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(54) **Connecting element for a ventilation duct system and assembly and methods concerning the same**

(57) The present invention relates to a connecting element 1 for a ventilation duct system, said connecting element 1 comprising a first end being adapted for connection to a panel element 6 and a sealing device 8, said panel element 6 comprising an opening with an inner edge 7. The sealing device 8 in a mounted position is adapted to fixate the panel element 6 in relation to the connecting element 1 so that the panel element 6 is held in a secure position, and also essentially preventing air flow between the inner edge 7 of the panel element 6 and the connecting element 1.

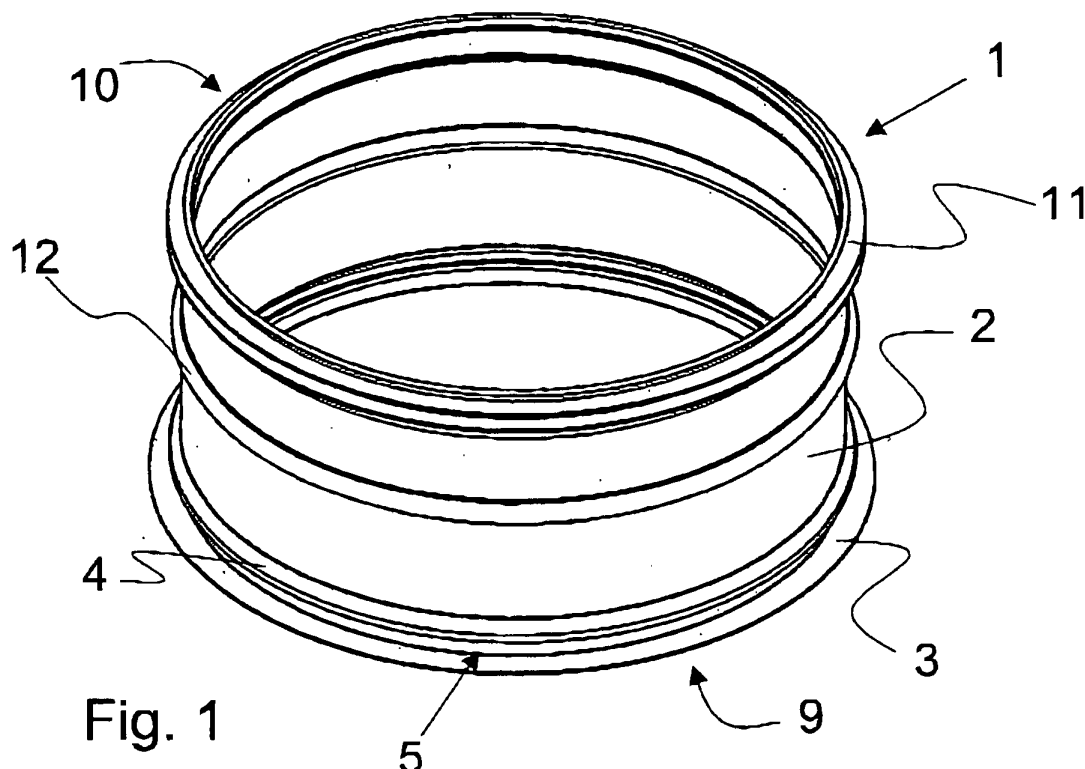


Fig. 1

EP 1 701 107 A1

DescriptionField of the Invention

[0001] The present invention relates to a connecting element for a ventilation duct system, said connecting element comprising a first end being adapted for connection to a panel element and a sealing device, said panel element comprising an opening with an inner edge. The invention further relates to a ventilation duct assembly and methods for connecting a panel element to a ventilation duct system.

Background Art

[0002] In the field of ventilation duct systems, connecting of different elements is an often performed operation. The elements concerned are typically various pipes or ducts, but can also be, for instance, panels or similar elements forming the outlet of the ventilation system and which are typically integrated into a ceiling or wall of a room.

[0003] A common method of connecting ventilation duct elements is by welding. The elements can either be welded together by the manufacturer or the welding can be performed in connection with the installation of the elements. In both cases, welding is a time-consuming process, which furthermore requires a highly skilled welder. This is especially so when the welding has to be performed in confined spaces or awkward working positions, which may often be the case when installing ventilation systems in buildings. In such cases, it may even require two people to perform the installation, thus considerably raising the cost of the procedure.

[0004] A known connecting device concerns the connecting of a sleeve to a plate by fitting an opening in the plate around the sleeve and subsequently mechanically fastening the plate by squeezing a compressible part, typically a rubber element, with a slidable compression ring. The slidable ring has to be adjusted by turning screws arranged in the ring. Thus, the mounting requires the turning of a number of screws while at the same time holding the plate in place. This procedure may be difficult, possibly requiring the coordinated efforts of two people, and is certainly time consuming. These factors all contribute to raising the cost of installation of the ventilation duct system.

