opening (P2a) of the second part (P2) to facilitate re-combustion of the mixed gas ejected from the third part (P3) by flowing through the first part (P1).

[0081] Next, referring to FIG. 8, a portable gas burner according to different embodiments of the present invention includes a bent pipe (Pd), a fuel tank (T), a decelerating portion (110), an igniter (120), and an exhaust extension (160).

[0082] Said exhaust extension (160) is arranged to wrap around the end of the second part (P2), and includes a plurality of retaining clips (161) and an exhaust extension pipe (162), wherein the length of the flow path of the flue gas discharged from the second part (P2) is adjustable.

[0083] The plurality of retaining clips (161) is formed so as to be in contact with the outer peripheral surface of the

second part (P2), and the exhaust extension pipe (162) is secured by the plurality of retaining clips (161) and is arranged to wrap around the second part (P2) and is movable up and down. In addition, a gap (g) is formed between the exhaust extension pipe (162) and the second part (P2) through which air is drawn in from the outside.

[0084] In particular, when the outside temperature is low, melting ice or alpine snow, or when the temperature of the contents being heated is several degrees below freezing, the combustion of the gas mixture can become unstable mid-combustion as the heat from the portable gas burner escapes to the surroundings. At this time, by installing the exhaust extension (160), air is reintroduced from the outside through said gap (g), and the incomplete combustion gas can be reburned by re-mixing the incoming air with the combustion gas remaining inside the second part (P2).

[0085] Next, referring to FIG. 9, a portable gas burner according to different embodiments of the present invention includes a bent pipe (Pe), a fuel tank (T), a decelerating portion (110), an igniter (120), and a flashback prevention portion (170).

[0086] Said flashback prevention portion (170) is disposed below the decelerating portion (110), and is formed in a grid shape, which can extinguish the flame by reducing the temperature of the flame when the ignited flame moves in the reverse direction.

[0087] In particular, when butane, a slow burning fuel gas, is used as a fuel gas, the mixing ratio may be maintained when the gas pressure drops, but the rate of ejection of the mixed gas may decrease, such as when a valve is closed to extinguish the flame in a situation where the air required for combustion is mixed with more than 100%. At this time, in order to prevent the burned flame from flashback and burning toward the nozzle (N), the flashback prevention portion (170) can be disposed to reduce the temperature of the flame to prevent it from flashback. In particular, this is to prevent flash back, where the flame is sucked into the nozzle.

[0088] Next, referring to FIG. 10, a portable gas burner according to different embodiments of the present invention includes a bent pipe (Pg), a fuel tank (T), a decelerating portion (110), an igniter (120), and a vortex generator (180).

[0089] Here, the first part (P1) is formed of an upper region (P1-1) in which the fuel injection pipe (P1a) is disposed, and a lower region (P1-2) extending downwardly from the upper region (P1-1) and having the decelerating portion (110) and the igniter (120) disposed therein, and having an inner diameter larger than the upper region (P1-1).

[0090] In addition, a vortex generator (180) formed by a plurality of blades (181) is disposed on the inner circumferential surface of the lower region (P1-2), disposed above the igniter (120) and causing vortices of the fuel and air. The vortex generator (180) may replace the decelerating portion (110).

[0091] In particular, when the mixed gas jet is vortexed as it passes through the vortex generator (180), ignition can occur even without the decelerating portion (110). This is because the vortexed gas scatters the small amount of flame that is generated after ignition and keeps the flame propagating, allowing the flame to be sustained. In other words, the vortex generator 180 can take over the role of the decelerating portion (110).

[0092] In addition, the vortex generator (180) can increase the efficiency of the device by increasing the combustion rate. Therefore, either the vortex generator (180) or the decelerating portion (110) is sufficient for ignition.

[0093] In addition, if the bent pipe (Pg) is enlarged for complete combustion, excessive air is drawn in, reducing thermal efficiency, so the bent pipe (Pg) cannot be used with an inner diameter exceeding the optimal size. To overcome this, the portable gas burner (8) of the present invention is formed with an inner diameter (Dt1) of the upper region (P1-1) of the bent pipe (Pg) for 100% air intake, and an inner diameter (Dt2) of the lower region (P1-2) for dispersing the drawn-in air. A vortex generator (180) is disposed below the decelerating portion (110) to create vortices in the fuel and air, thereby mixing the fuel and air.

[0094] Specifically, if the inner diameter is set to the inner diameter (Dt2) of the lower region (P1-2), which only takes in the required amount of air, the mixed gas flow rate is too high and combustion will not occur. To solve this problem, the inner diameter (Dt2) of the lower region (P1-2) can be enlarged. However, this can result in more air being drawn in than is necessary, reducing efficiency.

[0095] Therefore, the optimal inner diameter (Dt1) of the upper region (P1-1) for proper air intake can be determined, and the inner diameter (Dt2) of the lower region (P1-2) can be monolayer or smoothly expanded after air intake is achieved. This can slow down the flow rate of the gas mixture or the flame. However, since it is difficult to reduce the flow velocity sufficiently, a reducer or vortex generator (180) may be disposed in the lower region (P1-2) to reduce the flow velocity sufficiently to maintain the flame. On the other hand, as described above, either the decelerating portion (110) or the vortex generator (180) is required to maintain the flame.

[0096] FIG. 11 is a diagram showing a portable gas burner according to another embodiment of the present invention. Referring to FIG. 11, it further includes a first pipe (P11) disposed on the inner side of the first part (P1) and formed spaced apart from the inner wall of the first part (P1), and a barrier (P31) disposed between the third part (P3) and the first part (P1), wherein the end of the first pipe (P11) faces the third part (P3) and is formed to seal between the third part (P3) and the first part (P1).

[0097] In particular, the first pipe (P11) is inserted into the inner side of the first part (P1). Furthermore, the fuel injection pipe (P1a) is introduced into the first pipe (P11). The end of the first pipe (P11) extends proximate to the

third part (P3). Furthermore, a barrier (P31) may be formed between the first part (P1) and the third part (P3).

[0098] In this embodiment, the flame generated in the second part (P2) may not be transferred to the first pipe (P11). That is, the first pipe (P11) and the first part (P1) are spaced apart from each other, so that a wider insulation structure due to air layers and the like can be achieved. Therefore, it has a favorable effect on the thermal insulation of the heat inside the first pipe (P11).

[0099] In addition, the flame generated by the second part (P2) may generate heat at the area where the second part (P2) and the first part (P1) are in contact with each other, thereby activating the internal air circulation inside the first part (P1) by the temperature difference between the left and right sides shown in the drawing. Accordingly, cooling of the first pipe (P11) is made easier, and the first pipe (P11) can be prevented from heating up, which prevents the mixed gas in the first pipe (P11) from heating up and becoming buoyant, so that more air can be drawn into the air inlet (P1b), and furthermore, the temperature of the mixed gas flowing into the first pipe (P11) can be cooled down.

