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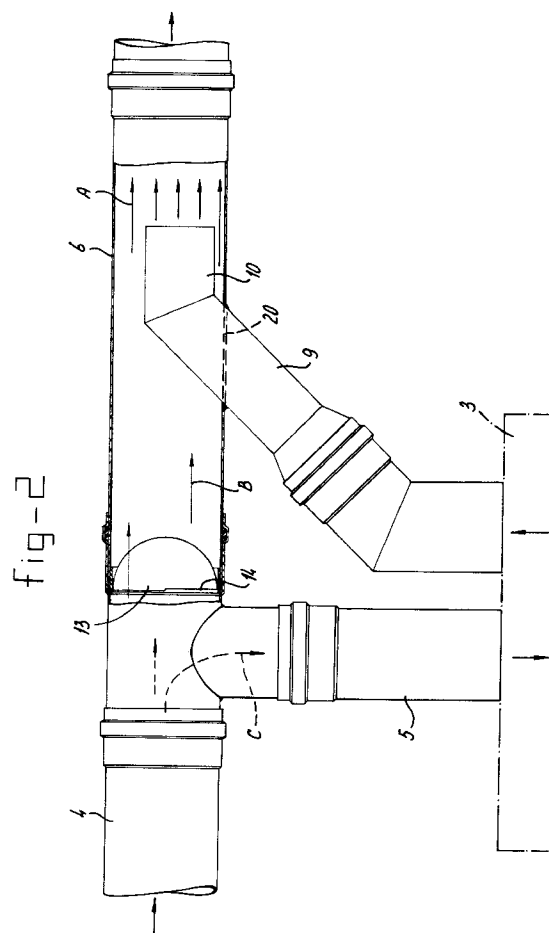
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(54) **Combined air supply and combustion gas discharge system for closed type combustion appliances.**

(57) System of air supply duct (4) and combustion gas discharge duct (6), connected to a combustion boiler (3) of the essentially closed type, for installation in a room of a building, and for opening out into the atmosphere, in which system the ducts are in fluid communication by means of a transition part (12) with controllable shut-off element (13) if the shut-off element is in the open position, which shut-off element is controlled between the open and the closed position depending on the pressure prevailing in the air supply duct.



The invention relates to the air supply and combustion air discharge in combustion boilers of the essentially closed type, such as those currently being widely used for the hot water supply and/or heating of dwellings.

Safety regulations stipulate that the excess pressure in the boiler relative to the atmospheric pressure must not exceed a certain limit. If it does, the supply of fuel to the boiler is shut off, and the boiler is put out of operation. It has been found that conditions which can prevail in the air supply duct, for example as the result of weather conditions (strong wind) can lead to the excess pressure in the boiler becoming too high. Many attempts have already been made to prevent the conditions in the air supply duct from being able to cause the boiler to be put out of operation on account of the excess pressure being too high. In that connection, reference is made to, for example, EP-A-0491444. The present invention makes a contribution to the object outlined above. The measures specified in the appended Claim 1 are proposed for this purpose.

Further objects and advantages of the present invention emerge from the sub-claims and from the description which follows of a number of embodiments, with reference to the appended figures. It is pointed out that these embodiments are given purely by way of illustration, and must not be interpreted as limiting the invention. In the figures:

Figures 1a and 1b show diagrammatically a side view in section, partially cut away, of a block of flats with a system of air supply duct and combustion air discharge duct with closed boiler according to the invention;

Figure 2 shows the system according to Figures 1a and 1b in greater detail, in side view and partially in section;

Figures 3a and 3b show a detailed view corresponding to Figures 1a and 1b of alternative embodiments;

Figure 4 shows a view corresponding to Figure 2 of an alternative embodiment;

Figures 5a and 5b show a view corresponding to Figure 4 of further alternatives;

Figure 6 shows a side view, partially in section, of a further alternative embodiment in a first position; and

Figure 7 shows a view of the variant according to Figure 6 in a second position.

Figures 1a and 1b show a block of flats 1, consisting of various floors 2 placed above one another. A closed boiler 3 is placed on each floor, for the hot water supply and for heating the living areas. The boiler 3 is gas-fired. An air supply duct 4 opens out on each floor in a side wall of the building 1 and runs horizontally to the boiler 3. The air supply duct 4 is connected to the boiler 3 by means of a vertical connecting stub 5 (Figure 2). A fan (not visible) is installed in

a manner known per se inside the boiler 3, for drawing in outside air through the air supply duct 4. A combustion air discharge duct 6 runs, also horizontally, from the boiler 3 to a vertical chimney 7 projecting beyond the roof of the building 1. The chimney 7 can run outside the building (Figure 1a), but could also be installed in a shaft 8 specially designed for it inside the block of flats 1 (Fig. 1b).

