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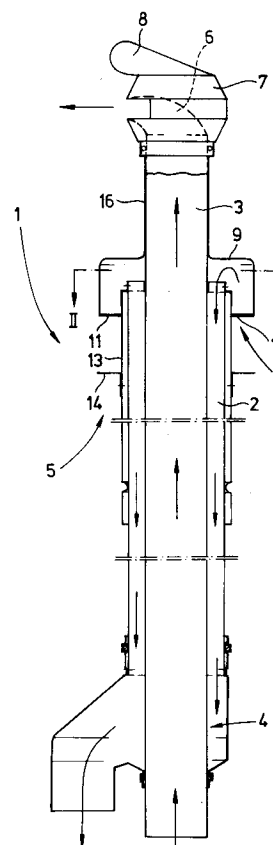
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NL-2502 LS Den Haag (NL)(54) **Combined burner air supply and combustion gas discharge system.**

(57) Combined burner air supply and combustion gas discharge system (1) comprising an air supply pipe (2) and accommodated therein a combustion gas discharge pipe (3), which pipes are provided at one end with connections shut off relative to each other, for connection to the air supply and the combustion gas discharge respectively of a burner, and the opposite-lying outside ends of which pipes open out into the environment and form an air inlet opening (12,15) and a combustion gas discharge opening (6), the combustion gas discharge pipe running past the air supply pipe, and at least one of the arrangement of air inlet opening and combustion gas discharge opening being situated only at one side of the combination (1), and being rotatable about the longitudinal axis of the combination (1), for purposes of orientation relative to the prevailing air flow in the environment under the influence of wind orientation means (8).

fig - 1

**EP 0 634 610 A1**

The present invention relates to a combined burner air supply and combustion gas discharge system, comprising an air supply pipe and accommodated therein a combustion gas discharge pipe, which pipes are provided at one end with connections shut off relative to each other, for connection to the air supply and the combustion gas discharge respectively of a burner, and the opposite-lying outside ends of which pipes open out into the environment and form an air inlet opening and a combustion gas discharge opening, the combustion gas discharge pipe running past the air supply pipe.

Such a combination is known from Dutch Patent Application 8700395, which has been laid open for inspection. In this case, a cap is placed on top of the end of the combustion gas discharge pipe running past the air supply pipe, which means that the air supply pipe opens out into the environment along a radially bypassing combustion gas discharge opening. The air inlet opening is also formed by the annular gap formed between the combustion gas discharge pipe and the end of the air supply pipe.

The disadvantage of such a combination is that the combustion gases discharged in all directions at a higher level can be sucked in again through the air supply openings generally disposed very close to the underside of the combustion gas discharge opening. At a level difference of about twenty centimetres, about 25% recirculation is common. In order to prevent this recirculation, it is common to place a separating element between the combustion gas discharge opening and the air supply opening, but this only slightly limits the amount of recirculation.

The object of the invention is to provide a combination with considerably less recirculation. This is achieved by a combination in which the air inlet opening and/or the combustion gas discharge opening open out radially on the periphery into the environment only at one respective side of the combination, and can be rotated about the longitudinal axis of the combination, for purposes of orientation relative to the prevailing air flow in the environment under the influence of wind orientation means.

Through the forced orientation of the blow-out direction and/or the suction direction, the degree of recirculation has been found to be significantly lower. The greatest effect is obtained by combined directing of the air inlet opening and the combustion gas discharge opening.

It has been found that in that situation the recirculation is limited to 5% with a level difference of ten centimetres between the air inlet opening and the combustion gas discharge opening, if it is ensured that the air inlet opening always opens out

at one side and the air outlet opening at the other side of the combination.

The invention is also directed to provide a combination of simple structure, which is effectively to fabricate and is reliable in its function.

Furthermore, the invention is directed to the provision of features for solving the problem of pressure-built up in the air intake, preferably in combination with the decrease of recirculation.

A so-called cowl which is placed on the top end of a flue duct is known per se from e.g. FR-A-1 169 667. Its purpose is to prevent smoke from being blown back down by the wind. To this end, the cowl consists of a cap-shaped part which can swivel about a vertical axis, which axis lies essentially concentrically with the flue duct. This cap-shaped part can be regarded as part of a dome-shaped vault with sloping upright walls extending through an arc angle of approximately 135°. When it is being fixed on a flue duct, it is ensured that the bottom edge of the cap-shaped part lies essentially flush with the wall of the flue duct. By means of a weather vane placed on the cowl, the latter is directed with its side facing away from the flue duct towards the windward side, thus providing a certain protection against wind beating into the flue duct. The object of this known cowl is not to direct the flue gas discharge opening of the combustion gas discharge pipe in order to discharge the combustion gases in a directed manner. Moreover, such a cowl is used only for conventional combustion gas discharge ducts of wood stoves and the like. Such a cowl is not used in forced-draught closed duct systems, as in the case of a combined burner air supply and combustion gas discharge system according to the present subject.

