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(54) Combined system for flue gas removal, air supply and ventilation air removal

(57) A building with an integrated tubing system (6) with three concentric tubes, wherein the first tube is used for flue gas removal of a heating system (55) of the building, the second tube for air supply to the heating system (55) and the third tube for ventilation air removal from the building, and closed off with an exhaust module (8) which optimally separates the flows. Preferably, the tubing system (6) is constructed of mating tubing modules (4).

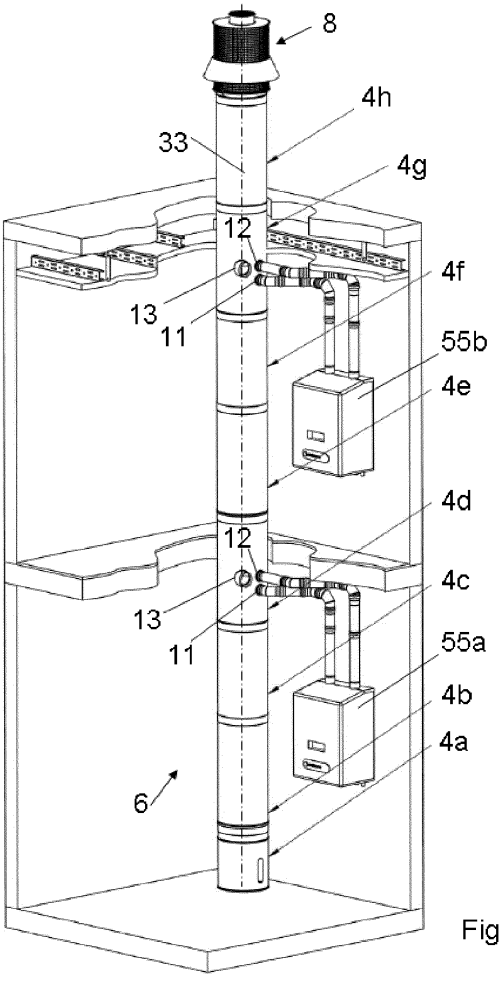

Fig. 3A

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a building with at least one heating system and at least one ventilation system, and with a tubing system comprising a first rising tube for flue gas removal of a heating system of the building, a second rising tube for air supply to the heating system, and a third rising tube for ventilation air removal from the building.

[0002] The invention is also related to a tubing module, and on an exhaust module for such tubing system.

PRIOR ART

[0003] Buildings with a system with two concentric tubes for flue gas removal and air supply from and to a heating system are known in the art. These tubes are usually made of stainless steel. Ventilation systems for active air removal of certain areas (e.g. kitchen and bathroom) to the outside are also known. These tubes are usually made of aluminium or plastics. Both systems are installed independently of each other. The installation of such systems is cumbersome and time consuming.

[0004] EP1541925A1 describes a building with at least one heating system and at least one ventilation system. The building is further provided with a tubing system comprising a first rising tube for flue gas removal of a heating system of the building, a second rising tube, more specifically a permanent existing chimney, for air supply to the heating system and third rising tube for ventilation air removal from the building. The first and the second and the third tube are concentric tubes along at least along a part of the height of the building. The second tube is located around the first tube. The third tube is located between the first and the second tube.

[0005] However, in such a configuration with three tubes relative to each other, outside air is supplied to the heating system on the outside of the tubing system and hence, the area surrounding the three concentric tubes is in thermal contact with the outside air. This has the disadvantage that, for example, in wintertime, the area surrounding the second tube is cooled, which is not always desirable, for example when the second tube is in contact with a living space. To this end, the second tube may, for example, be isolated. This has the disadvantage that the tubing system becomes more complicated.

DESCRIPTION OF THE INVENTION

[0006] It is therefore an object of the present invention to provide a building with a tubing system for flue gas removal from and air supply to a heating system of a building, and a tube for ventilation air removal from the building which can be mounted more easily.

[0007] This goal is achieved by a system according to the first claim.

[0008] To that end, the building with at least one heating system and at least one ventilation system comprises a tubing system with a first rising tube for flue gas removal of a heating system of the building and a second rising tube for air supply to the heating system and third rising tube for air removal (e.g. ventilation air removal) from the building, wherein the first and the second and the third tube are concentric tubes along at least a part of the height of the building, wherein the second tube is located around the first tube, and the third tube is located around the second tube.

[0009] By providing a tubing system with three concentric tubes, an integrated solution is offered for the conventional heating tubes and conventional ventilation tubes that - up to now - still needed to be mounted separately, by different teams and at different times in order not to hinder each other. The tubes of the tubing system according to the present invention are all installed at once by one single team, such that time and effort can be saved.

[0010] A major advantage of the tubing system according to the present invention is that only one roof opening needs to be provided, unlike conventional systems where several roof openings are required. This will reduce roof and insulation work, and will reduce the risk of leakage. Moreover, the system according to the present invention is provided to use an exhaust module on the roof that separates the various air and flue gas flows in a better way, such that the conventional problems of air flows disturbing each other are avoided.

[0011] Furthermore, the inventor has also found that the concentric tubing system according to the invention also requires less space, as the shafts of the conventional systems need to be dimensioned large enough to both accommodate all tubes for flue gas removal, air supply and ventilation air removal, and to anchored them individually, such that the ducts need to be wider than with the system according to the present invention. Moreover, the concentric tubing system according to the present invention may be anchored more quickly, as only the outer (third) tube needs to be anchored, which is time-saving.

[0012] In addition, the inventor experienced that by providing a tubing system wherein the second tube is located around the first tube, and the third tube is located around the second tube, the incoming outside air is no longer in direct thermal contact with the space surrounding the tubing system. However, according to the invention, the third tube is provided to remove the ventilation air and hence, the space surrounding the tubing system is in thermal contact with the ventilation air, which is often originating from the living rooms of the building itself, often removing the need for isolation.

[0013] Moreover, the supplied air is in thermal contact with the first tube and hence, also with the flue gas removal tube, such that the supplied air may also be heated by the flue gases that are being removed. Such heated air often provides a performance increase in the heating

system.

[0014] It was also found that the ventilation air being removed acted as an insulating layer for the outside air taken in, in order to thermally isolate the space surrounding the tubes from the outside air.

[0015] It was also found that the flow rate of the removed ventilation air often exceeds the flow rate of the flue gas removal and that the flow rate of the air supply often needs to be adapted to the specific configurations in which the tubing system needs to be used. Because in the present invention, the third tube is located around the second tube, the volume between the second and the third tube can be adjusted in a simpler way such that the speed of the removed ventilation air may easily be adapted, for example, reduced, without unnecessary having to adjust the dimensions of the first and the second tube accordingly. Moreover, the increase in volume between the second and the third tube and hence, the potential reduction in speed of the ventilation air in that volume is reached more quickly as the diameter of the third tube is larger than the diameter of the second and the first tube. As within the same diameter a larger volume is obtained between the second and third tube for the removal of ventilation air, it will become possible to at least remove as large a flow of ventilation air at a lower speed, such that noise is prevented and/or it becomes possible to use the space offered within an existing chimney more economically when the building comprises a chimney, for example a permanent existing chimney, such as a masonry chimney, and the tubing system is mounted in said chimney such that the chimney is different from the third tube and is located around the third tube. Preferably, the tubing system is modular, and more preferably, the first, second and third tube are modular and preferably, the first, second and third tube are part of a tubing module, wherein the tubing system consists essentially of the tubing modules.