As shown more particularly in Figure 2, the boiler 3 is connected by means of an injection duct 9 to the combustion air discharge duct 6. The general lengthwise direction of the injection duct 9 forms an acute angle with the lengthwise direction of the combustion air discharge duct 6. The end 10 of the injection duct 9 projecting into the combustion air discharge duct 6 runs parallel to the lengthwise direction of the combustion air discharge duct 6, and the mouth thereof faces the downstream direction. Flue gases discharged from the boiler 3 through the injection duct 9 into the combustion air discharge duct 6 will consequently preferably flow in the direction of the arrows A. Figure 2 also shows that the air supply duct 4 is connected by means of a transition part 12 to the combustion air discharge duct 6. A valve 13 is disposed in this transition part 12. It is shown in the open position in Figure 2. The valve 13 consists of two halves of a circular disc. These halves are pivotable in opposite directions about a central common hinge pin 14. In the open position shown, the disc halves face each other. In the closed position of the valve 13 (not shown) the disc halves lie in line with each other, and define a complete, circular shut-off disc. The shape of said shut-off disc is adapted to the cylindrical inside wall of the transition part 12, and rests against a peripheral flange (not visible) running all the way round and projecting inwards radially from the inside wall of the transition part 12, in order to provide a good fluid seal between the air supply duct 4 and the combustion air discharge duct 6. A spring (not shown) tries to hold the valve 13 in the closed position. Only when sufficient excess pressure prevails in the air supply duct 4 relative to the combustion air discharge duct 6 will the valve 13 be opened under that pressure difference against the action of the spring. Air from the duct 4 can then flow through the transition part 12 and into the combustion air discharge duct 6. This will continue until the pressure difference has decreased sufficiently again, following which the valve 13 will close again automatically. The possible flow of air from the duct 4 through the transition part 12 into the duct 6 is shown by means of the arrows B. Even when valve 13 is open, an inward flow of air 4 in the direction of the arrows C into the boiler 3 is ensured. Air flow out of the duct 6 through the transition part 12 to the duct 4 is effectively prevented by the valve 13 combined with the injection part 9.

Figures 3a and 3b show alternative embodiments of the invention, in which both the air supply

duct 4 and the combustion air discharge duct 6 open out at the side of the chimney 7. In Figure 3a the air supply duct 4 concentrically surrounds the combustion air discharge duct 6, with spaces between them. At the side of the boiler 3 the air supply duct 4 runs on past the combustion air discharge duct 6. The respective end of the duct 4 is shut off, as shown. Air comes out of the supply duct 4 through the connecting stub 5 into the boiler 3 through a stub 16 which is also surrounded concentrically by the air supply duct 4, with a space between them. The stub 16 is connected to the combustion air discharge duct 6 by way of the transition part 12, in which a shut-off valve 13 is housed. Figures 3a and 3b show the valves 13 in the open position. These valves are of the same type as those in Figure 2. Here again, an injection duct 9 runs from the boiler 3 into the combustion air discharge duct 6. As in Figure 2, this injection duct 9 has a constriction for increasing the discharge rate of the combustion air. Here again, the injection duct 9 opens out downstream of the transition part 12 in the combustion air discharge duct 6. The combustion gases discharged through the injection duct 9 into the combustion air discharge duct 6 have a direction of flow which forms an acute angle with the lengthwise direction of the combustion air discharge duct 6.

In Figure 3b the ducts 4 and 6 run outside each other.

Figure 4 shows a further variant of the invention. Here again, the duct 4 surrounds the duct 6 concentrically, with a space between them. The ducts 4 and 6 run vertically and, for example, project through a roof and open out above it. In that connection reference is made to Figures 1 and 2 of the earlier mentioned EP-A-0491444, which shows in greater detail how the air supply duct and combustion air discharge duct running concentrically inside one another project through the roof of a building. As can be seen from Figure 4, the lengthwise direction of the injection duct 9 runs parallel to the lengthwise direction of the combustion air discharge duct 6. The air supply duct 4 opens out into a box 17. This box 17 surrounds the duct 6 and is also connected to the connecting stub 5 for connection to the boiler 3. At 18 the injection duct 9 is constricted for the purpose of accelerating the flue gases which are to be discharged into the duct 6. The transition part 12 is accommodated in the box 17. Here again, the valve 13 is shown in the fully open position. The injection duct 9 opens out downstream of the transition part 12 into the duct 6.

Figures 5a and 5b show variants of Figure 4. In both Figure 5a and Figure 5b the boiler 3 is left out. The position of the box 17 is shown only in imaginary fashion in Figure 5a. In Figure 5b said box 17 is not necessary. In Figure 5a the lengthwise direction of the injection duct 9 runs parallel to the lengthwise direction of the duct 6. The injection duct 9 is constricted at 18. In Figure 5b a part of the injection duct 9 runs

at an angle relative to the lengthwise direction of the duct 6. The valve 13 is shown in the open position in both Figures 5a and 5b.