The invention is explained in greater detail below with reference to non-limiting examples of embodiments shown in the appended drawings, in which:

Figure 1 shows diagrammatically a side view of a first embodiment of a supply and discharge combination according to the invention, as used in the case of a combustion boiler;

Figure 2 shows a view along the line II-II in Figure 1;

Figure 3 shows a view corresponding to Figure 1 of a second embodiment;

Figure 4 shows a view corresponding to Figure 1 of the top part of a third embodiment;

Figure 5 shows a view corresponding to Figure 1 of the top part of a fourth embodiment;

Figure 6A shows a view in perspective of the top part of the fourth embodiment, shown in Figure 5;

Fig. 6B is a partly sectional view according to line VI-VI in fig. 5

Figure 7 shows a view corresponding to Figure 1 of a fifth embodiment of the invention; and Figure 8 shows a view along the line VIII-VIII in Figure 7.

Figure 1 shows diagrammatically an air supply and combustion gas discharge combination 1, with a combustion air supply pipe 2 and a combustion gas discharge pipe 3. At the bottom side, viewed in the plane of the drawing, a central heating combustion boiler (not shown) is to be connected to the combustion air supply pipe 2 or the combustion gas discharge pipe 3, for example as indicated in Figure 1 of EP-A-0491444. Typically, the burner is inside a building, and the pipes 2 and 3 debouch into the surrounding atmosphere.

As usual, the pipes 2, 3 run concentrically from a branch pipe 4 which is known per se, with the combustion gas discharge pipe 3 inside the combustion air supply pipe 2. Above the roof, the position of which is shown only diagrammatically here by means of dashed and dotted lines 5, the pipes 2, 3 open out into the environment, as usual the combustion gas discharge pipe 3 opening out at a higher level.

According to the present invention, the combustion gas discharge pipe 3 opens out into a duct part 6 which is deflected, so that the gases rising vertically through the combustion gas discharge pipe 3 are deflected in a horizontal direction, in such a way that the gases leave the combination 1 radially on the periphery only at one side. This deflected duct part 6 is accommodated in a cap 7, which is freely rotatable about the longitudinal axis of the combustion gas discharge pipe 3. This duct part 6 is narrowed towards the free mouth, in order to accelerate the combustion gases, which reduces the recirculation even further. Fixed on top of the cap 7 is a weather vane 8, which is fitted on the cap 7 in a manner known to the person skilled in the art, in such a way that the duct part 6 in each case opens out into the atmosphere at the leeward side.

An apron 9, running to below the mouth of the combustion air supply pipe 2 and gripping loosely around it as shown, is also provided according to the present invention above the top end of the combustion air supply pipe 2 around the combustion gas discharge pipe 3. The top side of said apron 9 is flat, so that any downgoing combustion gases are made turbulent, and recirculation is thus limited further. As Figure 1 shows in section, said apron 9 has on the lower edge thereof an inward directed flange 11, which with the exception of a peripheral part runs through to the outside wall of the combustion air supply pipe 2 and connects to it in an essentially gastight manner. Therefore, as shown in greater detail in the section according to Figure 2, a gap 12 is formed between the under-

side of the apron 9 and the outer casing 13 of the combination 1, through which gap 12 the air inflow from the environment to the combustion air supply pipe 2 essentially occurs. According to this example of an embodiment, said gap 12 runs halfway round the periphery. Of course, the gap can extend over a shorter distance, or it can be divided into connecting parts with flange material between them. Due to the provision of this gap 12 and its shape, recirculation is decreased even further, while its structure is rather simple.

This apron 9 is also mounted so that it is freely rotatable about the longitudinal axis of the combustion gas discharge pipe 3, in such a way that the gap 12 is also on the windward side of the combination 1. For this purpose, the apron 9 is coupled to the vane 8. Consequently, combustion air is in each case supplied at the windward side of the combination 1, while combustion gases are in each case discharged at the leeward side thereof. This largely prevents downward drifting combustion gases from being sucked back in again through the combustion air supply pipe 2. In addition, the combustion air supply pipe 2 is reliably screened off by means of the flange 11 bounding the gap 12 from the influence of wind gusts on the prevailing pressure inside the combination 1 and the combustion boiler (not shown) coupled thereto. This calming action is reinforced even further by an outward projecting annular flange 14 which is fitted at a distance below the apron 9 around the outer casing 13. However, this flange 14 can be left out under circumstances. Another advantage is provided by the gap 12 delimited by the flange 11 and the side wall of the pipe 13 in that there is less tendency of pressure-built up in the air intake pipe 2 due to environmental wind forces which could lead to malfunctioning of the burner. It is thought that this effect is caused due to the small width of the gap 12 w.r.t. the distance between the pipe 13 and the apron 9. The above mentioned EP-A is directed to the problem of pressure built up as well, but does not provide an improved recirculation behaviour at the same time. If the gap 12 would run around the pipe 13 for more than 1/2 of its periphery, e.g. 3/4 or fully around, the recirculation effect would be less, however the pressure-built up effect would be maintained. For decreasing pressure built-up, the feature of the gap 12 could be applied without the features of directing the inlet and/or the outlet according to the wind direction. A further decrease of pressure built-up is attained by the flange 14 which provides a further, horizontal directed, gap in cooperation with the apron 9 and the flange 11.