[0016] The advantage of such tubing modules is that more airtight channels can be obtained more easily.

[0017] Preferably, the second tube is connected to the first tube, and the third tube is connected to the second tube.

[0018] In this way, a firm assembly is obtained, and only the outer tube needs to be mounted, which saves time.

[0019] Preferably, the building comprises at least two heating systems which are both connected to the flue gas removal duct formed by the first tube and to the air supply duct located between the first and the second tube, and at least two rooms to ventilate which are both connected to the ventilation air removal duct for removal of contaminated air present therein.

[0020] The tubing system according to the present invention is particularly suitable for buildings (e.g. apartment buildings) with multiple heating systems and rooms to ventilate, which all can be connected to the concentric tubing system.

[0021] Preferably, the two are heating systems are located on a different floor.

[0022] The tubing system according to the present invention provides a very convenient, compact and efficient solution for a group of apartments, both adjacent on the same floor, but in particular apartments located above each other on different floors.

[0023] Preferably, the first and the second and the third tube are made of a material selected from the group of: stainless steel, galvanized steel and aluminium.

[0024] These materials are particularly suitable because they are corrosion-resistant, both for the hot smoke as well as for humid air.

[0025] Preferably, the tubing system extends over at least 50% of the height of the building, more preferably at least 75%, more preferably at least about 80%, most preferably over substantially the entire height of the building.

[0026] Preferably, the tubing system forms three rising ducts without curves, from the lowest floor with the boiler and/or ventilation connection to above the roof where the exhaust module is located. In this way, use is made of natural convection for the removal of flue gases and the removal of the contaminated (e.g. humid) air, such that energy can be saved.

[0027] Preferably, the first tube is connected to the second tube by means of first transverse connections, and the third tube is connected to the second tube by means of second transverse connections, wherein the second transverse connections are situated in a different plane as the plane defined by the first transverse connections and a central axis of the tubing system.

[0028] This position offers advantages with the welding during production.

[0029] Preferably, the tubing system also comprises an exhaust module which connects to the three concentric tubes and which is provided with separation means for guiding the flue gas removal in a first direction, the air supply in a second direction separated from the first direction, and the ventilation air removal in a third direction separated from the first and the second direction. Preferably, use is made of a first rising tubular element for guiding the flow from the flue gas removal duct, and an annular disk mounted along an outer surface of the second tube for separating the flow from the air supply duct and the ventilation air removal duct.

[0030] An additional advantage is that, since the third tube is located around the second tube, and the second tube is located around the first tube, a well-known exhaust module can be used for the assembly of the first and second tube, i.e. a known exhaust module which is provided for removal of flue gasses from the heating system and which is also provided to supply air to the heating system.

[0031] Preferably, the exhaust module comprises an element to prevent rain from entering the third tube without hampering the removal of ventilation air. Such an element comprises, for example, a collar, preferably in the form of a canopy, which is provided over the exhaust

of the third tube and which, on the one hand, allows that ventilation air is removed and, on the other hand, prevents rain from entering the third tube. The collar can be fitted to a mounting element, for example the annular disk.

[0032] Preferably, the collar has an angle α of approximately 135° to the vertical axis, but this angle is not essential for the invention, and other angles are also possible, e.g. 45°, 60°, 75°, 90°, 105°, 120°, 135° or 150°. The collar works as separating means, to minimize interference between the different flows. Preferably, the collar is attached, for example by means of the mounting element, along the edge of the second tube for directing the flow from the ventilation air removal duct between the second and third tube, away from the air supply.

[0033] In preferred embodiments, the mounting element and the collar may are provided as modules existing exhaust modules can be provided with on the first and the second tube, and yet, for example, allow to protect the inlet of the space between the second and the third tube against rain and/or to direct the removal of ventilation air in a certain direction in order to prevent interference with other air flows. This allows, using existing first and second tubes and their associated exhaust modules, to easily manufacture also the tubing systems according to the present invention using the mounting element and the collar.

[0034] By using such an exhaust module, the flow directions of the flue gas exhaust, the heating air supply and the ventilation air exhaust are separated maximally, such that the flows minimally disturb each other.

[0035] Preferably, the tubing system comprises several tubing modules stacked attached to one another, wherein each tubing module comprises three concentric tubes, and each tubing module has a lower and an upper end such that the upper end of a lower tubing module may simply and in an airtight manner be connected to the lower end of a higher tubing module.

[0036] By providing such tubing modules, the length of the tubing modules can be reduced (e.g. to a length of 900 to 1000 mm), allowing the tubing modules to be easily manageable and manoeuvrable, allowing both the production and installation of the tubing system to be greatly simplified. Due to the low weight and the reduced length of the tubing modules these are very easy to install, also in a cellar or on an attic, and a crane can be avoided.

[0037] Preferably, the tubing system comprises dehumidification means to evacuate condensation fluid that occurs at the first, the second and/or the third tube, from the first, the second and/or the third tube. Indeed, it was found that by the action of air flows with a different temperature, condensation may occur, for example on the inner wall of the first tube and/or on the outer wall of the second tube, both being cooled by the cooler air supply through the second tube.

[0038] Preferably, to this end, the dehumidification means comprise a cover plate that closes off the first, the second and/or the third tube at the bottom of the tubing system containing therein at least one opening for the discharge of condensation fluid from the first, the second and/or the third tube. In this way, a more continuous discharge of the condensation fluid can be obtained, wherein the opening is preferably connected to a water drainage system such as a sewer ; more preferably in such a configuration a water seal is provided between the opening and the subsequent water drainage system, for example, to stop bad odours, or, for example by providing a valve, at regular intervals, e.g. during maintenance, the collected condensation fluid may be removed by opening the valve. The more continuous discharge of the condensation fluid has the advantage that possible corrosion of the tubes by condensation fluid that remains stationary in the tubes for a long time, is avoided.

[0039] Preferably, the cover plate is mounted at an angle with respect to the horizontal in order to guide the condensation fluid to a lower region of the cover plate wherein the opening is preferably arranged to discharge the condensation fluid.

[0040] Although a single cover plate can be provided for the first, the second and the third tube, also for each individual tube a separate cover plate may be provided with a respective opening for the discharge of condensation fluid from the respective tube. Also, for example, adjacent tube openings may be fitted with a single cover plate with a single opening for the discharge of condensation fluid. For example, the first and the second tube may be closed off together by a cover plate with a single opening and the third tube may be closed off by a separate cover plate with separate opening for the discharge of condensation fluid. Since the second tube is often a tube with standard dimensions, for the combined cover plate of the first and the second tube, easily a standard cover plate may be used provided with an opening for the discharge of the condensation fluid. Furthermore, a separate cover plate for the third tube allows that the opening between the second and the third tube remains separated from the opening of the first tube and the opening between the first and the second tube in order, for example, to avoid that ventilation air which is being removed, ends up in the burner, which is undesirable.

[0041] The invention is also directed to the tubing module and to the exhaust module as described above.

BRIEF DESCRIPTION OF THE FIGURES

[0042] The invention is further illustrated by the following description and the accompanying figures. Note that the figures are not necessarily drawn to scale. The figures serve to describe the principles of the invention. Similar elements are numbered in a similar way between the various figures. A skilled person may combine different features from the different figures.

Figure 1 shows an example of a tubing system with multiple separate tubes from the prior art.

Figure 2 shows an embodiment of a tubing system

with an exhaust module according to the present invention.

Figure 3A shows a schematic drawing of a building with two apartments one above the other, with two heating systems and two ventilated spaces, both connected to the tubing system according to the invention.