[0100] In particular, the barrier (P31) formed between the first part (P1) and the third part (P3) prevents the flame generated in the second part (P2) and the third part (P3) from propagating to the first part (P1).

[0101] FIG. 12 is a cross-sectional view of a portable gas burner according to another embodiment of the present invention.

[0102] A portable gas burner according to one embodiment of the present invention, comprising a first pipe (P1'), a second pipe (P2') formed to enclose a lower region of the first pipe (P1'), and inserted inside the first pipe (P1'), a fuel injection pipe (P1a) in which a nozzle for injecting fuel in a direction toward the second pipe (P2') is formed, and an air inlet (P1b) disposed between the first pipe (P1') and the second pipe (P2') through which air (a) miscible with the fuel injected inside the first pipe (P1') is injected.

[0103] In particular, the first pipe (P1') is inserted and disposed inside the second pipe (P2'). Then, the second pipe (P2') is formed to wrap around the lower region of the first pipe (P1'). The first pipe (P1') is formed by protruding into the upper region of the second pipe (P2'). Furthermore, between the first pipe (P1') and the second pipe (P2'), a flange portion (P1d) protruding from the outer circumferential surface of the first pipe (P1') may be formed so that the combustion gas escaping from the second pipe (P2') is not sucked into the air inlet (P1b) formed in the first pipe (P1').

[0104] In particular, the flange portion (P1d) can prevent the combustion gas discharged from the second pipe (P2') from reentering the air inlet (P1b) of the first pipe (P1') while preventing the heat of the high temperature combustion gas from being transferred to the upper portion of the flange portion (P1d).

[0105] On the other hand, while the drawing only shows the flange portion (P1d) protruding in a direction

perpendicular to the first pipe (P1'), the flange portion (P1d) may also extend at an angle to the first pipe (P1'). This prevents exhausted combustion gases from reentering the air inlet (P1b).

[0106] The fuel in the form of gas injected from the nozzle (N) of the fuel injection pipe (P1a) formed on the upper side (P1'a) of the first pipe (P1') is mixed with the air entering the air inlet (P1b) formed on the lower side of the fuel injection pipe (P1a) of the first pipe (P1') to form a mixed gas (m). The mixed gas (m) proceeds downward along the first pipe (P1'). In this case, the flame (f) may not occur inside the first pipe (P1').

[0107] Furthermore, the mixed gas (m) from the lower end of the first pipe (P1') hits the lower end (P2'b) of the second pipe (P2'), and the mixed gas (m) may form a vortex (tb) in the vortex space. As the mixed gas (m) forms a vortex and is ignited by the igniter (not shown), it is engulfed in a flame (f) inside the second pipe (P2') and flue gas is ejected to the upper portion.

[0108] Here, the inner diameter (d1) of the first pipe (P1') may be formed to be equal to or smaller than the inner diameter (d2) between the outer circumference of the second pipe (P2') and the outer circumference of the first pipe (P1'). As the inner diameter of the first pipe (P1') is formed to be equal to or smaller than the inner diameter between the outer circumference of the second pipe (P2') and the outer circumference of the first pipe (P1'), the mixed gas (m) flows inside the first pipe (P1') at a velocity greater than the flame propagation speed.

[0109] Furthermore, the mixed gas (m) that reaches the vortex space of the second pipe (P2') reduces its velocity, making it easier to maintain the flame (f). In addition, the flame (f) can be sustained due to vortex phenomena.

[0110] The portable gas burner according to one embodiment of the present invention has a structure in which the first pipe (P1') is inserted inside the second pipe (P2'), thereby facilitating overall miniaturization. In addition, by adopting a structure in which the first pipe (P1') is inserted inside the second pipe (P2'), the structure is simple and the production cost is reduced. Furthermore, the flame (f) inside the second pipe (P2') generates pressure, causing flue gases to escape through the gas outlet opening (P2a). In addition, the flange portion (P1d) between the first pipe (P1') and the second pipe (P2') is less obstructive to the air inlet (P1b), so the amount of oxygen is sufficient to facilitate complete combustion.

[0111] On the other hand, the first pipe (P1') may be made of an insulating structure with high thermal insulation performance. For example, the outer wall of the first pipe (P1') may use ceramic insulation or a two-layer tube. In particular, since the temperature of the flame (f) generated in the second pipe (P2') may be more than 1000°C, the flame (f) may heat the first pipe (P1'), and when the mixed gas (m) is heated, the flow of the mixed gas (m) downwardly by buoyancy may be impeded and the velocity may be reduced. This slowing of the velocity of the mixed gas (m) may reduce the Venturi effect of the

air inlet (P1b), resulting in poor air intake.

[0112] However, the first pipe (P1') may not be made of an insulating structure with high thermal insulation performance. In particular, since the mixed gas m flows into the first pipe (P1') at a high speed, it has the effect of cooling the inside of the first pipe (P1'). Furthermore, since there is water outside the second pipe (P2'), the heat generated by the second pipe (P2') is dissipated to the outside, so it is easy to manufacture because it does not require high insulation performance between the first pipe (P1') and the second pipe (P2').

[0113] Each configuration of the invention described in the above detailed description is not to be construed as limiting in any respect and is to be considered exemplary. The scope of the invention shall be determined by a reasonable interpretation of the appended claims, and all changes within the equivalent scope of the invention are included in the scope of the invention.

Claims

1. A portable gas burner comprising: a bent pipe forming a fuel injection pipe into which fuel is injected from the outside; and

a fuel tank connected to the bent pipe and configured to inject fuel into the fuel injection pipe, wherein the bent pipe includes:

a first part in which the fuel injection pipe is disposed, and in which an air inlet extending in a longitudinal direction is formed at a lower portion of the fuel injection pipe;
a second part spaced apart from the first part and in which a gas outlet opening is formed; and
a third part formed at a lower portion of the first and second parts, and connecting the first and second parts,
wherein a nozzle configured to inject fuel into the first part is formed at an end of the fuel injection pipe in the first part,
and wherein the air inlet is opened at a lower portion of the nozzle in the first part to introduce air from the outside.

2. The portable gas burner of claim 1, wherein the bent pipe further comprises a decelerating portion disposed inside the first part and configured to decelerate a flow velocity of a mixed gas flowing within the first part, the mixed gas being formed by mixing fuel injected from the nozzle and air introduced through the air inlet.