Otherwise, it is not necessary that the apron 9 itself is moveable, but it is meant that the gap 12 can be moved around the pipe 13. According to an alternative, the gap 12 could be running all around

the pipe 13, and could be partly covered by a shut-off means such as a plate (not shown) which is sliding over the flange 11 and which can be rotated around the pipe 13. In all cases, the top of the apron 9 can be inclined as well in stead of being almost horizontal as shown. The gap 12 is shown closest to the pipe 13, while the flange 11 is connected to the apron 9. However, it is also possible to provide the gap 12 closest to the apron 9, while connecting the flange 11 to the pipe 13.

The outlet of the duct part 6 and the gap 12 are thus always directed in such a way to the prevailing wind direction that they lie diametrically opposite each other relative to the longitudinal axis of the combustion gas discharge pipe 3, with the gap 12 in each case facing the windward side and the mouth of the duct part 6 always facing the leeward side of the combination 1.

Figure 3 shows a second embodiment of the present invention, in which principally the shape of the apron 9 is changed. According to Figure 3, said apron 9 now grips more tightly around the outer casing 13, while roughly around half the periphery said apron is provided with a series of vertical slits 15 of uniform mutual pitch. Combustion air is sucked from the environment into the combustion air supply pipe 2 through said slits 15. Here again, the cap 7 and the apron 9 are freely rotatable about the longitudinal axis of the combustion gas discharge pipe 3, and here again in each case the vane 8 ensures that the duct part 6 opens out at the leeward side and the slits 15 are directed to the windward side. For this purpose, the vane 8, the cap 7 with the duct 6 immovably fixed therein and the apron 9 are attached to one another by means of a pipe part 16 which grips in a freely rotatable manner around the combustion gas discharge pipe 3.

Since by comparison with the embodiment according to Figure 1 the annular flange 14 does not have any effect here in limiting the influence of wind gusts on the prevailing pressure in the combination 1, said flange is omitted from Figure 3. This embodiment requires only few components for preventing recirculation, and is therefore a relatively cheap, reliable structure. The amount and dimensions of the slits 15 can be selected such that pressure built-up and recirculation can be kept to a minimum. In this embodiment the top of the apron 9 can be inclined in stead of horizontal too.

Figure 4 shows diagrammatically another embodiment of the cap 7 to be connected to the top end of the combustion gas discharge pipe 3. A duct part 6, which again is tapered towards the free mouth, runs inside the cap 7, which is now in the form of an essentially cylindrical housing, and which is freely rotatable about the longitudinal axis of the duct 3. This duct part 6 is now deflected

through an angle of less than 90°. Here again, the gases flowing vertically upwards through the duct 3 are accelerated by the duct part 6, and are deflected in such a way that they flow away radially at one side of the combination 1.

A third variant of the invention is shown in Figures 5 and 6. In the case of that embodiment, the cap 7 only partially surrounds the deflected duct part 6. Vertical slits 17 are provided in the cap 7, both at the side of the free mouth of the duct part 6 and diametrically opposite such opening. A forced air stream all around the top end of the duct part 6 in the direction of the arrow shown in Fig. 6A is maintained by means of such slits, in order to reinforce the discharge of the combustion gases to the leeward side. Transverse bars 18 are placed in the free opening, as shown. They prevent, for example, birds from gaining access to the combination 1. Here again, the duct part 6 tapers towards the free mouth. As shown, the underside of the duct part 6 connects directly to the apron 9, and the cap 7 ends a good distance above the underside of the duct part 6. For the sake of clarity, said apron 9 is shown cut away at the underside in Fig. 5, so that the parts situated therein are visible. As in the case of the embodiment shown in Figure 1, an inward facing flange 11 is again situated on the underside of the apron 9, but together with the outer casing 13 (here shown in an imaginary fashion in Fig. 5) it bounds a gap 12 running around the full periphery of the combination. Around half the periphery of the combination 1, at the side thereof where the combustion gases are discharged radially, the gap 12 runs through the downward facing side of a duct 20 also running around half the periphery of the combination 1. This duct 20 is open at both longitudinal sides, and opens out there into the space enclosed by the apron 9 and the flange 11, in order to be in communication with the combustion air supply pipe 2, which is not shown here (see Fig. 1). As shown in Figs. 5 and 6, this duct 20 is bounded on the inside by a plate 19, extending to below the flange 11 and surrounding the pipe 13. Within the apron 9, at the top side thereof, said plate 19 has an outward directed collar (not visible), which runs along the entire top edge of the plate 19, and which connects to the apron 9. By means of this duct 20, the air supply is greatly limited from the side of the combination 1 at the mouth of the duct part 6, while air still flowing in from that side, for example due to an unexpected gust of wind, is guided through the duct 20 to the combustion air supply pipe 2. By these features, air feed towards the pipe 2 is guaranteed under all circumstances, while preventing the risk of unallowable pressure built up.