Figure 3B shows a schematic drawing of a building with four adjacent apartments, with four heating systems and four ventilated rooms, all connected to the tubing system according to the invention.

Figures 4A and 4B show a first preferred embodiment of a tubing module according to the present invention, without lateral branches, as a horizontal cross section and a vertical cross section, respectively.

Figures 5A, 5B and 5C show a second preferred embodiment of a tubing module according to the present invention, with lateral branches, as a front view, a top view and side view, respectively.

Figures 6A and 6B show a preferred embodiment of an exhaust module according to the invention, as a half open front view and a top view, respectively.

Figures 7A-7C show a preferred embodiment of an airtight connection between tubes modules stacked on top of each other.

Figure 7A shows a bottom end of an upper module.

Figure 7B shows a top end of a lower module.

Figure 7C shows a cross section of a seal ring in detail.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

REFERENCES:

[0043]

1 first tube
2 second tube
3 third tube
11 first lateral branch
12 second lateral branch
13 third lateral branch
21 flue gas removal duct
22 air supply duct
23 ventilation air removal duct
27 first grid
28 second grid
29 third grid
31 first connection means
32 second connection means
33 central axis
34 seal ring
4 tubing module
41 lower end
42 upper end
43 seal ring
44 bulge
45 recess
46 protrusion
5 building
53 roof
54 separate exhaust structures
55 heating system
56 duct
6 tubing system
8 exhaust module
81 rising tubular element
82 collar
d1, d2, d3

[0044] The invention relates to a building **5** with a concentric tubing system **6** comprising an inner (first) rising tube **1** for flue gas removal of a heating system (e.g. a boiler, such a gas boiler or oil boiler) 55 of the building, a second concentric tube **2** for air supply to the heating system 55, and an outer concentric (third) tube **3** for removal of ventilation air.

[0045] The tubes **1, 2, 3** may have a circular cross-section, but other shapes are also possible, e.g. square, hexagonal, polygonal, elliptical, or other forms deemed appropriate by the skilled person. The tubes **1, 2, 3** may all have the same shape (e.g. circular), or may have a different shape. In an example, the first and second tube **1, 2** are circular and the third tube 3 is square. With "concentric tubes" is meant that the centre of a cross section of an inner tube **1, 2** essentially coincides with a centre of a cross section of an outer tube **2, 3,** even if the cross section is not circular.

[0046] In the prior art, heating systems and ventilation systems are typically two separate disciplines. Both systems are produced by different manufacturers with totally different machines, because heating tubes are typically manufactured from stainless steel, and the ventilation tube from aluminium or a plastics material, but the stainless steel is a much harder material, which is difficult to process, and this requires different machines. In the prior art, both systems are often independently of each other dimensioned and installed in order to minimize influencing each other. In the prior art, the systems are often housed in two separate ducts, or one large duct, with the aim to keep the systems separated as much as possible. The different systems are typically assembled by different teams: e.g. a heating system team, and a ventilation system team, such that a potential synergy is not exploited. Furthermore, often each system has its own separate exhaust(s) on the roof 53. The installation of the tubing system 6 is usually done after one another in time, again in order not to hinder each other, with the result that the risk of errors or delays in the construction of the building increases.

[0047] Figure 1 shows a roof **53** of a building 5 with a tubing system **1, 2, 3** from the prior art. Shown is a roof 53 of a building 5 with multiple exhausts. On the right of the figure, the flue gas removal and air supply from and

to a heating system **55** is located, to the left thereof a system with separate exhaust structures **54** for air removal from the humid areas. As shown, in the building **5** multiple tubing systems are required, which takes up a lot of space.

[0048] Figure 2 shows a roof of a building **5** with a tubing system **6** according to the present invention. Apart of the known flue gas duct **21** in the first tube **1** and the air supply duct **22** between the first tube **1** and the second tube **2,** this tubing system **6** further comprises a concentric third duct **23** for the removal of the contaminated (e.g. humid) air to an exhaust on the roof. The third channel is mainly intended for an active (forced) air ventilation system. The advantages in space savings in construction (only one shaft or tube required) are evident. Possibly, there is an energy savings because the suction power of the outer channel **23** will also promote the speed of the air removal and therefore less mechanical energy is to be consumed. Currently, the ventilation air removal is usually done via separate spiral tubes which are usually mounted adjacent to the flue gas removal system **1, 2.** To this end, either a second shaft is required, or a wider shaft is required. The flue gas removal is installed by heating system installers, and the ventilation system is usually installed by others at another time. Consequently, one has to wait before the shaft can be closed. Aesthetically, the tubing system **6** according to the invention has also advantages because only one roof opening and one exhaust module **8** is required for both air supply and air removal, while currently, in apartment buildings, there are usually several exhausts on the roof **53** (as shown in Fig 1). Sometimes they are counteractive when they are too close to each other, e.g. an air supply **22** adjacent to the flue gas exhaust **21.**

[0049] Figure 3A shows a schematic drawing of a building with five apartments one above the other, with two heating systems **55a, 55b** and two ventilated rooms, all connected to the same tubing system **6.** Preferably, the tubing system **6** is provided with tubing modules **4a-4h** with a typical length of 50-150 cm, preferably 75-125 cm, more preferably 90-110 cm, but other dimensions are also possible. These tubing modules **4** contain the first, second and third tube **1, 2, 3** as described above. The tubing modules **4a-4h** are stacked on top of each other and airtight connected to one another, preferably with a rubber seal ring **43.** Preferably, the tubing modules **4a-4h** are in an airtight manner connected to one another, using rubber seal rings **43** (Fig. 4B) to ensure air tightness.

[0050] In Figure 3A, three modules are stacked on top of each other for each floor. In an alternative embodiment, this may be, for example, two modules with a length of approximately 150 cm, or four or more modules with a modified length. The length of the tubing modules may be identical or different.

[0051] In the example of Figure 3A, the tubing system **6** according to the invention comprises four types of tubing modules **4:** (1) a lower tubing module **4a** with an inspection panel, (2) tubing modules **4b, 4c, 4e, 4f, 4h** without lateral branches, (3) tubing modules **4d, 4g** with first, second and third lateral branches **11, 12, 13,** and (4) an exhaust module **8.** Preferably, the inspection panel **4a** is provided to connect the second duct **22** (the air supply duct) to the first duct **21** (the flue gas removal duct), to faster expel the flue gasses. On the contrary, the third duct **23** (the ventilation air removal duct) is not connected to the first or the second duct **21, 22.** The upper tubing module **4h** is provided for attachment to the exhaust module **8** on the roof **53.** In this example, three tubing modules of approximately 955 mm are used per floor, but of course, other amounts or other dimensions are also possible. Of course, tubing modules with more or less lateral branches **11, 12, 13** are possible. If desired, the lateral branches **11, 12, 13** may be concealed in a false ceiling. Figure 3 clearly shows that the installation of the tubing system 6 according to the present invention corresponds to the simple stacking and securing of the tubing modules **4a-4h,** the connection of the lateral branches **11, 12, 13,** and the connection of the exhaust module **8** at the top. By the installation thereof, both the heating ducts as the ventilation ducts are installed, and the building can be completed more quickly. A typical diameter of the first and second lateral branches **11, 12** is 80 mm, but other dimensions are also possible. A typical diameter for the third lateral branch **13** is 125 mm, but other dimensions are also possible.