[0005] However one chooses to couple elements of a ventilation duct system, it is essential to obtain a result that satisfies a number of requirements. Firstly, the final installation has to be safely mounted, with no risk of the individual elements coming apart in use of the system. Secondly, the system has to be well sealed to prevent undesirable leakage of air through gaps in the system. In addition to these basic requirements, desirable features of ventilation duct systems include few movable parts for the purpose of reducing maintenance and limiting noise from the system and a technical solution allowing easy dismantling and repair of the system.

[0006] Since ventilation duct systems are usually manufactured in a location other than the place of installation, it is desirable to achieve a system with few and easily transportable separate parts. It may thus be advantageous to assemble some of the components at the installation site to avoid transportation of large and unhandy assembled units. Such on-site assembly further increases the demands for easy assembly in order to minimize the skill requirements of the installation crew.

[0007] The above-mentioned known assembly methods and devices have a number of shortcomings. Welding of elements during the installation is time-consuming and requires a skilled welder. Furthermore, there is a significant risk of improper assembly, especially if the welding has to be performed in confined spaces or if no properly skilled welders are available at the site. There is also a considerable risk of damaging the ventilation duct elements during welding. For instance, surface treatments such as paints or anti-corrosive layers may be damaged or destroyed during welding, possibly leading to corrosion and decreased durability of the elements. Elements which have been welded by the manufacturer prior to delivery can be used, but are often large and bulky and thus difficult and expensive to transport. Finally, welding has the intrinsic problem of difficult dismantling, thus making repairs and adjustments difficult.

[0008] Assembling elements together by screwing shares many disadvantages with the welding method. Thus, the method is time-consuming, difficult to perform in confined spaces and may easily lead to improper assembly. Furthermore, this method employs a large number of loose parts, namely fastening elements, such as screws, which are undesirable in a ventilation duct system due to the risk of their coming loose and of noise from improperly tightened screws. Obviously there is also a significant risk of dropping the screws during installation, and thus extra difficulties for the installation crew. Also, ventilation duct systems assembled with screws will often have the ends of screws projecting into or out from the ventilation duct. Such screw ends can obstruct cleaning, possibly tearing up and damaging cleaning equipment, and may even cause injury to the people cleaning or performing maintenance of the ventilation duct. Finally, it is important to note that the mentioned known devices for assembly all require tools, thus making installation practically impossible if the proper tools are missing.

[0009] Based on the above-mentioned disadvantages of prior art, there is a need to provide a new device for assembly of ventilation duct elements, which can be installed in a simple yet safe and effective manner by a single person.

[0010] There is also a need to provide a device of the kind mentioned, which can be assembled by workers unskilled

in the field of ventilation and preferably without requiring tools of any kind.

[0011] There is furthermore a need to provide a device of the kind mentioned, which easily may be dismantled for repair or adjustment.

[0012] There is moreover a need to provide a device of the kind mentioned, which is easy to transport, has few loose parts, and complies with the many requirements of ventilation duct systems, such as being airtight, noiseless and durable.

Summary of the Invention

[0013] It is an object of the present invention to provide a connecting element for a ventilation duct system, which solves the above-mentioned disadvantages and problems of the prior art.

[0014] The above object, together with numerous other objects, advantages and features, which will become evident from the below description, are accomplished by a solution in accordance with the present invention wherein the sealing device in a mounted position is adapted to fixate the panel element in relation to the connecting element so that the panel element is held in a secure position, and essentially preventing air flow between the inner edge of the panel element and the connecting element.

[0015] By providing a connecting element wherein a sealing device is adapted to fixate the panel element in relation to the connecting element, it is achieved that the panel element may be securely connected to the connecting element in a simple and efficient manner. The sealing device is arranged at the connecting element either before or after arrangement of the panel element, depending on the exact type of sealing device and panel element, and will hold the panel element in place without requiring any subsequent adjustment or manipulation. This procedure may be performed entirely without any tools or special skills, such as knowledge of welding. Likewise, although the sealing device will remain securely in place during all normal use of the ventilation duct system, it can be quite easily removed without in any way damaging the connecting element, the panel element or indeed the sealing device itself. Thus, the sealing device may be mounted and removed a virtually infinite number of times without losing its sealing and fixating properties.