Finally, a fourth embodiment of the invention is shown in Figures 7 and 8. In this case no apron 9 is used for surrounding the combustion air supply pipe 2. At the top side, the combination 1 has a cap 7, into which the combustion gas discharge pipe 3 opens directly. Said cap 7 is freely rotatable about the longitudinal axis of the duct 3. For the purpose of directing it to the wind, a weather vane of the type shown in Figure 1 can be placed on top of said cap 7, which is a symmetrical round shape, viewed from the top. As shown, the cap 7 has an otherwise closed, disc-shaped top plate 21, and a likewise disc-shaped bottom plate 22 of corresponding diameter. Both plates 21, 22 are held apart by means of four narrow strips 23 uniformly distributed around the periphery, only two of which can be seen here. A cylindrically curved plate 24, which with the top and the bottom plate 21 and 22 bounds a gap 25, 26 respectively, is connected to said strips 23. The duct 3 is in communication with the environment by way of said slits 25, 26.

A buffer plate 27 is also disposed inside the cap 7 and, as can be seen from Fig. 8, runs around the duct 3, enclosing half of it, and then also runs radially outwards relative to said duct 3 from positions diametrically opposite the duct 3. By means of said buffer plate 27, viewed from the side, one half of the cap 7 is thus separated in a gastight manner from the other half. A gap 12 is provided in the bottom plate 22 at the side of the buffer plate 27 facing away from the duct 3. As shown, said gap 12 opens out into the combustion air supply duct 2, which in this embodiment connects with its casing 13 in an airtight manner to the bottom plate 22 of the cap 7. The gap 12 runs only over a peripheral part of the casing 13 therein. The cap 7 in this embodiment consequently acts both for the air supply and for the combustion gas discharge, and by means of the buffer plate 27 the supply and discharge are largely separated from each other in a gastight manner. With this cap it is also possible to direct the supply to windward and the discharge to leeward, so that the air flow is in the direction indicated by the arrows. Of course, the gap 12 and/or the buffer plate 27, for example, can be formed differently, for example they can extend further or not as far along the casing 13 or the duct 3. What is important here is that a buffer plate is situated in the cap as a continuation of the discharge duct 3 and/or the supply duct 2, on either side of which the supply opening 12 or the discharge opening is situated. Making the cap 7 in such a way that it can be directed towards the wind means that the recirculation can be limited even further. However, the cap 7 can be made so that it is immovable.

Of course, other embodiments which differ from those shown in the appended figures also lie

within the scope of the present invention. For example, it is possible to make the orientation of the duct part 6 relative to the combustion gas discharge pipe 3 of the embodiments shown in Figures 1 and 3 such that it cannot rotate. In that case only the apron 9, and thereby the gap 12 or the slits 15, can be directed to the wind, with the intervention of the vane 8. In addition, it is also possible for the apron 9 to be such that it cannot rotate relative to the combustion gas discharge pipe 3, which means that the duct part 6 can be directed only by the vane 8 depending on the wind direction. Instead of the vane 8, other means for orienting the duct part 6 and/or the gap 12 or the slits 15 depending on the wind direction can be used. The apron 9 with the duct 20 as according to fig. 5 and 6 can be combined with other caps 7, such as according to fig. 1 or 4. The cap according to fig. 4 can also be used in the embodiment according to fig. 1 or 3.

The object of the invention is thus to direct the mouth of the combustion air supply duct or the combustion gas discharge duct into the environment in such a way relative to the prevailing air flow that combustion gases are prevented as effectively as possible from being sucked in again.