[0052] In Figure 3A, the apartments connected to the tubing system **6** according to the invention are stacked on top of each other, but it is obvious that one tubing system **6** according to the invention also can be used for adjacent apartments, as is shown in Figure 3B, wherein four heating systems **55a-55d** and four ventilation systems are connected to the tubing system **6** according to the invention. Although Figure 3b shows four adjacent apartments, of course, few or more adjacent apartments may be connected to the single tubing system **6,** such as two three, five, six, etc.

[0053] Figures 4A and 4B show a first preferred embodiment of a tubing module **4** according to the invention in horizontal and vertical cross section. This is a tubing module **4** without branching, such as the tubing module **4b** in Fig 3. The tubing module **4** comprises a first inner tube **1** in which the flue gases from one or more heating systems of the building **55** move upwardly to the exhaust module **8** on the roof **53** of the building. The flue gases are transported in the flue gas exhaust duct **21** located inside the first tube **1.**

[0054] Surrounding the first tube **1** and preferably concentric therewith, is a second tube **2,** which is maintained by means of first connection means **31** at the desired distance from the first tube **1.** Surrounding the second tube **2** and preferably concentric therewith is a third tube **3,** which is maintained by means of second connection means **32** at the desired distance from the second tube **2.** The first and second connection means are selected such that they obstruct as little as possible the upward

or downward flow in the air removal duct **23** and in the air supply duct **22.** The first and second connection means **31, 32,** may be, for example, thin rods, welded between the wall of the first and the second tube **1, 2,** but other connection means known by the skilled person may also be used, e.g. a raised strip of a metal plate. Between the first and the second tube **1, 2** is located the air inlet duct **22** for feeding (fresh) air from the outside to one or more heating systems **55** in the building. The first, second and third tube **1, 2, 3** may be made of the same material, or of a different material. The first and the second tube and the third **1, 2, 3** are preferably made of metal, preferably stainless steel, galvanized steel or aluminium. The first tube should be smoke-proof, but the second and third tube **2, 3** might also be made of a plastics material such as PVC, PP (polypropylene) or PE (polyethylene). The connection means **31, 32,** may be attached to the tubes in conventional ways, e.g. by welding, gluing, screwing, etc. Note that the position of the first and second connecting elements **31, 32** is preferably chosen not in line with one another because this has advantages in the production (e.g., no welding or screwing on the same spot), and also increases stability.

[0055] In an example, the diameter **d1** of the first tube is equal to 8 to 20 cm, e.g. 14 cm, the diameter **d2** of the second tube is equal to 15 to 36 cm, e.g. 26 cm, and the diameter **d3** of the third tube is equal to 22 to 54 cm, e.g. 38 cm, but other dimensions are also possible, depending on the existing heating and/or ventilation system.

[0056] Figures 5A-5C show a second preferred embodiment of a tubing module **4** according to the invention, as a front view, a top view and side view, respectively. This is a tubing module **4** with a first lateral branch **11** for guiding the flue gases from a boiler system **55** to the flue gas removal duct **21** located in the first tube **1,** a second lateral branch **12** for guiding the fresh air in the second tube **2** to the boiler system **55,** and third lateral branch **13** for guiding contaminated (e.g. humid) air through the ventilation air removal duct **23** located between the second and third tube **2, 3.** In Figure 5, the lateral connections **11, 12, 13** are horizontal connections, but that is not necessary for the invention. It is important that the connections are airtight, which is accomplished in known ways, e.g. by welding.

[0057] Figure 6 shows a preferred embodiment of the exhaust module **8** according to the invention, wherein the flow directions of the gases are indicated. As shown, the three flow directions are maximally separately. The direction of the flue gases from the flue gas removal duct **21** located in the first tube **1** is almost vertically upwardly directed, the suction direction of the fresh air to the air supply duct **22,** located between the first and second tube **1, 2,** is nearly horizontal (above the collar **82** in this example arranged as an annular disk), the removal direction of the ventilation air from the air removal duct **23,** located between the second and third tube **2, 3** in directed downward this case (below the collar **82).** The collar **82** of Figure 6A shows an angle α of approximately 135° from the vertical axis 33, but this angle is not essential for the invention, and other angles are also possible, e.g. 45°, 60°, 75°, 90°, 105°, 120°, 135° or 150°. The rising tubular element **81** and the collar **82** function as separating means to minimize the interference between the various flows. The rising tubular element **81** acts as an extension of the flue gas removal tube. Preferably, the collar **82** is attached along the edge of the second tube 2 for directing the flow of the ventilation air duct **23** away from the air supply.

[0058] Figures 7A-7C show in more detail a lower end **41** and an upper end **42** of one of the tubes of the tubing module **4** according to the invention, e.g. the third tube **3.** The same airtight connection principle is also applied to the first and the second tube **1, 2.** The upper tube **3c** has a recess **45** in which a sealing ring **43,** preferably of rubber, may be introduced which will provide an airtight seal. A cross section of such a sealing ring **43** is shown in detail in Fig 7B. This cross section has a straight edge applied against the circumference of the tube **3c,** and has two flaps that extend in a direction away from the tube **3c,** and which are elastically deformable. Other forms deemed appropriate by the skilled person may also be used. The tube diameters of the third tube **3b** and **3c** are adapted at the first and the second end **41, 42** such that the two ends **41, 42** can slide over one another, until the top edge of the tube **3c** touches the protrusion **46** of tube **3b.** To increase the strength of the tube, a bulge **44** is applied at the upper end **42.** No further connection means (such as screws or the like) are necessary to maintain the two stacked tubing modules **4b, 4c** in place.

[0059] Although the present invention has been described with reference to specific preferred embodiments, it will be understood that various modifications can be made to these embodiments without departing from the scope of the invention as put forward in the claims. Accordingly, the description and drawings should be considered in an illustrative sense rather than a restrictive sense.

Claims

1. A building (5) with at least one heating system and at least one ventilation system, and with a tubing system (6) comprising a first rising tube (1) for flue gas removal of a heating system (55) of the building, a second rising tube (2) for air supply to the heating system (55) and a third rising tube (3) for ventilation air removal from the building, wherein the first (1) and the second (2) and the third (3) tube are concentric tubes along at least a part of the height of the building, **characterized in that** the second tube (2) is located around the first tube (1), and the third tube (3) is located around the second tube (2).

2. The building according to claim 1, wherein the second tube (2) is connected to the first tube (1), and

the third tube (3) is connected to the second tube (2).

3. The building according to claim 1 or 2, wherein the building (5) comprises at least two heating systems (55a, 55b) which are both connected to the flue gas removal duct (21) formed by the first tube (1) and to the air supply duct (22) located between the first and the second tube (1, 2), and at least two rooms to ventilate which are both connected to the ventilation air removal duct (23) for removal of contaminated air present therein.

4. The building according to claim 3, wherein the two heating systems (55a, 55b) are located on a different floor.

5. The building according to any one of the preceding claims, wherein the first, second and third tube (1, 2, 3) are made of a material selected from the group of: stainless steel, galvanized steel and aluminium.

6. The building according to any one of the claims 1 to 4, wherein the third tube (3) is made of a plastics material, preferably selected from the group of: polyvinylchloride (PVC), polyethylene (PE) and polypropylene (PP).

7. The building according to any one of the preceding claims, wherein the tubing system (6) extends over at least 50% of the height of the building, preferably at least 75%, more preferably at least 80%, most preferably over substantially the entire height (H) of the building.

8. The building according to any one of the preceding claims, wherein the second tube (2) is connected to the first tube (1) by means of first transverse connections (31), and the third tube (3) is connected to the second tube by means of second transverse connections (32), and wherein the second transverse connections are situated in a different plane as the plane defined by the first transverse connections and a central axis (33) of the tubing system (6).