Figures 6 and 7 show yet another variant. Air supply duct 4 and combustion air discharge duct 6 which run at a distance from each other are shown. They can be installed vertically for use as a variant of Figure 4, but they can also be installed horizontally for use as a variant of Figures 1 to 3. The ducts 4 and 6 can be connected by what is the underside in the drawing to a combustion boiler (not shown). Further upwards, the ducts 4 and 6 can continue to run parallel to each other and at a distance from each other. However, they can pass by way of a conventional transition piece into an arrangement in which they surround each other coaxially, and in which the air supply duct 4 surrounds the combustion air discharge duct 6, for example with space between them. Other variants for the arrangement of the ducts 4 and 6 are also possible. The air supply duct 4 is connected by way of a transition piece 12 to the combustion air discharge duct 6. A valve 13 is fitted in the transition part 12. Said valve 13 is shown in the closed position in Figure 6. In Figure 7 the valve 13 is partially open, against the action of a release spring (not shown). The valve 13 used here corresponds to that shown in, inter alia, Figures 2 and 4. An injection duct projects from the bottom in the drawing into the combustion air discharge duct 6, which injection duct forms the continuation of the combustion air discharge duct 6 to the boiler (not shown). Said injection duct 9 is constricted in the region of the transition part 12, and opens out into the combustion air discharge duct 6 downstream of the transition part 12. Fixed at what is the underside of the transition part 12 in the drawing, at the side of the air supply duct 4, is an air scoop or air shaft 15, which projects into the air supply duct 4 and runs slanting in an upstream direction. Said air scoop 15 makes an additional contribution towards counteracting the pressure increase forming in the air supply duct 4. The air shaft 15 and/or the injection duct 9 may also be left out, in which case equalization of pressure is still possible by means of valve 13. The assembly of air supply duct 4, combustion air discharge duct 6 and transition part 12 according to Figures 6 and 7 is expediently achieved by two T-shaped lengths of pipe or tube which are inserted into each other, as shown, and are connected to each other in a gastight manner by means of a sealing ring 16. An annular part 17 is also inserted into the inner tube part of the tube parts of the transition part 12 inserted into each other, to which annular part the valve 13 is hingedly connected. The annular part 17 with the valve 13, the release spring (not shown) therefor and the hinge 14 thereof form a sub-assembly. Other embodiments, including those shown in the remaining Figures 1 to 5, can also be provided with an air shaft 15 projecting into the air supply duct 4.

As will be clear, it is ensured in the case of all embodiments that the injection duct 9 opens out into the duct 6 downstream of the valve 13, and thus the transition part 12. It is also ensured in each case that the flue gases discharged from the injection duct 9 into the combustion air discharge duct 6 have a velocity component which is directed in the direction of flow through the combustion air discharge duct 6. Combined with the valve 13, this consequently ensures in a particularly reliable way that flue gases are prevented from passing at any time out of the duct 6 into the air supply duct 4.

It goes without saying that variants other than those described and shown here are also conceivable. The valve 13 may be of any suitable shape which is conceivable for a shut-off element. Other tube shapes instead of a circular cross-section may also be selected for the various duct and tube elements. In addition, all combinations of the details shown in the figures are possible. Moreover, it is not necessary for the injection duct 9 to have a constriction. Furthermore, it is not necessary in all circumstances for the injection duct 9 to run over some distance inside the combustion air discharge duct 6. For example, in the embodiment shown in Figure 2 the injection duct 9 can end at the dotted line 20. The transition part 12 can be an integral part of, for example, the combustion air discharge duct 6 or the air supply duct 4.

Claims

1. System of air supply duct and combustion air discharge duct, connected to a combustion boiler of the essentially closed type, for installation in a room of a building, and for opening out into the atmosphere, in which system the ducts are in fluid communication by means of a transition part with controllable shut-off element if the shut-off element is in the open position, which shut-off element is controlled between the open and the closed position depending on the pressure prevailing in the air supply duct.
2. System according to Claim 1, in which a combustion air injection duct runs between the combustion boiler and the combustion air discharge duct, which combustion air injection duct opens out into the combustion air discharge duct downstream of the place where the transition part opens out into the combustion air supply duct.
3. System according to Claim 2, in which the combustion air injection duct projects over some distance into the combustion air discharge duct.
4. System according to Claim 2 or 3, in which the

combustion air injection duct is disposed and/or opens out into the combustion air discharge duct in such a way that the fluid discharged from the injection duct into the combustion air discharge duct has a velocity component directed in the downstream direction of the combustion air.

5. System according to one of the preceding Claims 2 to 4, in which the air supply duct surrounds the combustion air discharge duct concentrically, or vice versa.
6. System according to one of the preceding Claims 1 to 4, in which the combustion air supply duct lies in line with the combustion air discharge duct.
7. System according to one of the preceding claims, in which the shut-off element is fixed to a side wall of the combustion air discharge duct.
8. System according to one of the preceding Claims 1 to 6, in which the shut-off element is fitted in an end wall of the combustion air discharge duct.
9. System according to one of the preceding claims, in which the shut-off element is a spring-loaded butterfly valve, which can be held in the open position against the action of a spring.
10. System according to Claim 9, in which the butterfly valve consists of two wings which can pivot about a common central hinge pin, in order to assume the open position by pivoting in opposite directions, which wings lie in line with each other when in the closed position.
11. System according to Claim 10, in which in the open position of the shut-off element the wings are situated at the side of the hinge pin facing the combustion air discharge duct.
12. Assembly of air supply duct and combustion air discharge duct provided with a transition part with controllable shut-off element obviously intended for use in a system according to one of the preceding claims.