Claims

1. Combined burner air supply and combustion gas system (1), comprising an air supply pipe (2) and accommodated therein a combustion gas discharge pipe (3), which pipes at one end are provided with connections shut off from each other, for connection to the air supply and the combustion gas discharge respectively of a burner, and the opposite-lying outside ends of which open out into the environment and form an air inlet opening (12, 15) and a combustion gas discharge opening (6), the combustion gas discharge pipe running past the air supply pipe, characterized in that the air supply opening (12, 15) and/or the combustion gas discharge opening (6) open out radially on the periphery thereof into the environment only at one axial side of the combination (1), and can be rotated about the longitudinal axis of the combination (1), for purposes of orientation relative to the prevailing air flow in the environment under the influence of wind orientation means (8), preferably a weather vane.
2. Combination (1) according to Claim 1, wherein at a distance from the end of the air supply pipe (2), at the side of the air inlet opening (12, 15) an apron (9) is disposed all around the combustion gas discharge pipe (3), which apron extends in the direction of the air supply

pipe (2) and grips around it, and which apron (9) also has over no more than half its periphery an area with one or more air inlet openings (12, 15), while said apron (9) is rotatable about the longitudinal axis of the combination (1).

3. Combination (1) according to Claim 2, wherein the apron (9) grips loosely around the outer casing (13) surrounding the burner air supply (2), while at the free bottom edge of the apron (9) a flange (11) runs in the direction of the outer casing (13), leaving an air inlet opening (12) in said area between itself and the outer casing (13) or said apron (9).

4. Combination (1) according to Claim 2 or 3, wherein the apron (9) is preferably cooperating with the outer casing (13) in a substantially fluid tight manner at its lower region, while said apron (9) is provided with one or more openings (15) in its circumferential wall on a higher level, such as in the area where the combustion gas discharge pipe (3) projects past the burner air supply pipe (2).

5. Combination according to any of the preceding claims, wherein within the apron (9) a duct (20) is provided which only partly, preferably over about half the circumference, extends around the casing (13) at the side where the discharge pipe (3) opens out into the environment, and which duct (20) is communicating with the environment along at least a part of its length and opens out into the air feed pipe (2) at or near one or both of its face ends.

6. Combination according to any of the preceding claims, wherein both the air inlet opening (12, 15) and the combustion gas discharge opening (6) can be rotated about the longitudinal axis of the combination (1), and are connected to each other in a non-rotatable manner.

7. Combination according to Claim 1, wherein at the top side it has a bottom plate (22) and may have a top plate (21) at a distance therefrom and running parallel thereto, which plates are directed essentially at right angles to the lengthwise direction of the combustion gas discharge pipe (3), which pipe (3) projects through the bottom plate (22), and ends at a distance from the top plate (21) which may have been provided, and the burner air supply pipe (2) runs until it is against the bottom plate (22) and connects thereto essentially in a gastight manner, the bottom plate (22) having an opening (12) which opens into the pipe (2), at the side of which opening (12) the pipe (3)

is at least partially enclosed by a buffer plate (27), which consequently is situated between the outside wall of the pipe (3) and the opening (12). (for instance as shown in Figure 7).

8. Combination according to Claim 7, wherein the buffer plate (27) runs radially outwards from points lying essentially diametrically opposite each other along the periphery of the pipe (3), and between those points runs closely along the outer periphery of the pipe (3) parallel to the periphery thereof.

9. Combination according to any of the preceding claims, wherein the combustion gas discharge pipe (3) tapers towards the free mouth (6) thereof.

10. Combination according to any of the preceding claims, wherein the mouth of the combustion gas discharge opening (6) is situated at an angle relative to the longitudinal direction of the combustion gas discharge pipe (3).

11. Combination according to any of the preceding claims, wherein the free end of the discharge pipe (3) is at least partially enclosed by a housing (7) which has openings (17) at its circumference both at the side where the pipe (3) debouches and at the opposite side.