9. The building according to any one of the preceding claims, wherein the tubing system (6) also comprises an exhaust module (8) which connects to the three concentric tubes (1, 2, 3) and which is provided with separating means (81, 82) for guiding the flue gas removal in a first direction, the air supply in a second direction separated from the first direction, and the ventilation air removal in a third direction separated from the first and the second direction.

10. The building according to claim 9, wherein the separating means (81, 82) comprise a first rising tubular element (81) for guiding the flow from the flue gas removal duct (21).

11. The building according to claim 9 or 10 wherein the separating means comprise a collar (82) for directing the flow of the ventilation removal duct (23) away from the air supply.

12. The building according to any one of claims 9 to 11, wherein the exhaust module (8) further comprises a first, second and third grid (27, 28, 29) respectively, located at a first, second and third exhaust of the flue gas removal duct (21), the air supply duct (22) and the ventilation air removal duct (23), respectively.

13. The building according to any one of the preceding claims, wherein the tubing system (6) comprises several tubing modules (4) stacked and attached to one another, wherein each tubing module comprises three concentric tubes (1, 2, 3), and each tubing module has a lower and an upper end (41, 42) such that the upper end (42) of a lower tubing module (4) may simply and in an airtight manner be connected to the lower end (41) of a higher tubing module (4).

14. The building according to claim 13, wherein the tubing modules (4) are joined together by means of a sliding mechanism with a rubber seal (43).

15. The tubing module (4) with three concentric tubes (1, 2, 3) according to claim 13.

16. The exhaust module (8) according to any one of the claims 9 to12.

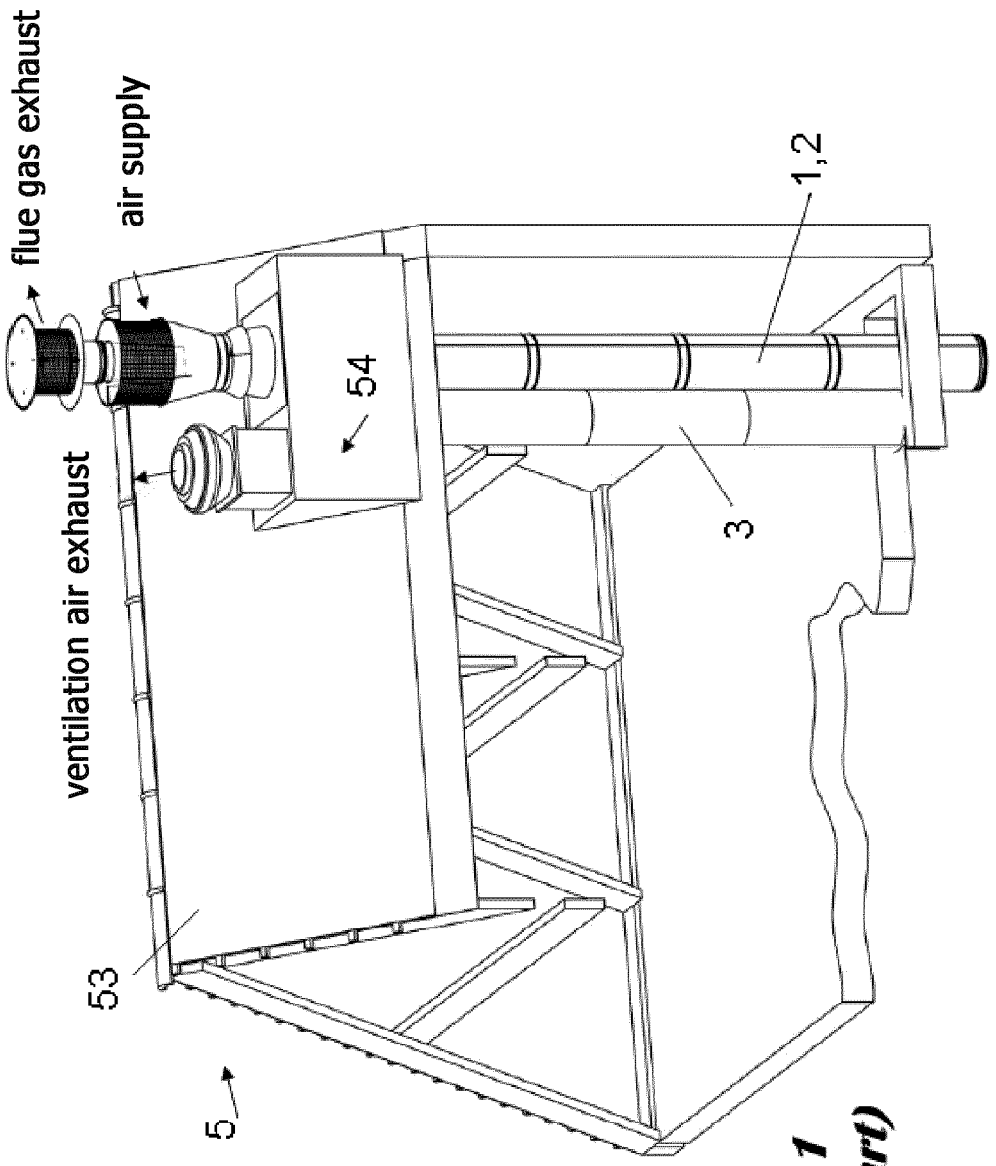

Fig. 1 (prior art)

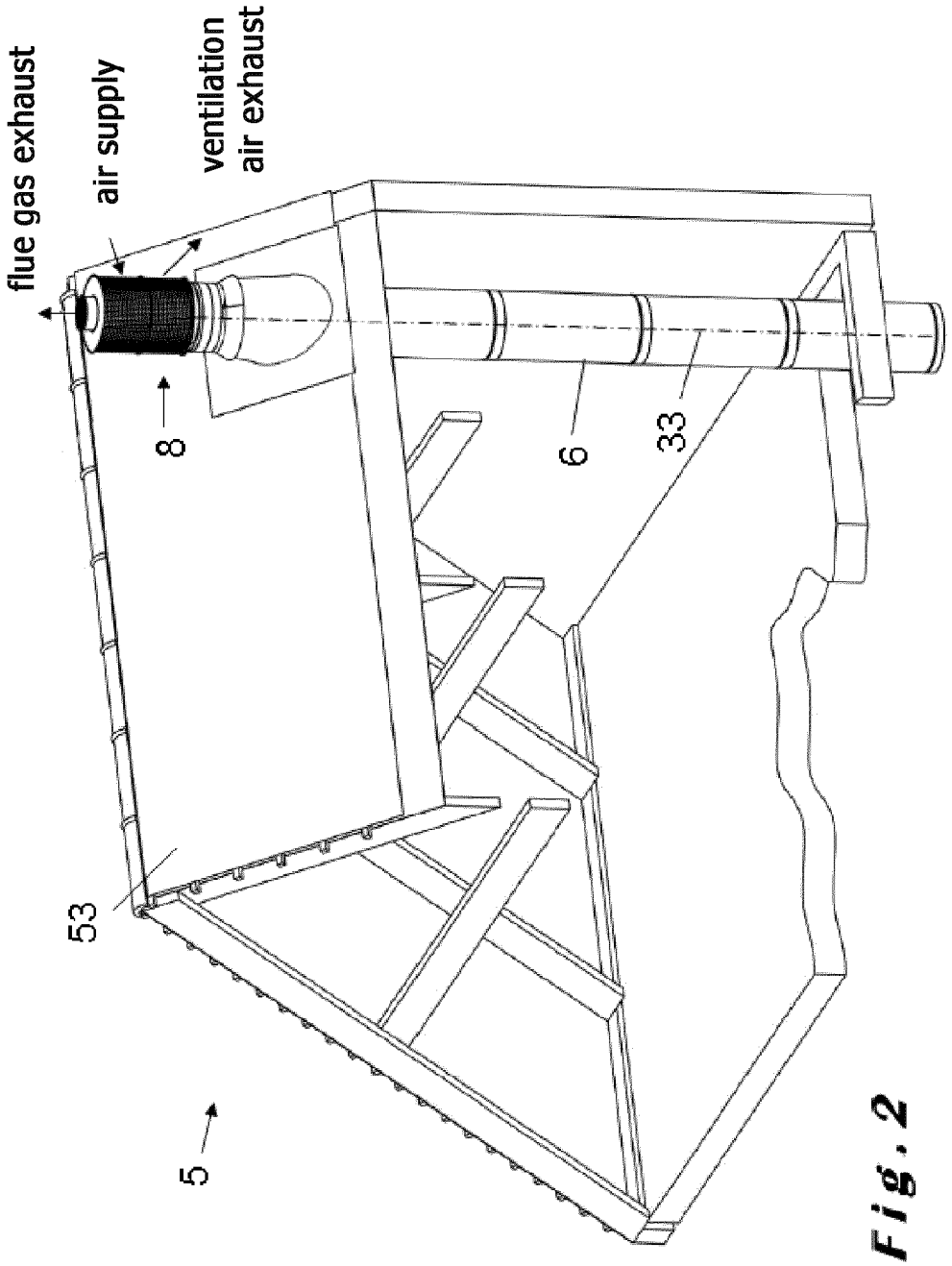
flue gas exhaust
air supply
ventilation air exhaust
8
6
33
53
5