fig-1a

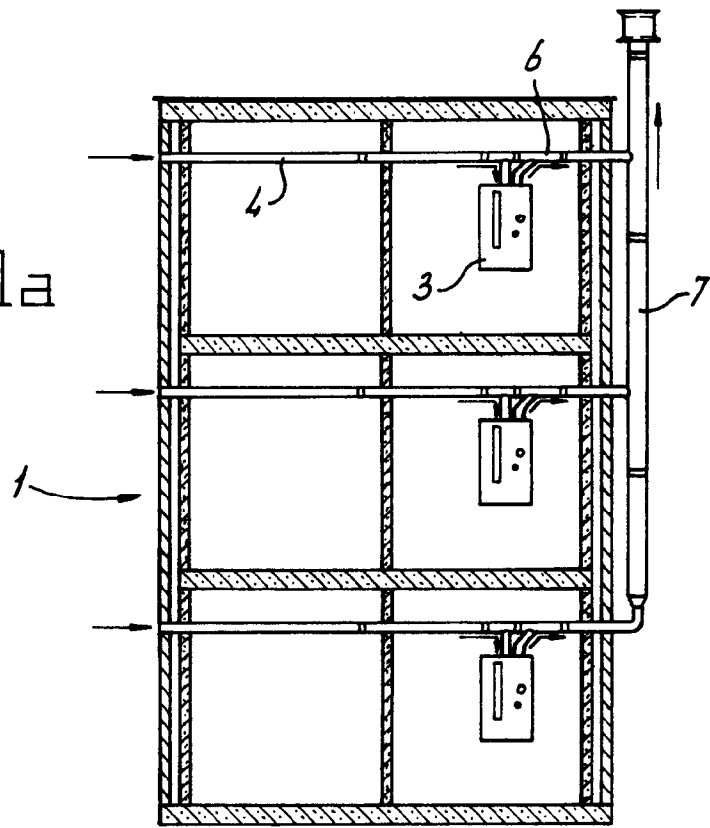


fig-1b

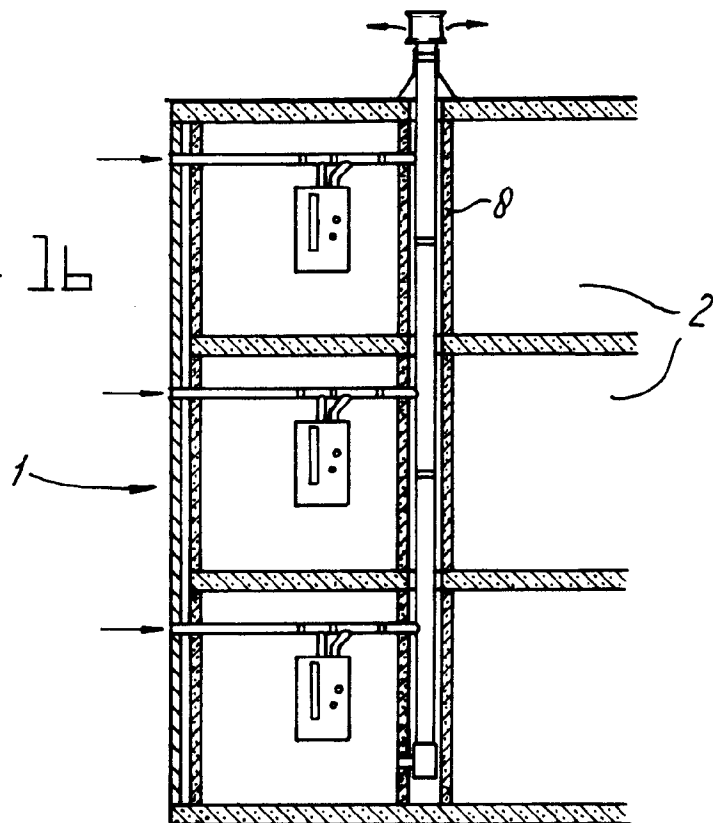