3. The portable gas burner of claim 2,

wherein the decelerating portion comprises

- a plurality of semicircular pipes connected in a row, with adjacent semicircular pipes convexly oriented in different directions, the decelerating portion being inserted so as to be in contact with the outer wall of the first part, the decelerating portion having a center opening through which the mixed gas flows inwardly, and a plurality of side openings formed between the first part and the decelerating portion through which the mixed gas flows.
4. The portable gas burner of claim 2, wherein the portable gas burner further comprises an igniter disposed downstream of the decelerating portion and configured to ignite the mixed gas formed from fuel injected from the nozzle.
5. The portable gas burner of claim 2, wherein the portable gas burner further comprises a height adjustment portion configured to adjust the distance between the nozzle and the decelerating portion, the height adjustment portion being connected at one end to the decelerating portion and movably fixed to the first part, the height adjustment portion comprising a body connected at one end to the decelerating portion, extending from the end and bent so as to be disposed outside the first part, and a fixing member by which the body is movably coupled to the first part.
6. The portable gas burner of claim 1, wherein the portable gas burner further comprises a heat insulation portion disposed between the first and second parts and configured to reduce the temperature drop of the flame generated from the combustion of the mixed gas.
7. The portable gas burner of claim 1, wherein the portable gas burner further comprises an exhaust extension arranged to wrap around an end of the second part and adjustable in length to define a flow path of combustion gases discharged from the second part, the exhaust extension comprising a plurality of retaining clips contactable with an outer peripheral surface of the second part, and an exhaust extension pipe secured by the retaining clips and arranged to wrap around the second part and movable vertically.
8. The portable gas burner of claim 7, wherein a gap is formed between the exhaust extension pipe and the second part, the gap being configured to allow air to be drawn from outside.
9. The portable gas burner of claim 2, wherein the portable gas burner further comprises a flashback prevention portion disposed above the decelerating portion and formed in a grid shape to extinguish the flame by reducing the flame temperature when the ignited flame travels in the reverse direction.
10. The portable gas burner of claim 2, wherein the first part comprises: an upper region in which the fuel injection pipe is disposed; and a lower region extending downwardly from the upper region, in which the decelerating portion and the igniter are disposed, the lower region having an inner diameter larger than the upper region.
11. The portable gas burner of claim 10, further comprising a vortex generator formed by a plurality of blades installed on the inner circumference of the lower region, the vortex generator being disposed adjacent to the igniter and configured to generate vortices in the fuel and air.
12. The portable gas burner of claim 1, wherein, when the specific gravity (S) of the fuel supplied to the fuel injection pipe is S, the inner diameter of the nozzle is D_0 , the inner diameter of the first part is D_t , and a ratio R of air entering the bent pipe to the amount of fuel ejected from the nozzle satisfies:
- $$R = S^{1/2} \left(\frac{D_t}{D_0} - 1 \right),$$
- where R has a value required for complete combustion of the fuel used.
13. The portable gas burner of claim 1, wherein the fuel tank comprises: a storage portion configured to store fuel and connected to the fuel injection pipe to supply fuel thereto; a switch configured to control injection of the fuel, the switch being formed along the length of the storage portion and connected to the nozzle; and a regulating lever configured to regulate the amount of fuel injected, the regulating lever being formed on an outer side of the storage portion.
14. The portable gas burner of claim 13,

further comprising a locking mechanism configured such that, when the switch is operated to direct fuel to be injected through the nozzle, the storage portion is rotatable, and the locking mechanism is configured to secure the rotated storage portion to the bent pipe. 5

15. The portable gas burner of claim 1,

a first pipe disposed inside the first part and spaced apart from an inner wall of the first part; and a barrier disposed between the third part and the first part, wherein an end of the first pipe faces the third part and is formed to seal a space between the third part and the first part. 10 15

16. A portable gas burner comprising: a first pipe;

a second pipe formed to enclose a lower region of the first pipe; a fuel injection pipe including a nozzle formed to inject fuel into an interior of the first pipe in a direction toward the second pipe; and the air inlet is disposed above the second pipe, and air introduced through the air inlet is mixable with the fuel injected inside the first pipe. 20 25