Fig. 2

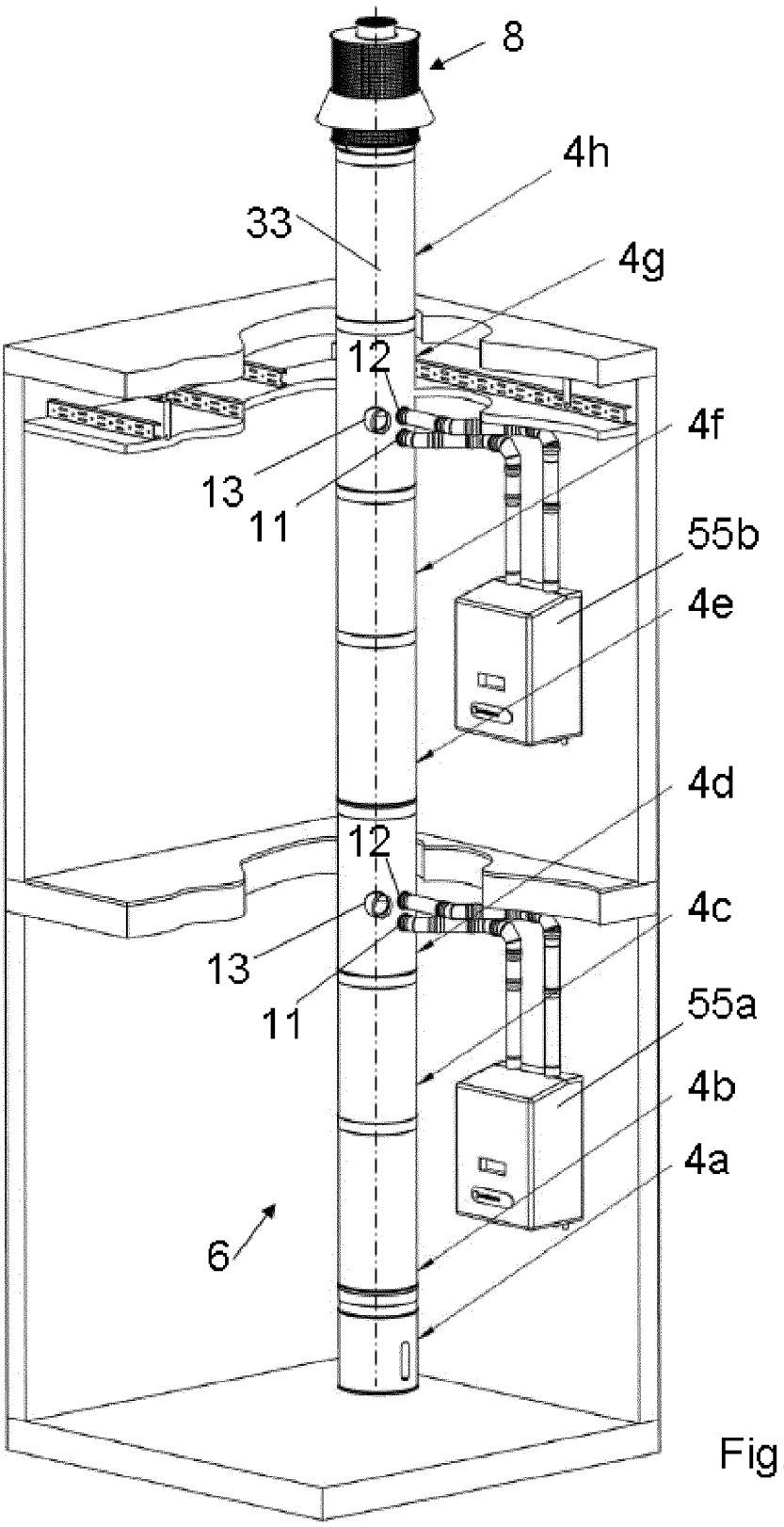

Fig. 3A

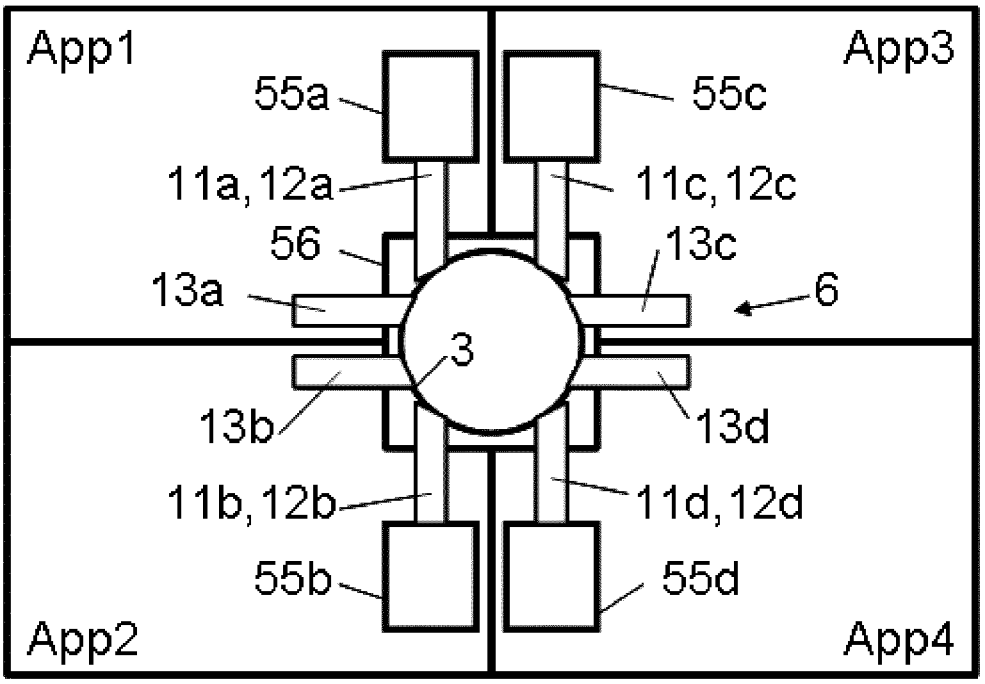
App1
App3
55a
55c
11a, 12a
11c, 12c
56
13c
13a
6
3
13b
13d
11b, 12b
11d, 12d
55b
55d
App2
App4