fig-2

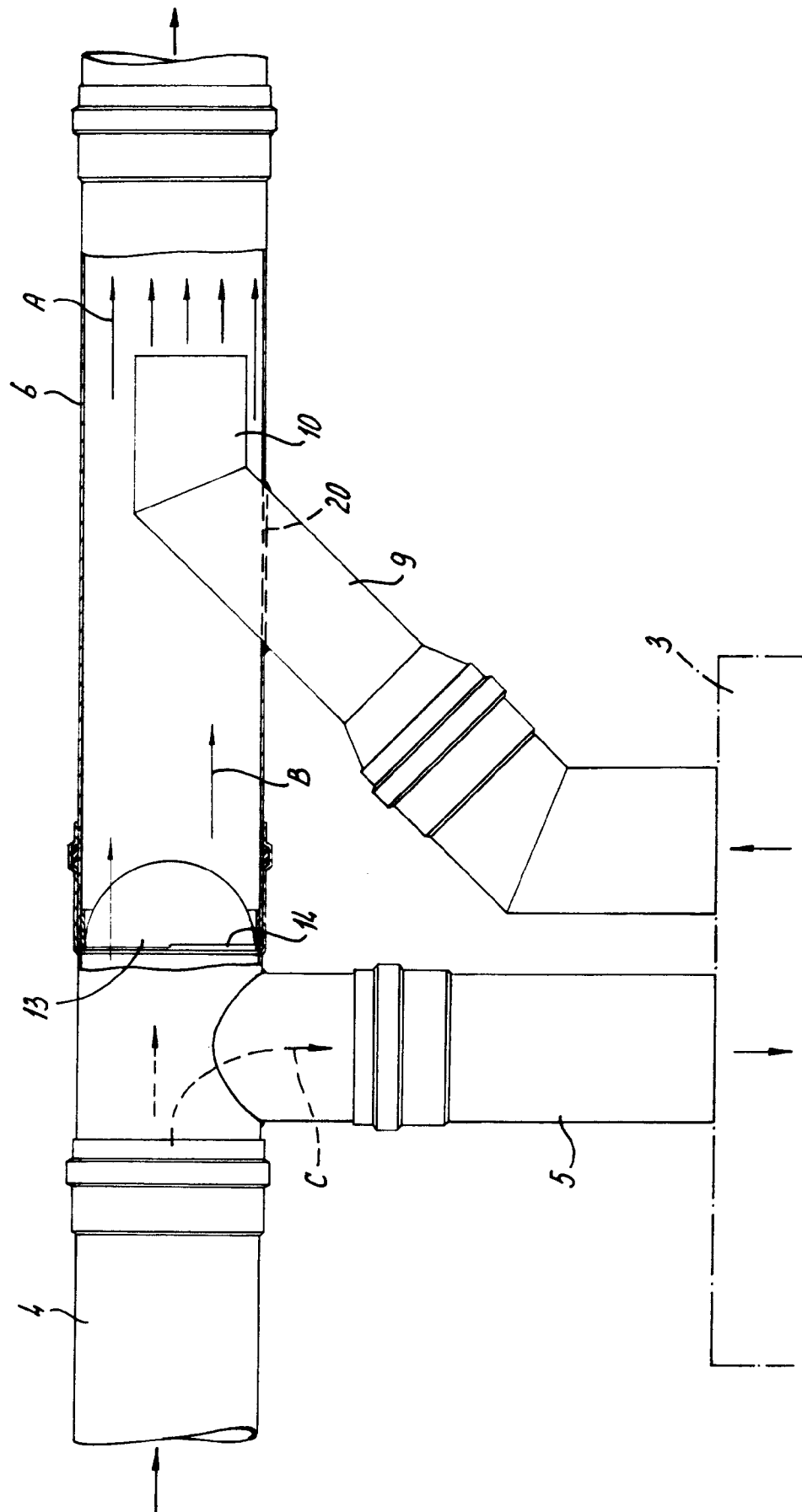


fig-3a

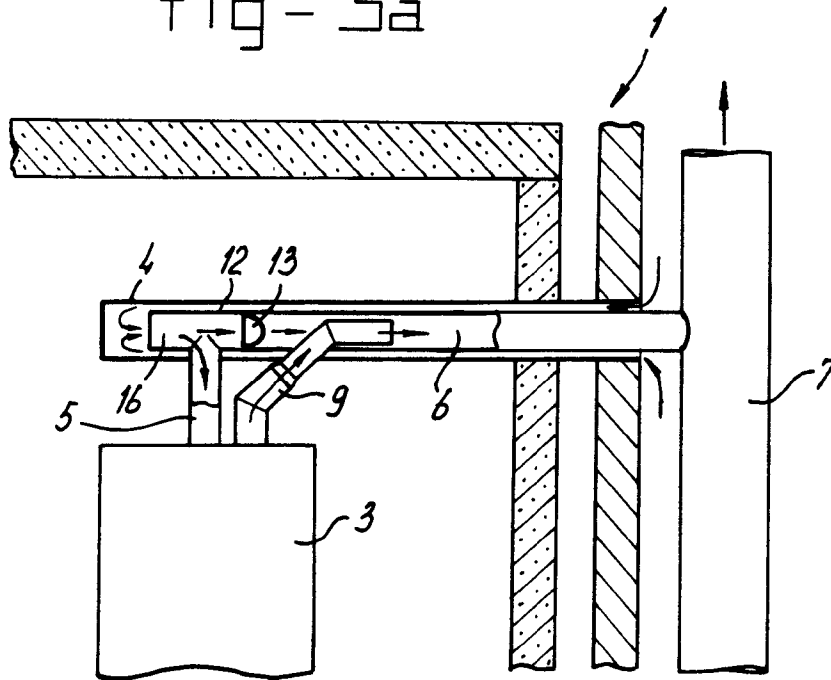