fig - 1

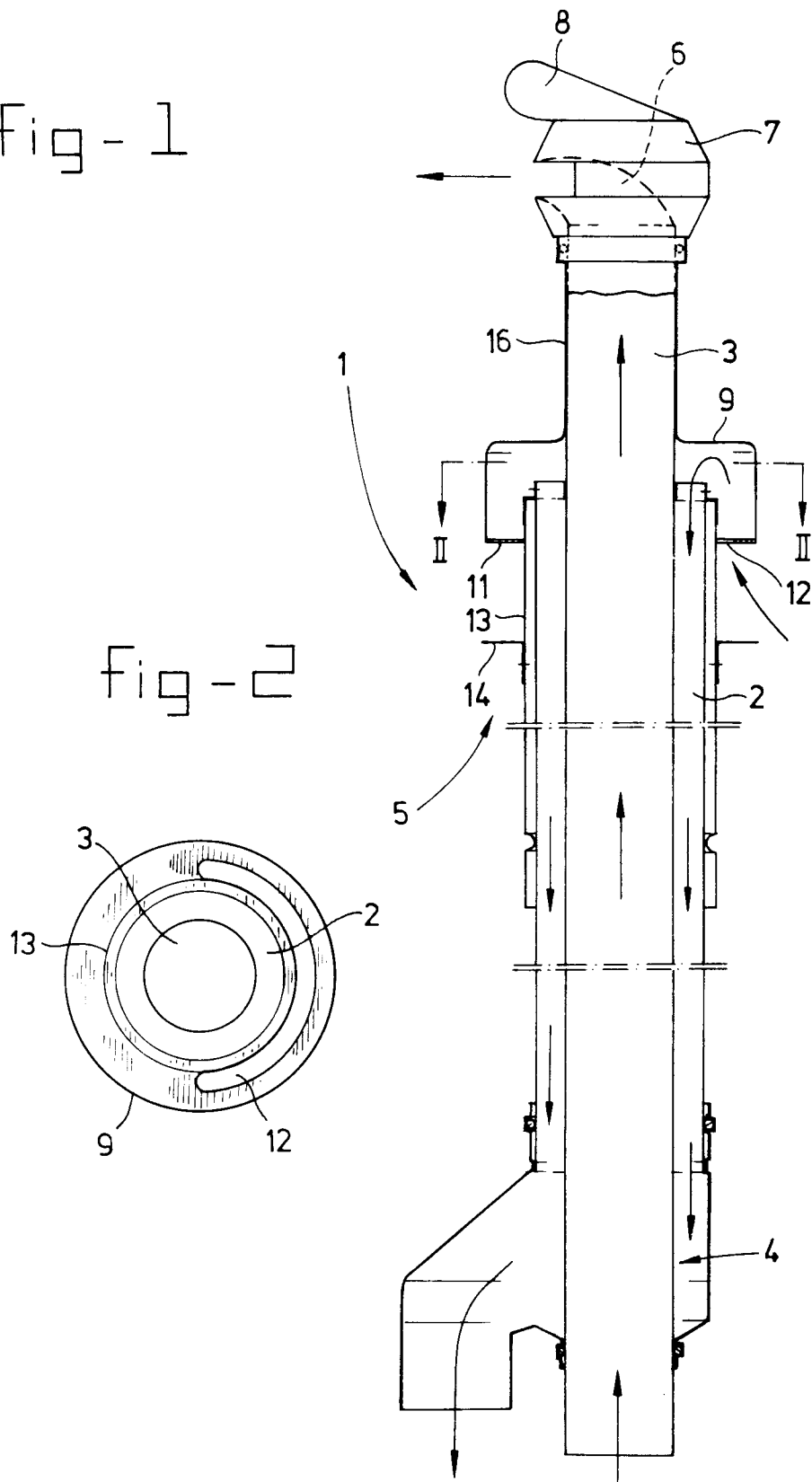


fig - 3

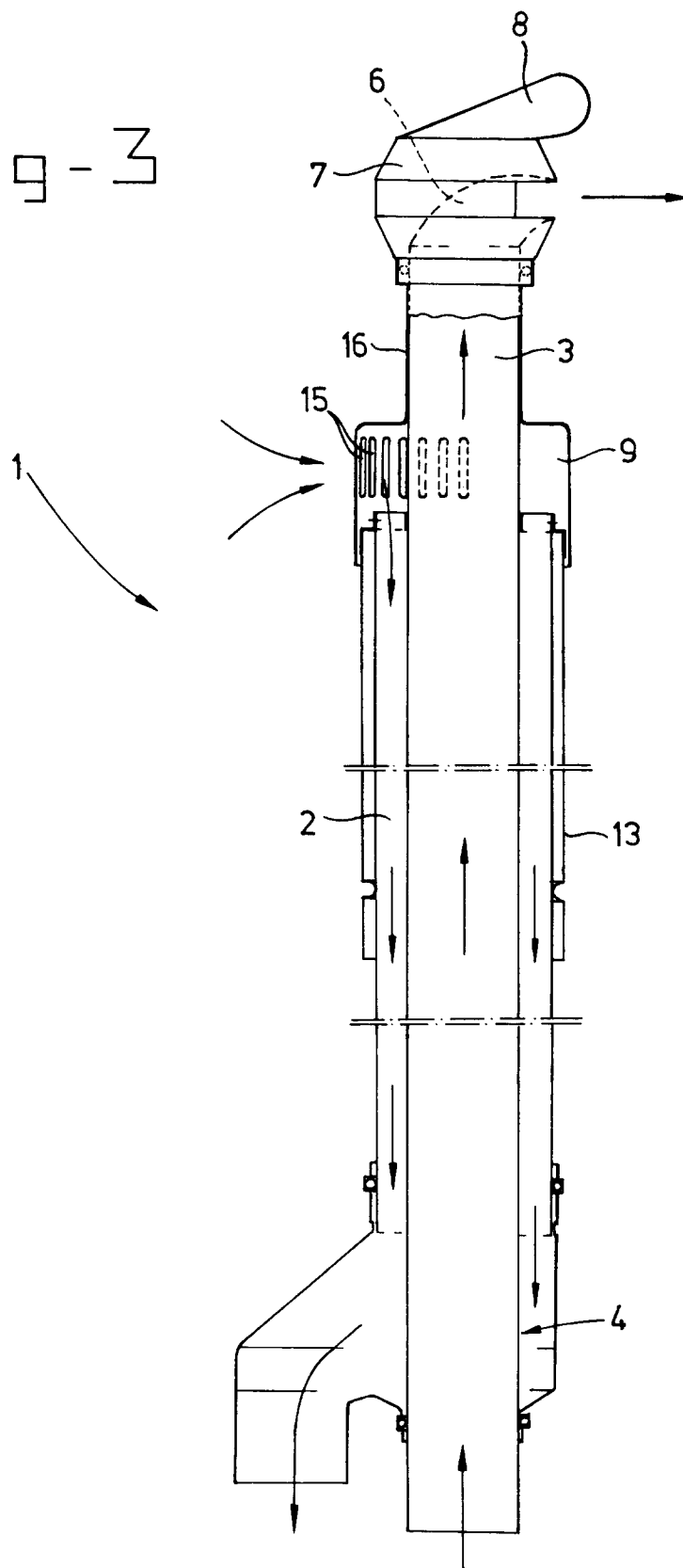


fig - 4

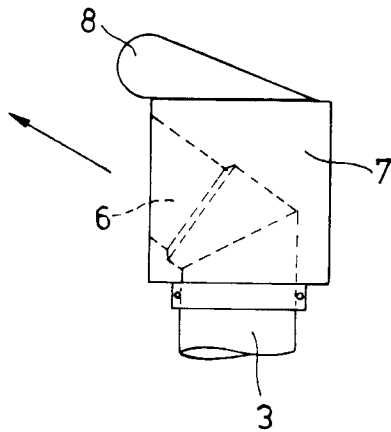


fig - 5

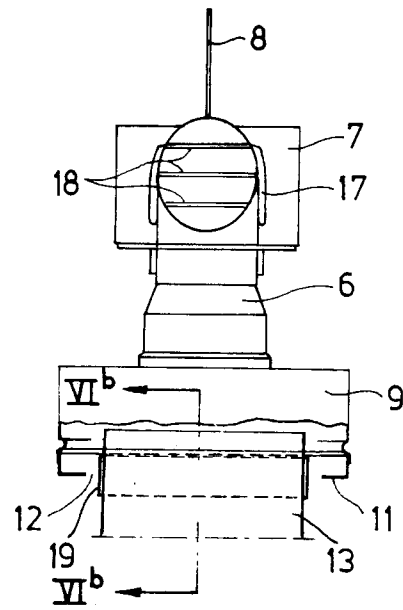


fig - 6a

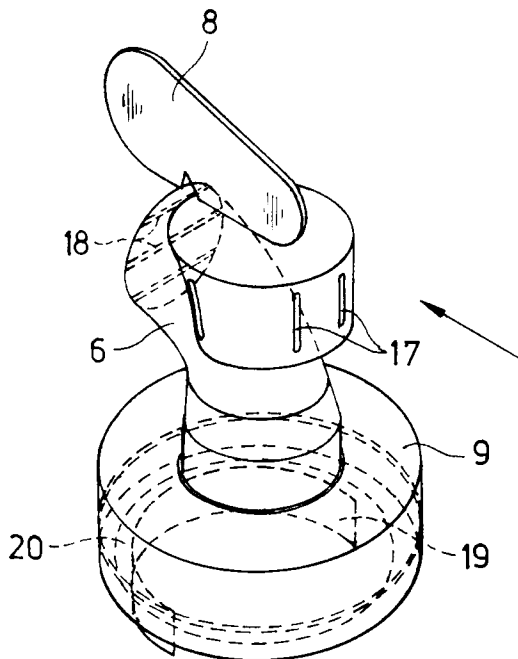


fig - 6b

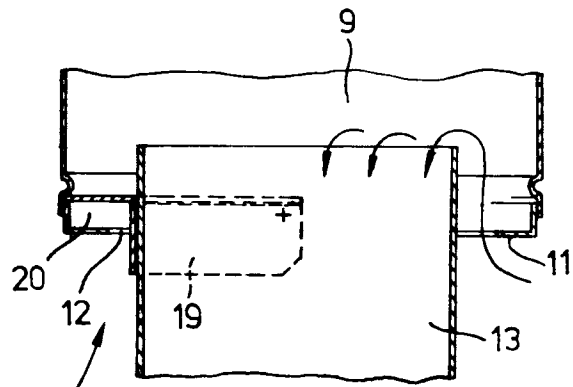


fig-7

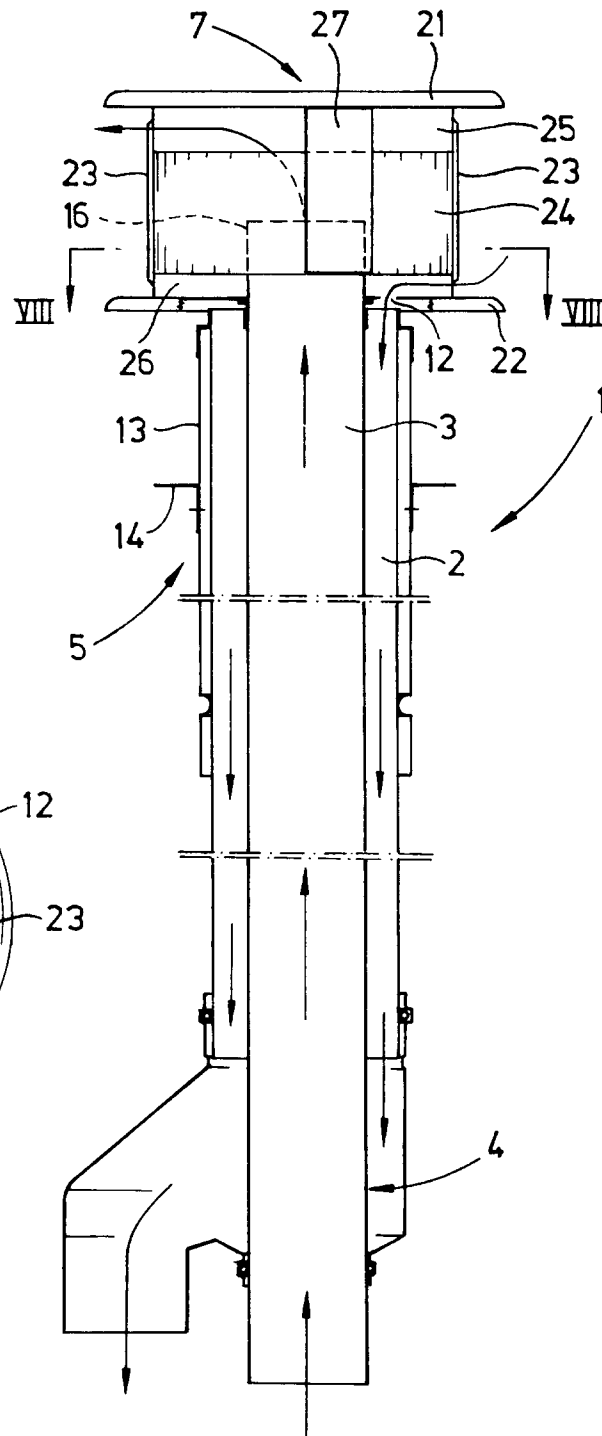
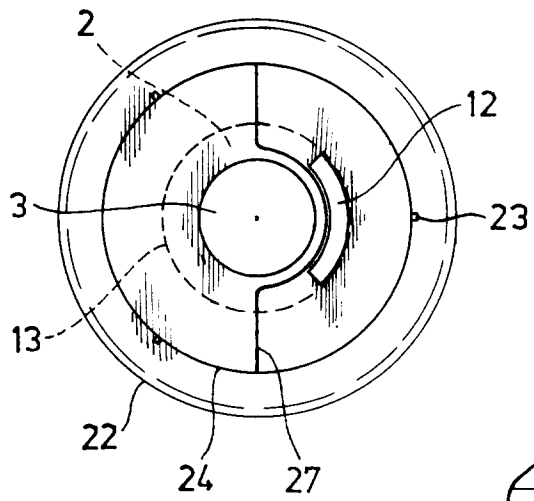


fig-8





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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 1864

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	US-A-4 893 608 (REASER) * column 2, line 24 - line 38; figure 1 * ---	1,3,6,10 2	F23L17/04 F23J13/02
Y	US-A-4 273 032 (SPAIN) * column 4, line 20 - line 60; figure 3 * ---	1,6,10	
D,Y A	EP-A-0 491 444 (BARENDRECHT) * column 3, line 24 - column 4, line 8 * * column 5, line 49 - line 51 * * figures 1,2,4 * ---	3 1,2	
A	US-A-3 315 586 (MARRAPESE ET AL) ---		
A	FR-A-1 169 667 (BEHIELS) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F23L F23J F24F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 August 1994	Examiner Vrugt, S
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