Fig 3B

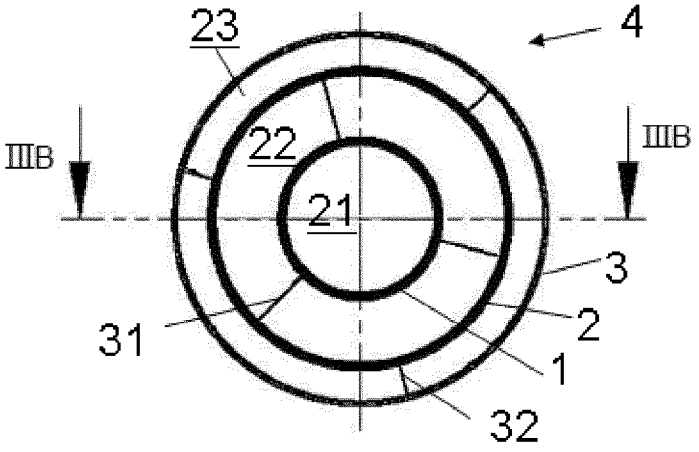

Fig 4A

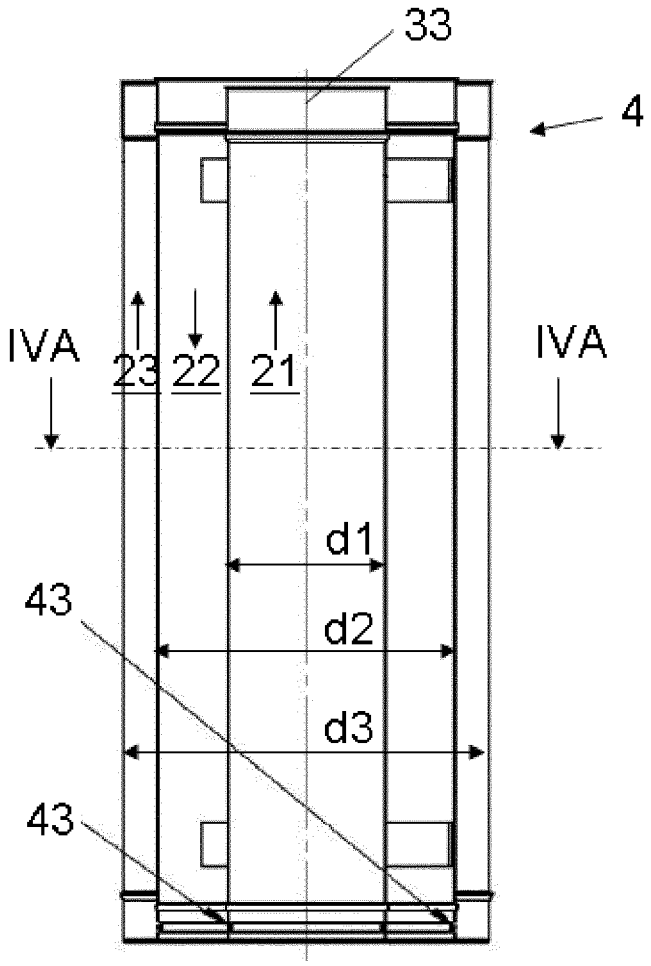

Fig 4B

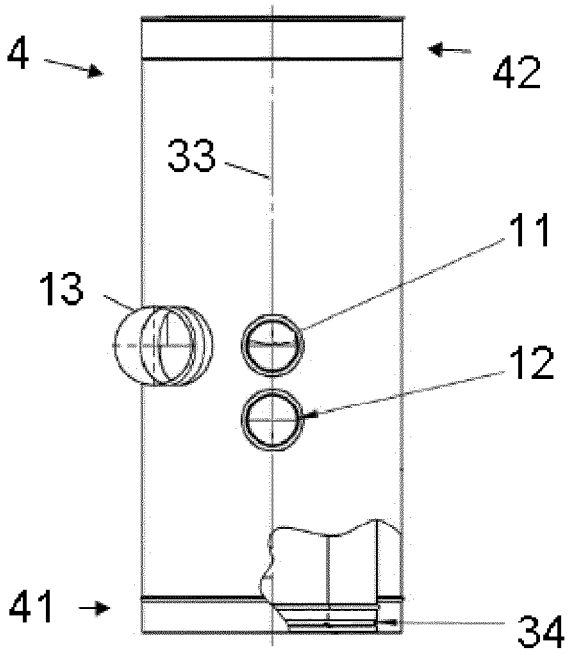

Fig. 5A

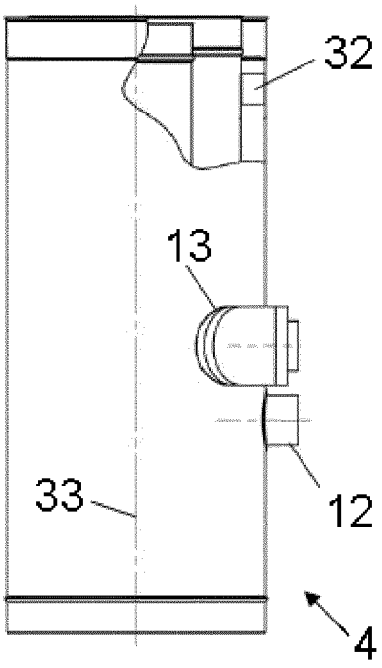

Fig. 5B

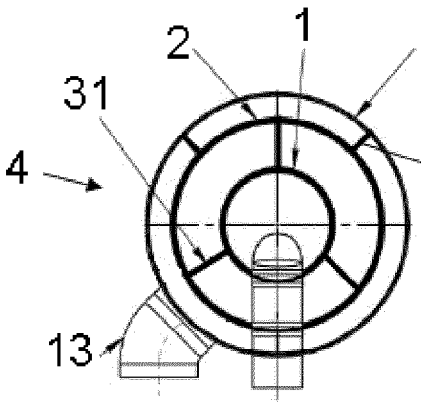

Fig. 5C

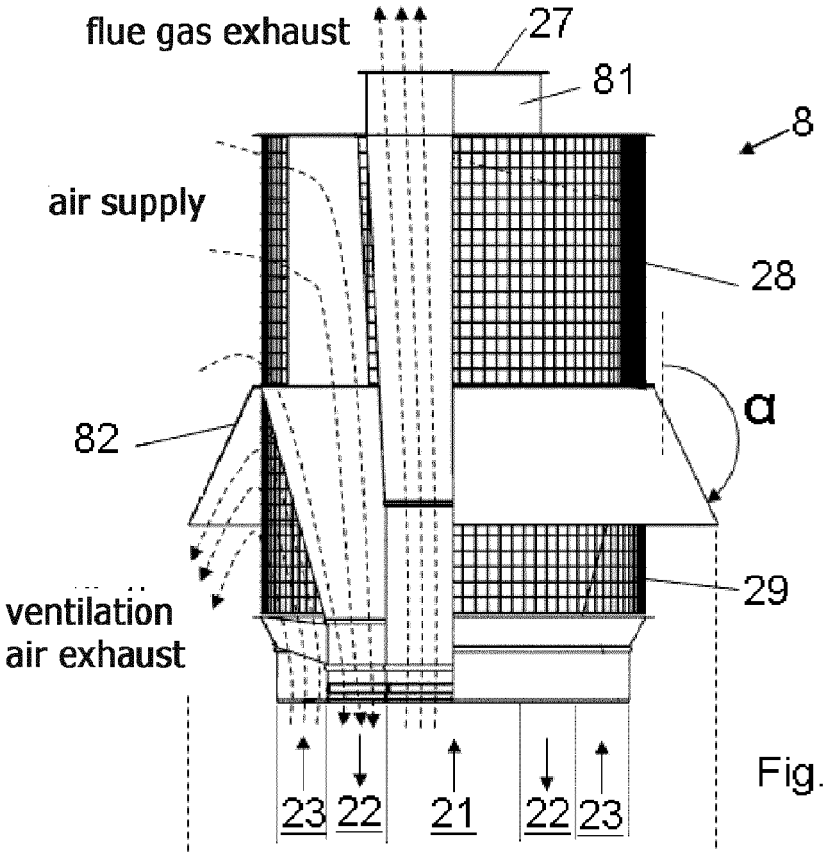
flue gas exhaust
27
81
8
air supply
28
α
82
29
ventilation
air exhaust
23
22
21
22
23

Fig. 6A

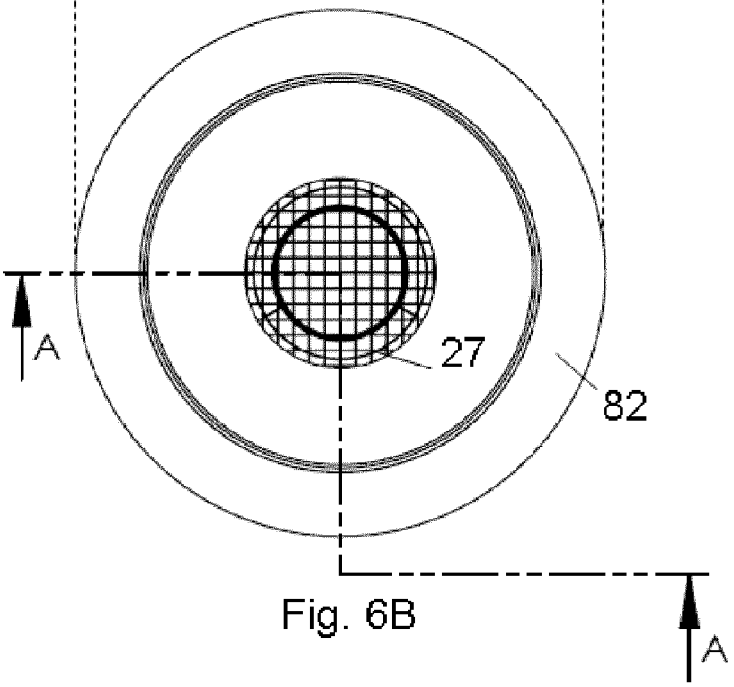
A
27
82