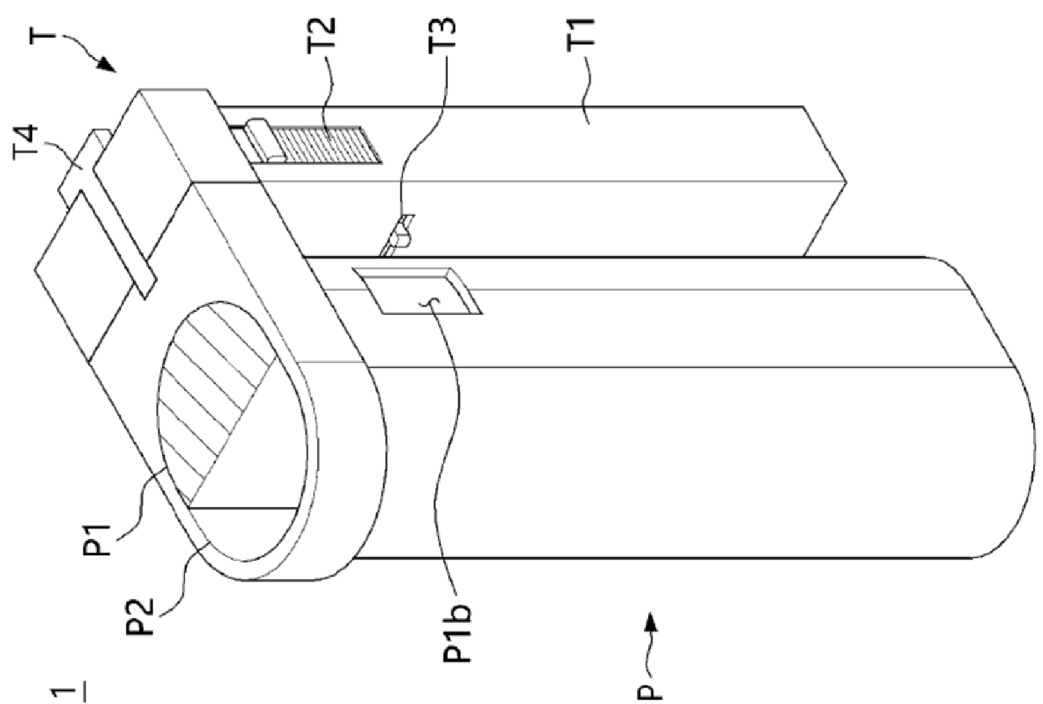
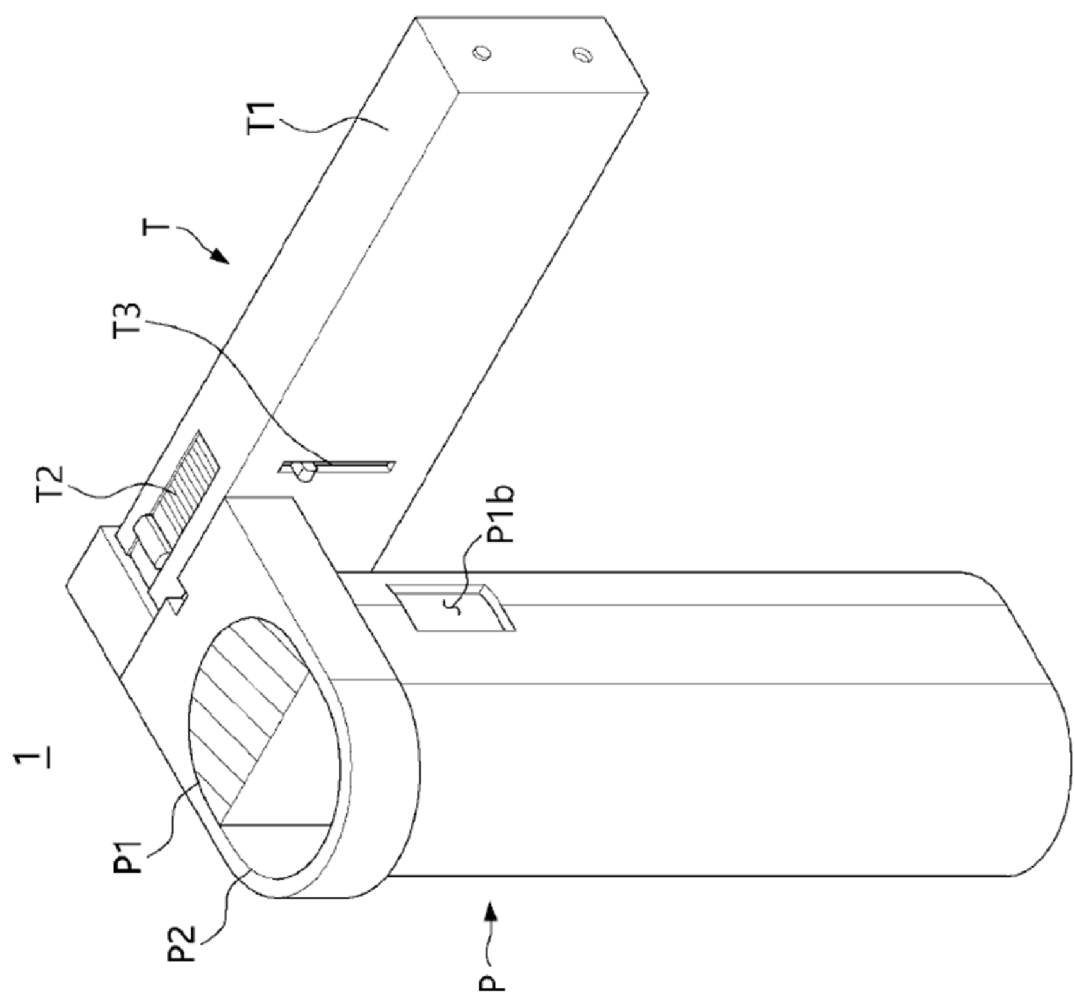
17. The portable gas burner of claim 16, wherein an inner diameter of the first pipe is equal to or smaller than an inner diameter defined between the outer circumference of the first pipe and the outer circumference of the second pipe. 30 35

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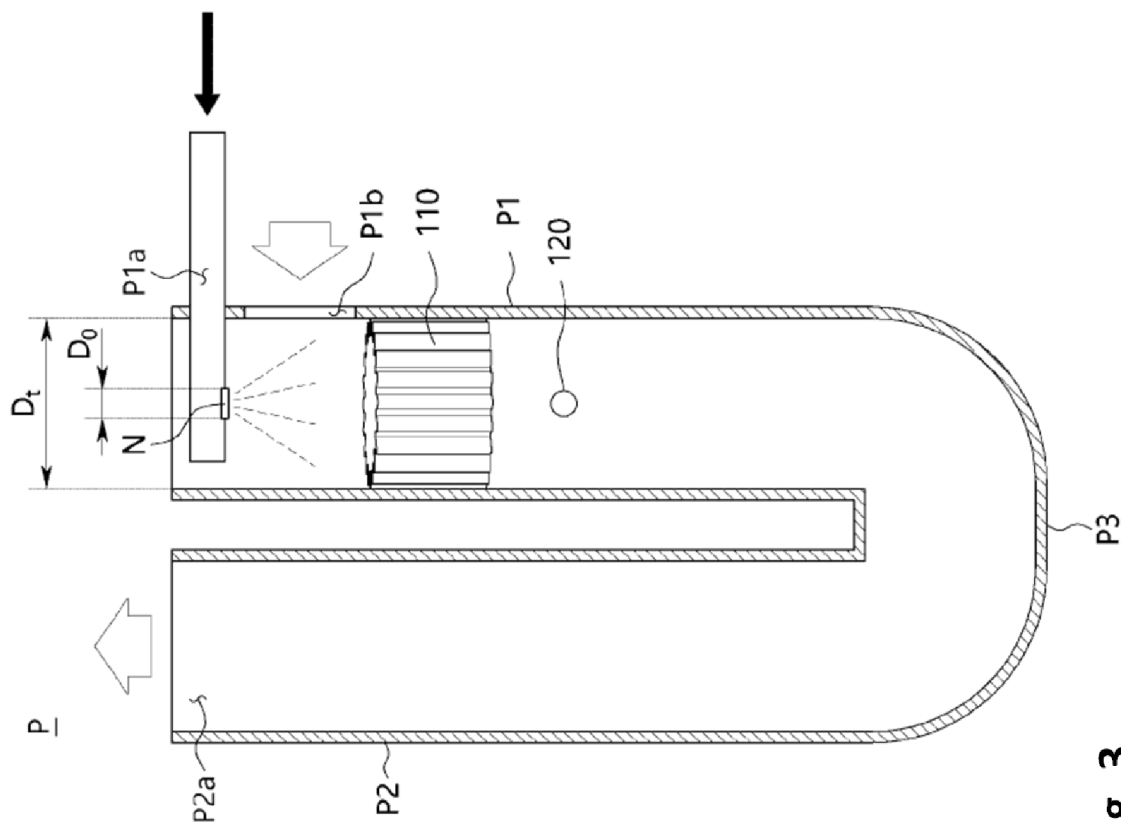