fig-3b

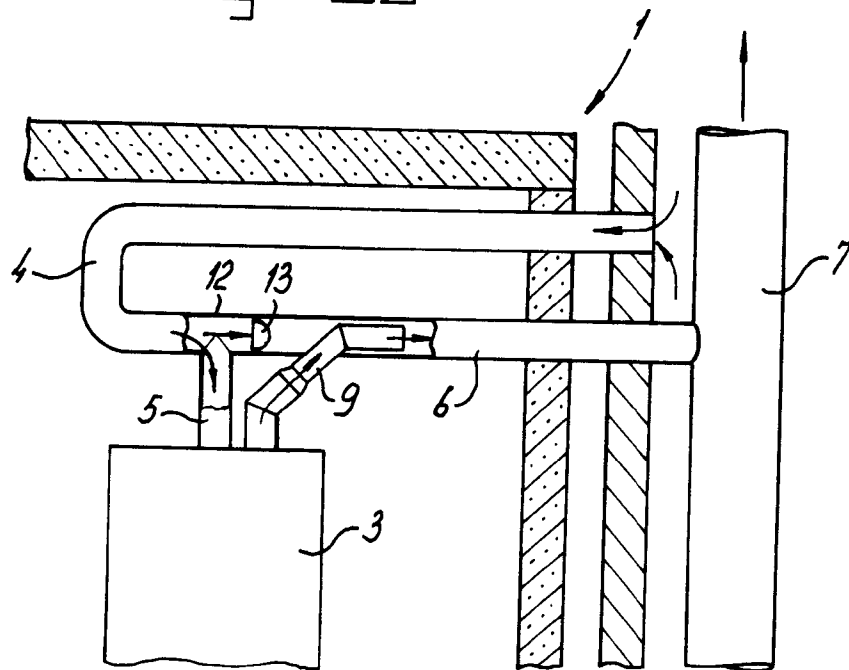


fig-4

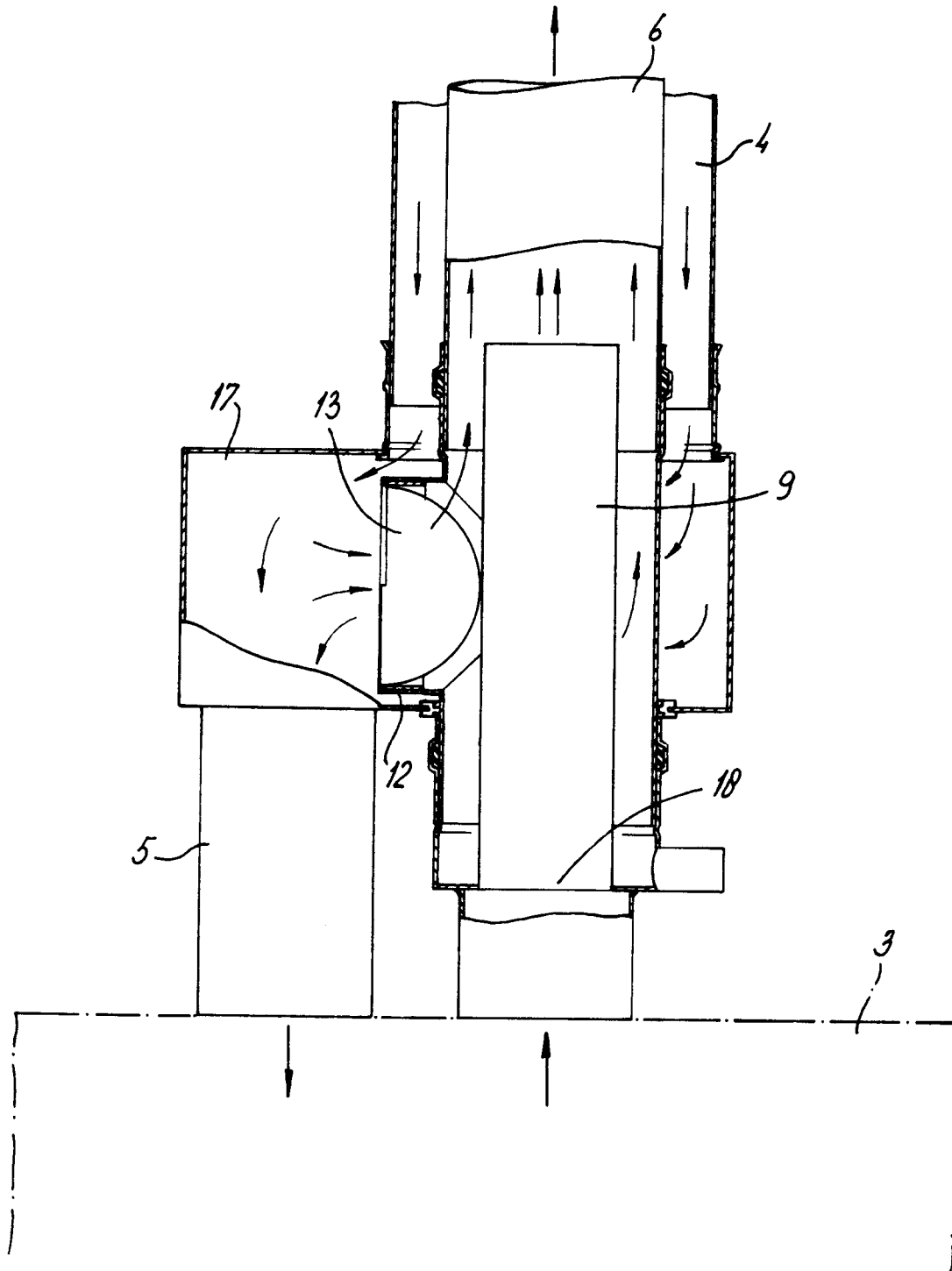