A

Fig. 6B

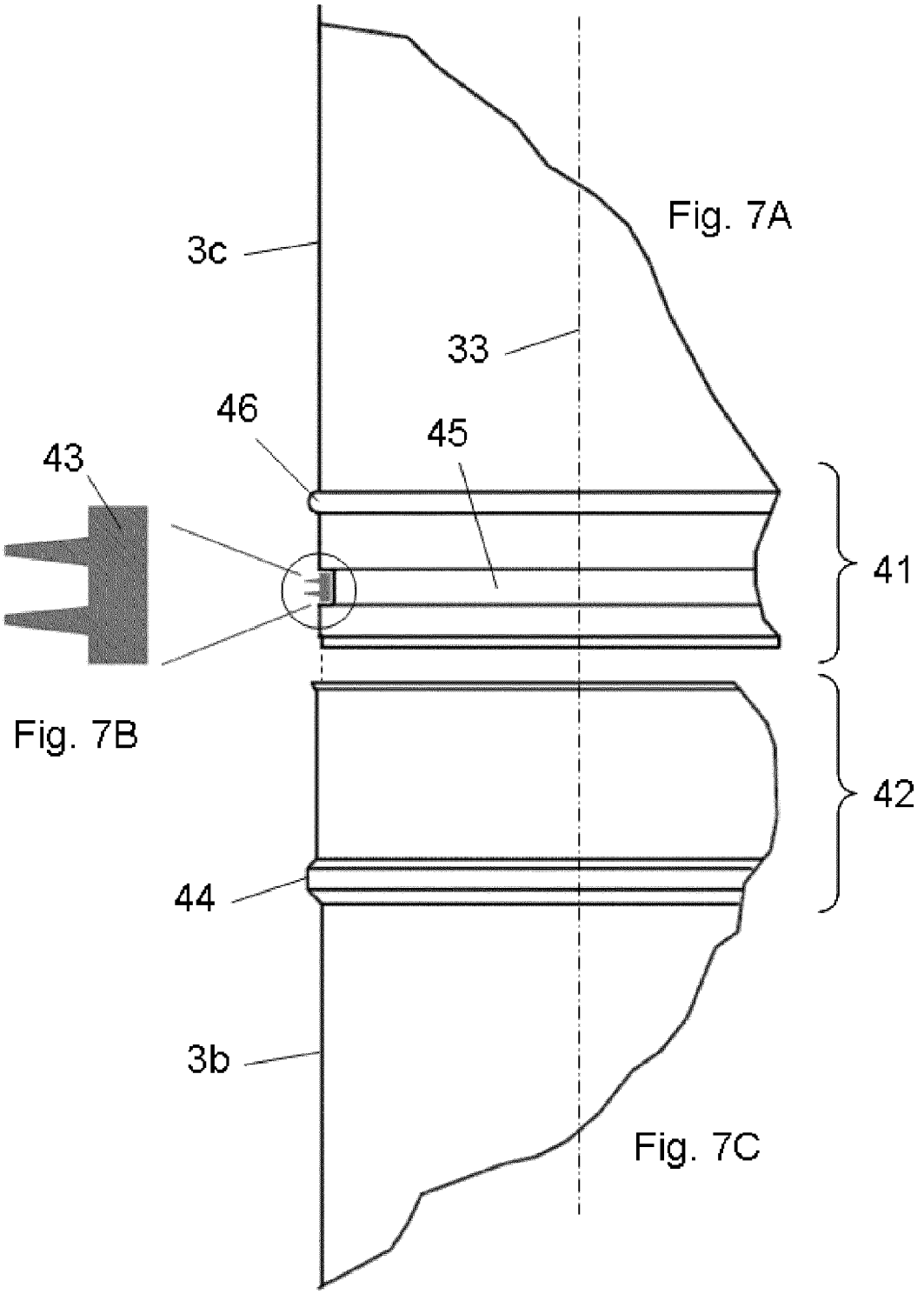

Fig. 7A

Fig. 7B

Fig. 7C

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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 5713

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 March 2012	Coli, Enrico

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

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26-03-2012

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