Fig. 4

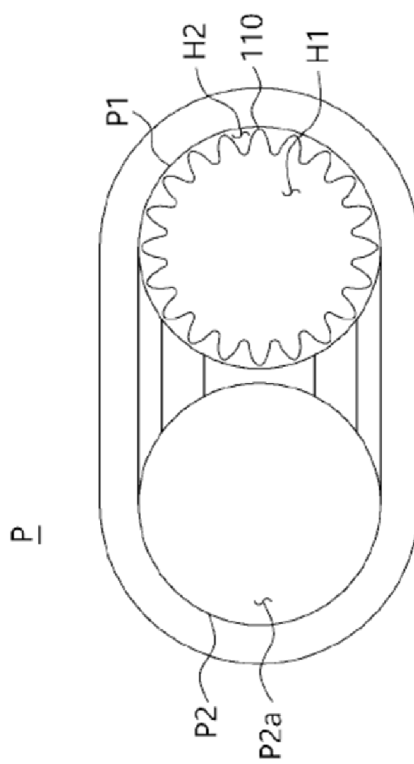
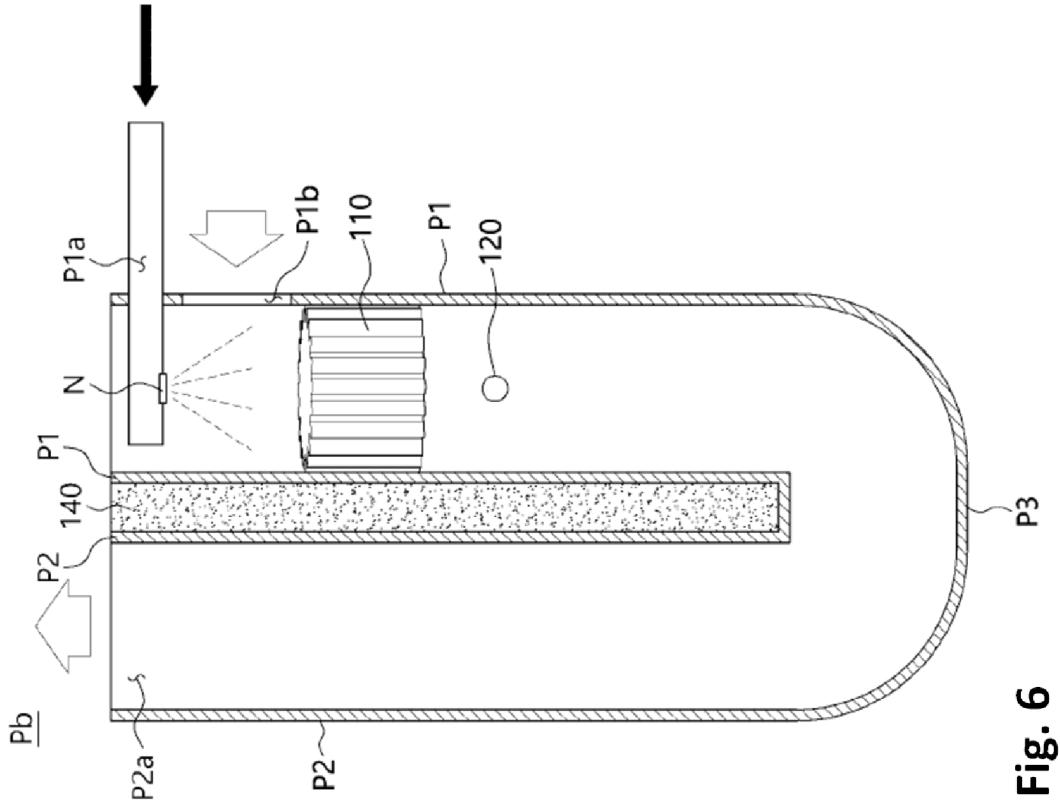
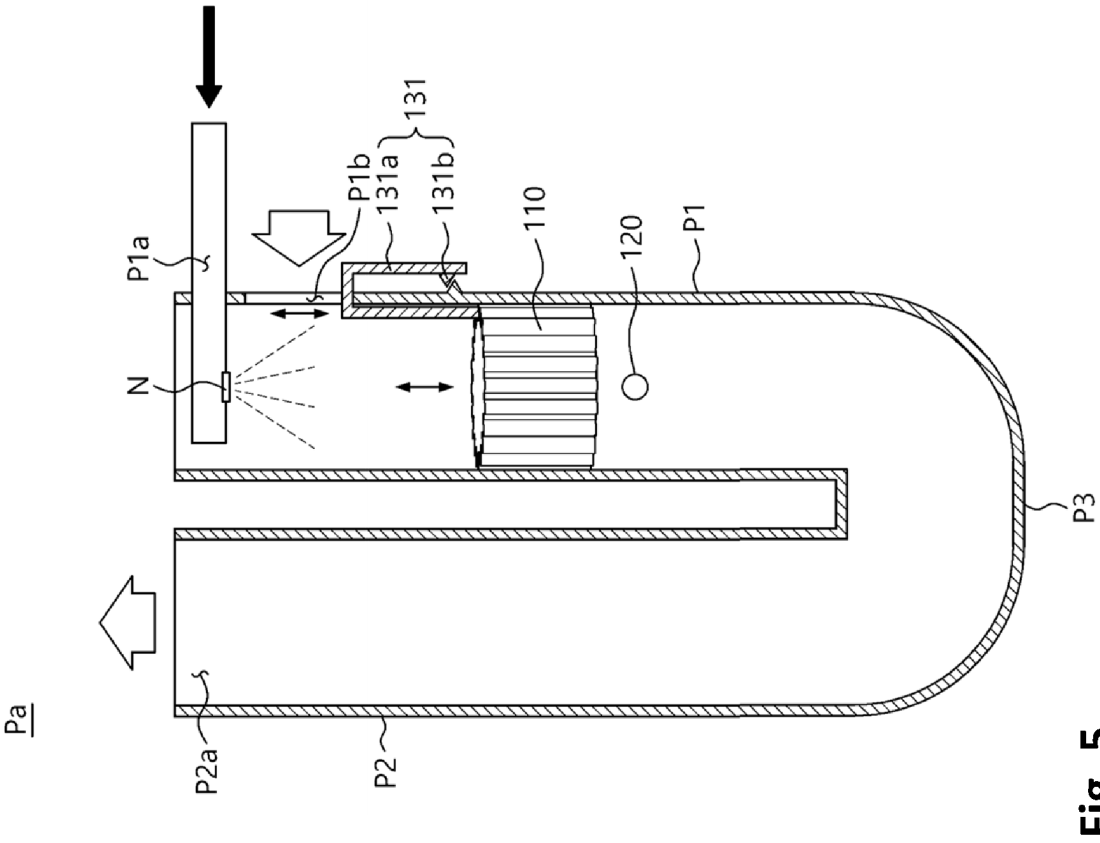