fig-5a

fig-5b

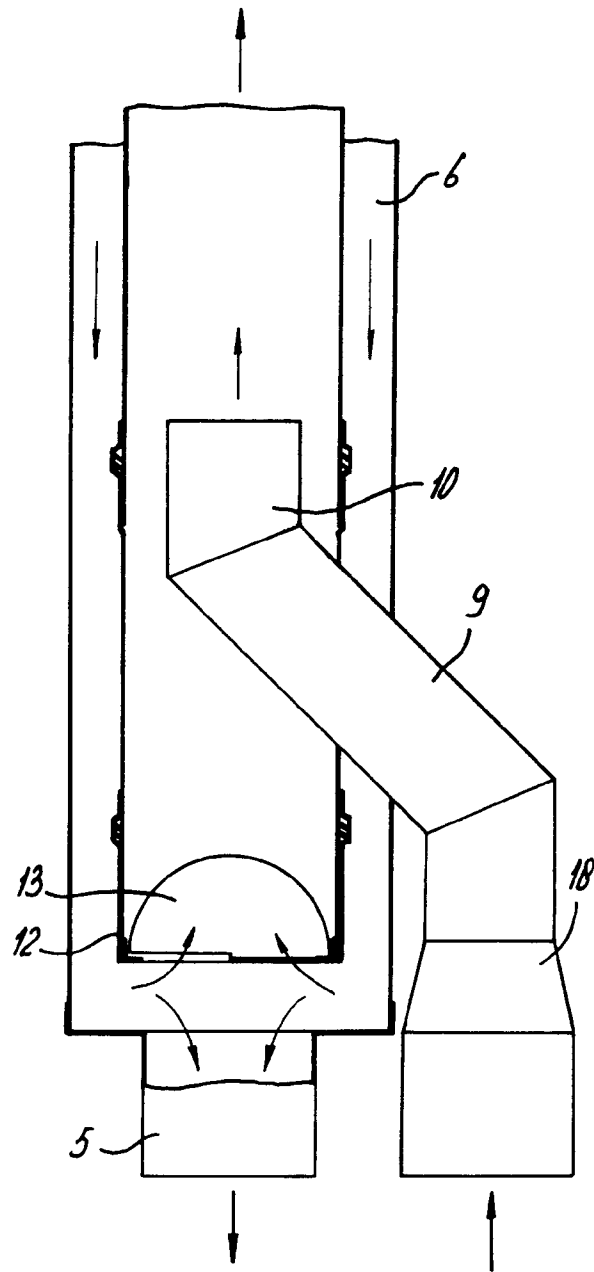
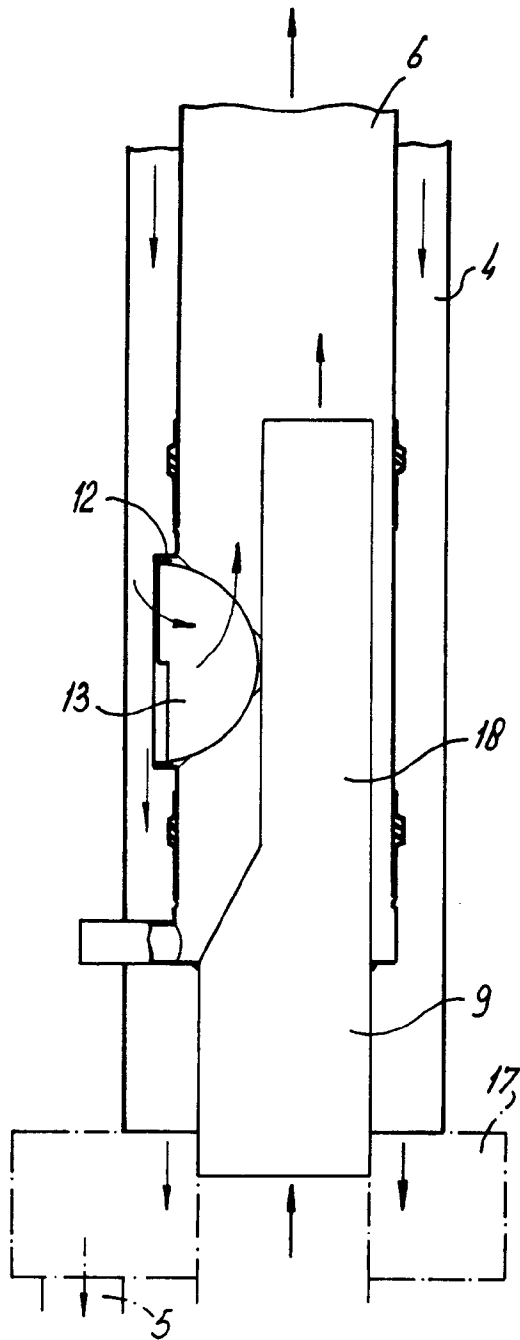


fig-6

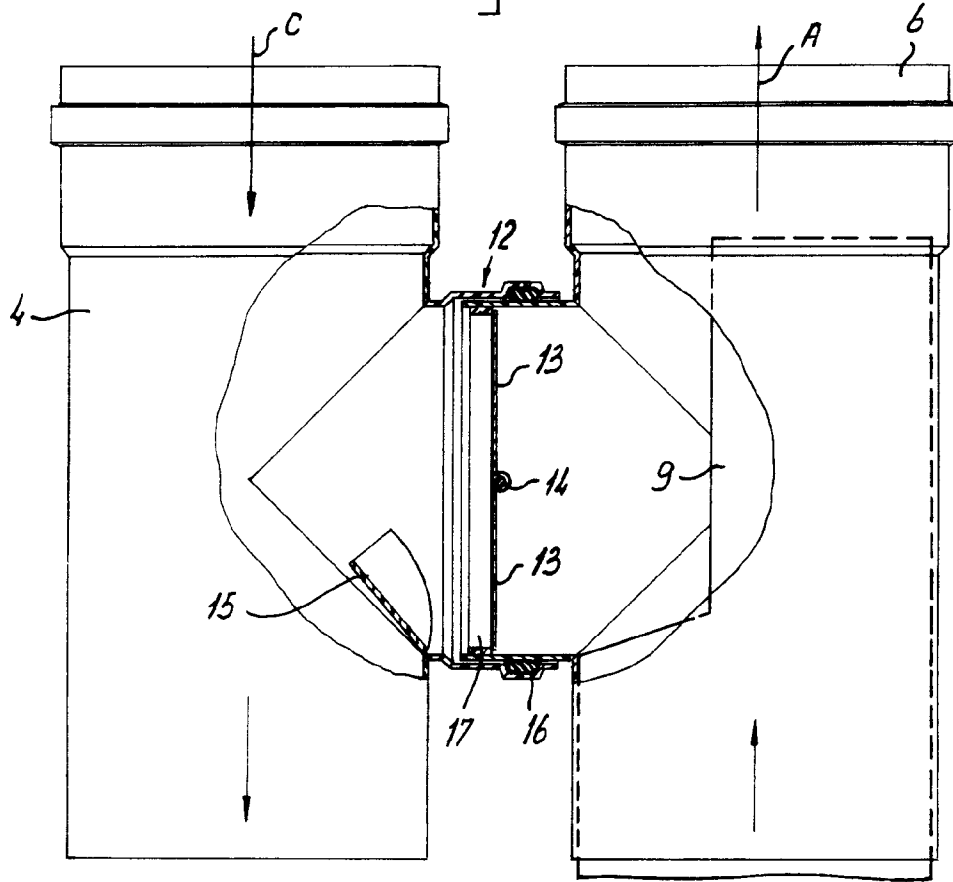
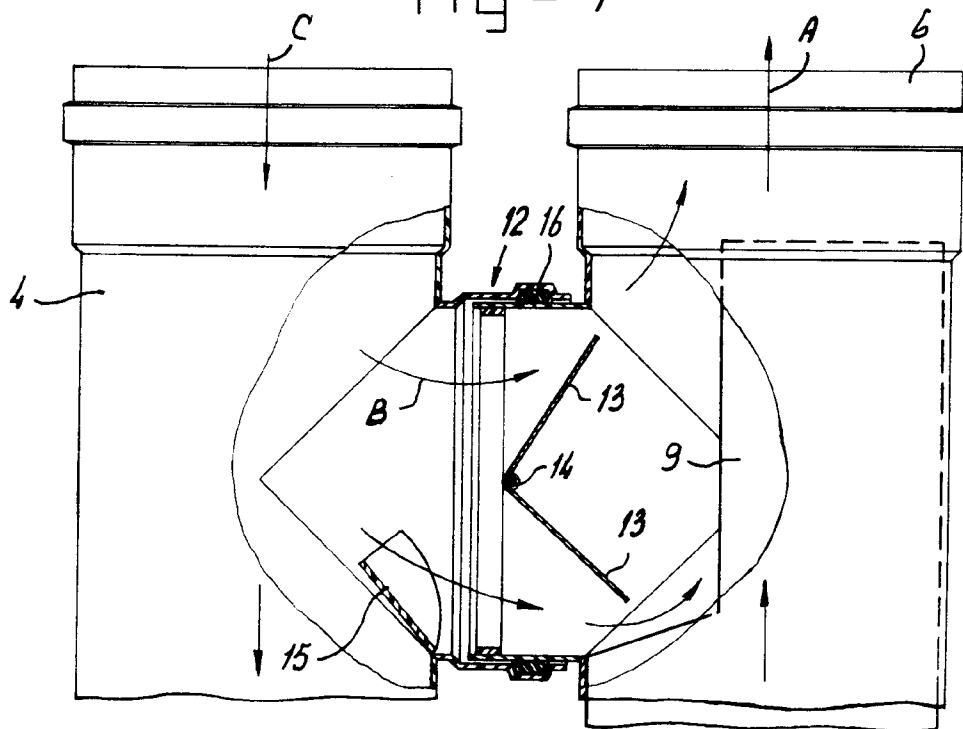


fig-7





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 1404

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)
X	DE-U-94 01 894 (JOH. VAILLANT GMBH) 24 March 1994 * page 3, paragraph 3 - page 3, paragraph 4 * * page 4, line 16 - page 4, line 25 * * figure *	1,2,6,12	F23J11/00 F23L11/02
X	EP-A-0 235 092 (FERROLI INDUSTRIE RISCALDAMENTO) 2 September 1987 * page 6, last paragraph - page 7, paragraph 4; figure 1 *	1,12	
A	FR-A-2 550 318 (GAZ DE FRANCE) 8 February 1985 * page 9, line 22 - page 9, line 35; figure 3 *	1-4,6	
A	EP-A-0 418 976 (UBBINK NEDERLAND B.V.) 27 March 1991		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F23J F23L F23N
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 September 1995	Examiner Phoa, Y
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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