Fig. 3



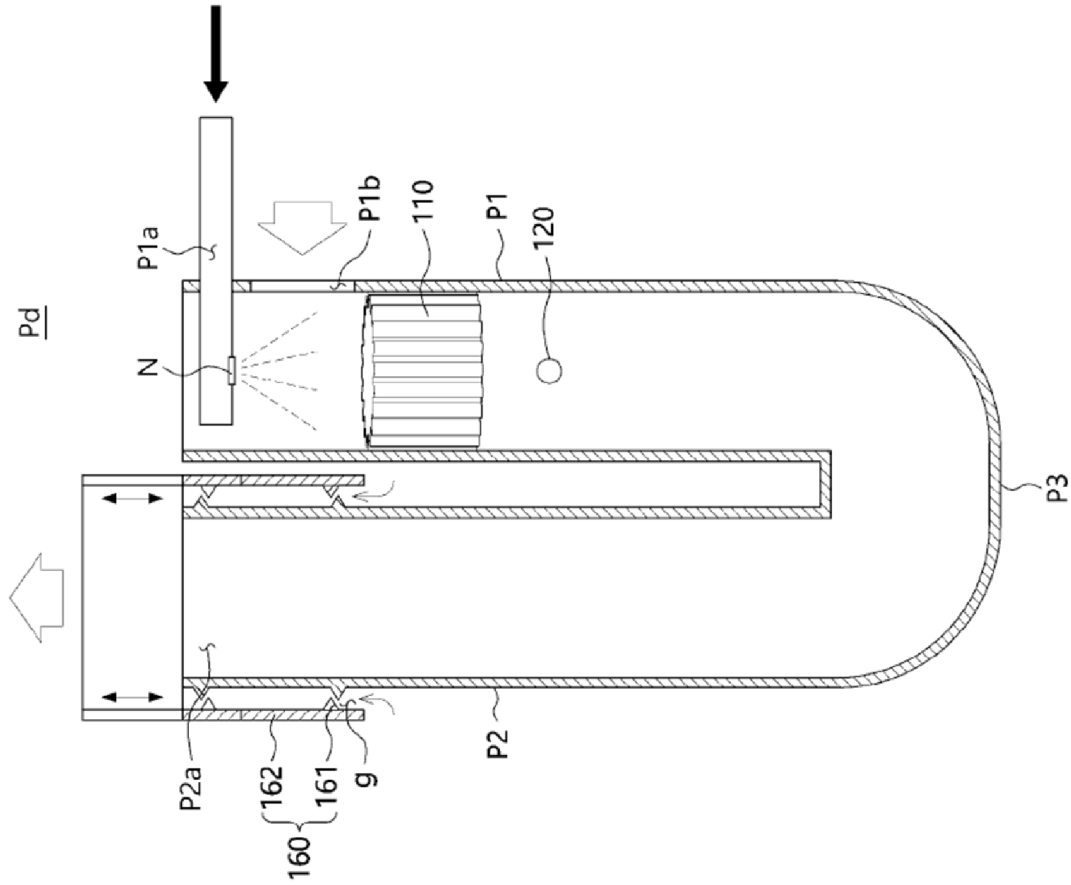


Fig. 7

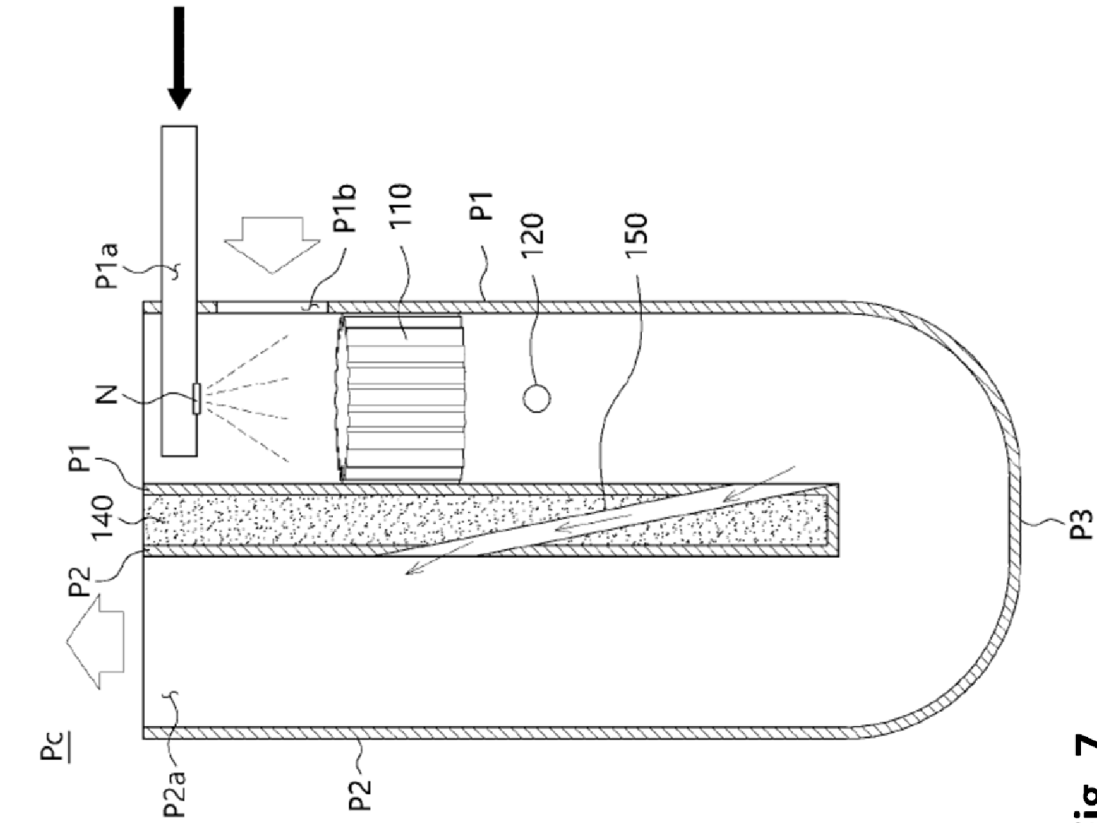


Fig. 8

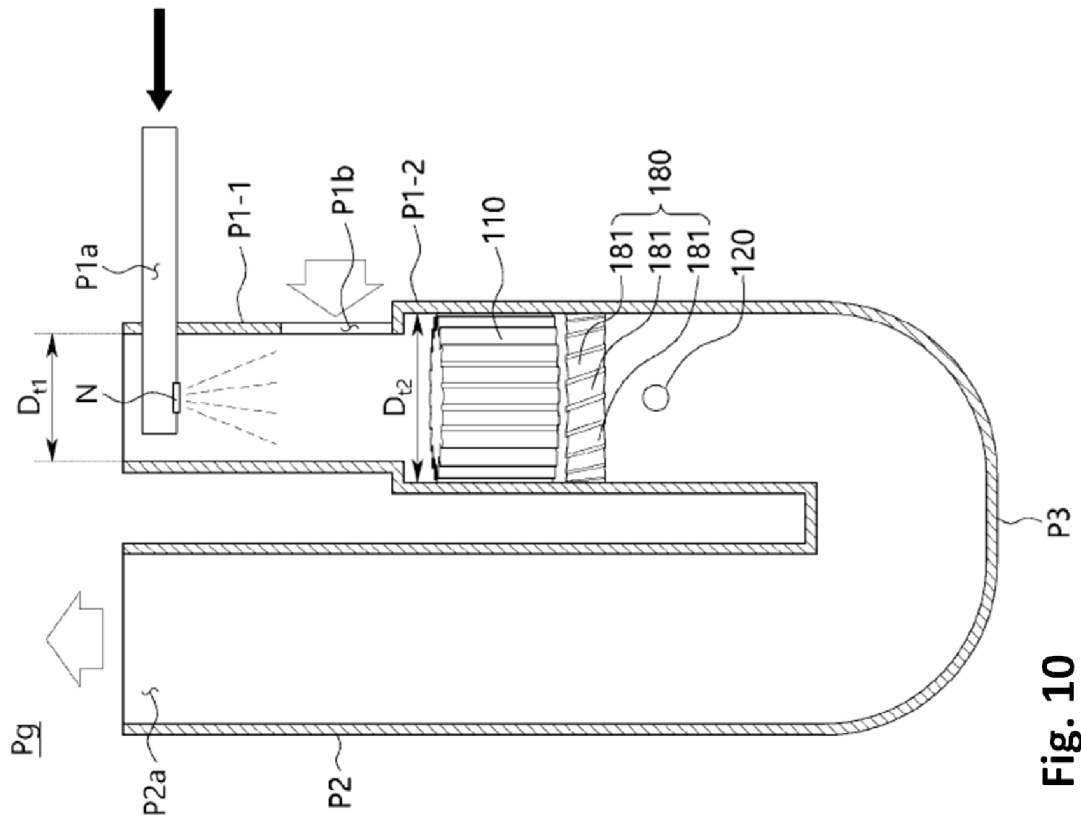


Fig. 10

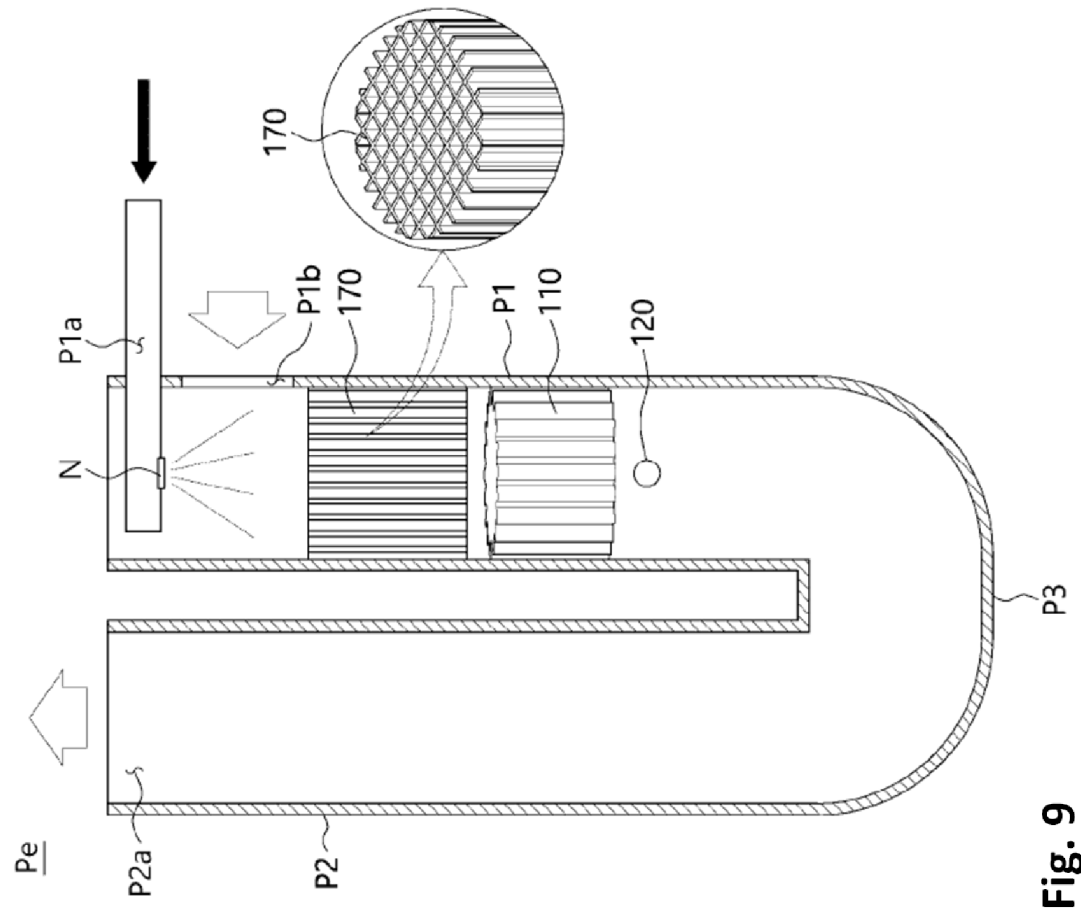


Fig. 9

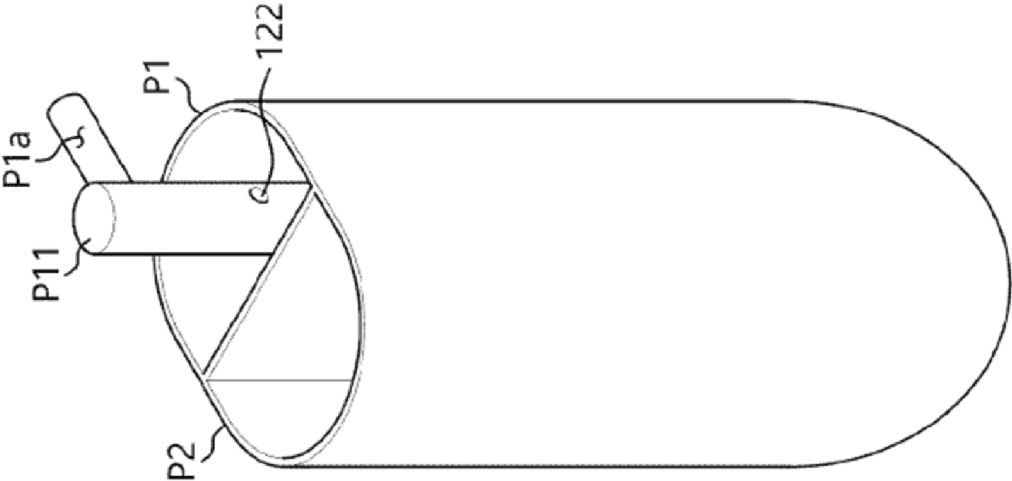


Fig. 11A

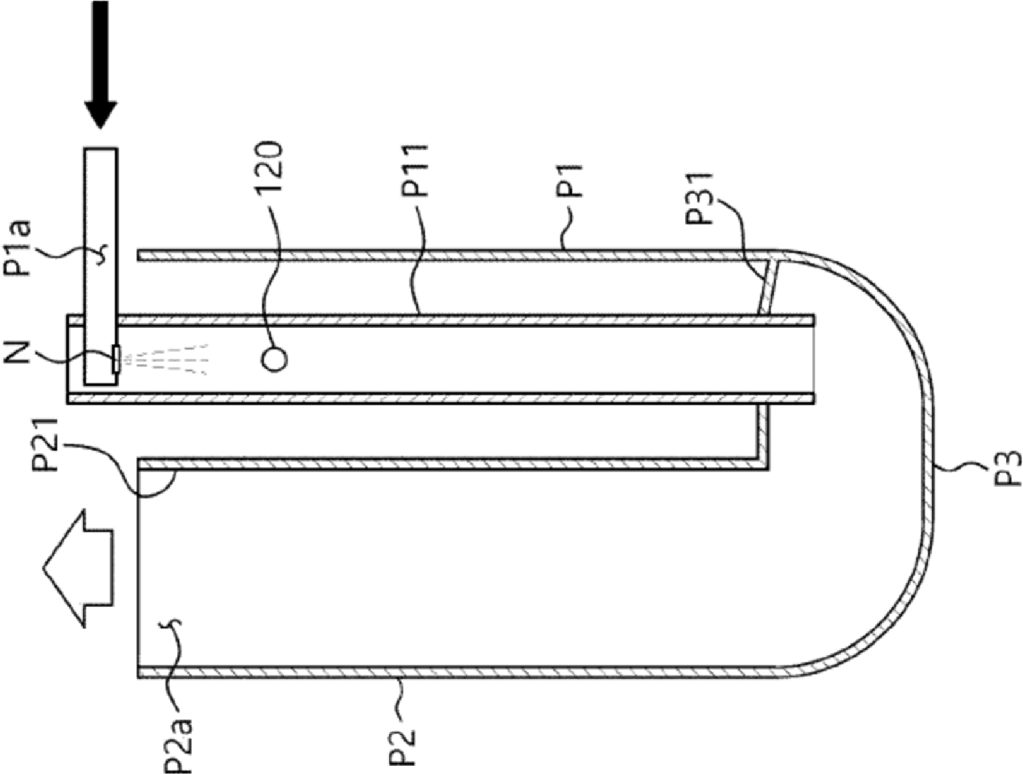


Fig. 11B

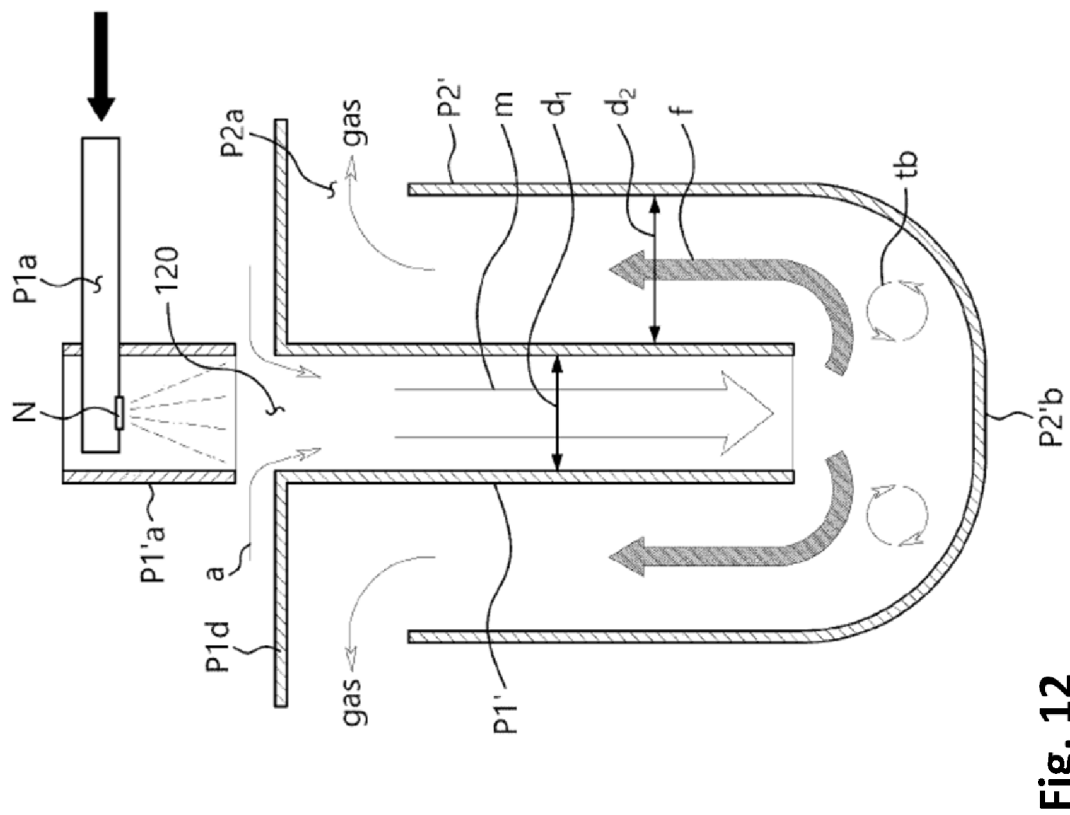


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/012828

A. CLASSIFICATION OF SUBJECT MATTER

F23D 14/02(2006.01)i; F23D 14/62(2006.01)i; F23D 14/60(2006.01)i; F23D 14/68(2006.01)i; F23D 14/82(2006.01)i;
F23D 14/70(2006.01)i; F24C 3/14(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F23D 14/02(2006.01); B23K 7/00(2006.01); B23K 7/10(2006.01); B63B 43/06(2006.01); F02C 7/22(2006.01);
F23D 14/12(2006.01); F23D 14/58(2006.01); F23G 7/06(2006.01); F23J 15/02(2006.01); F23R 3/14(2006.01);
F23R 3/16(2006.01); F23R 3/28(2006.01); F23R 3/46(2006.01); F23R 3/48(2006.01); F24H 1/22(2006.01);
F24H 9/1836(2022.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 가스 버너(gas burner), 연료(fuel), 공기(air), 절곡(bending), 가스(gas), 노즐
(nozzle), 관(tube)

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Further documents are listed in the continuation of Box C.



See patent family annex.

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“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

29 November 2024

Date of mailing of the international search report

29 November 2024

Name and mailing address of the ISA/KR

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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2024/012828

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EP 4 772 794 A1

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International application No.

PCT/KR2024/012828

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