Furthermore, the sealing device will, in a mounted position, essentially prevent air flow between the inner edge of the panel element and the connecting element. This is achieved by the sealing element effectively closing gaps between the connecting element and the inner edge of panel element. Preventing unwanted air flow in relation to a ventilation duct systems serves the dual purposes of making the system more efficient, that is minimizing the unwanted loss of energy when using the system, and reducing the noise generated by the system.

[0016] Advantageously, the connecting element may comprise a first projection, such as a flange or bead, substantially at one end and an outer surface, said first projection forming an angle of approximately 90° with the outer surface and, in a mounted position, supporting the panel element and the sealing device. Such a first projection is a convenient way to support the panel element and the sealing device, and it may in a mounted position either support both directly, or optionally be in direct contact with only one of them and support the other indirectly. The first projection may be constructed as a part of the connecting element, and can thus be manufactured in the same process, or it may optionally be added to the connecting element subsequently, for example by welding.

[0017] Preferably, the first projection may extend circumferentially around the outer surface of the connecting element. A first projection extending in this way around the connecting element provides for very secure mounting of the sealing device and thus very secure fixation of the panel element. Optionally, the first projection may extend only partially around the outer surface of the connecting element. A first projection which allows the panel element and/or the sealing device to be supported only in specific places around the outer surface of the connecting device may be preferable for certain types of panel elements and/or sealing devices.

[0018] Advantageously, a groove may be arranged adjacent to said first projection of the connecting element and the sealing device may, in a mounted position, be arranged in said groove. A groove in the connecting element is a simple and inexpensive way to provide a means that may hold the sealing device in place. Other ways of achieving this, such as by employing special sealing devices, may however be envisioned and would be within the scope of the present invention. Preferably, the groove may be formed between the first projection of the connecting element and a second projection, such as a bead or flange, arranged at a predetermined distance from the first projection. In this way, the groove may be formed in the process of manufacturing the connecting element, thus decreasing the total cost of manufacturing the connecting element. The second projection may extend circumferentially around the outer surface of the connecting element, thus allowing for a groove to be provided circumferentially around the connecting element for easy and secure fastening of the sealing device and panel element. Optionally, the second projection may extend only partially around the outer surface of the connecting element. This may be preferable the case of special sealing devices and/or panel elements.

[0019] In expedient manner an extension or diameter of the first projection may be larger than an extension or diameter of the second projection or vice versa.

[0020] Furthermore, one of the extensions or diameters of the first projection or the second projection may be larger than an extension of the opening of the panel element and the other projection may have a smaller extension than the

extension of the opening of the panel element so that the panel element may be fitted on the connecting element by mounting it over the projection having a small extension.

[0021] Advantageously, the connecting element according to the present invention may be made of metal, plastic, fibre or any other material suitable for ventilation ducts. Different materials may be employed for the connecting element in different situations and according to the specific needs of a particular user.

[0022] Preferably, the connecting element may be made of a lightweight metal or a combination of lightweight materials, such as aluminium, brass, copper. Lightweight metals may be employed since they are easy to handle and inexpensive to transport.

[0023] Advantageously, the connecting element may be manufactured in one piece from for instance sheet metal. This method for manufacturing the connecting element is inexpensive and quick, thus reducing the final cost of the connecting element.

[0024] Advantageously, the connecting element may be in the shape of an essentially cylindrical or rectangular duct. By a cylindrical or rectangular duct is meant a duct with a substantially cylindrical or rectangular cross-section. These are both common shapes for ventilation ducts, and the connecting element may preferably be made to fit in an existing system of ducts.

[0025] Advantageously, the sealing device may be made of an elastic material, such as rubber or plastic. A sealing device of an elastic material will be easy to mount on the connecting element, since it may be expanded prior to and during mounting, and will then, when released, retract to fit tightly in place, for instance around the connecting element. Furthermore, the elasticity allows the sealing device to be squeezed in between two surfaces, such as a bead or flange and a panel element, after which the sealing device will apply pressure to both adjoining surfaces, thereby holding one or both in place. Preferably, the sealing device may be in the form of an O-ring, that is a sealing ring with a substantially O-shaped cross-section. The O-ring will be particularly easy to mount on a connecting device and allows secure fixating of a panel element, since neither twisting of the O-ring around its own length axis nor displacement of the O-ring in the direction along the outer surface of the connecting element will have any negative effects. Furthermore, an O-ring provides for very good sealing of the gap between the connecting element and the panel element. Optionally, the sealing device may be in the shape of an S-profile ring or an H-profile ring. By S- or H-profile ring is meant a ring with a substantially S- or H-shaped cross-section. Both these shapes allow easy mounting of the sealing device on the connecting element, and also easy mounting of the panel element. Both types also ensure good sealing of the gap between the outer surface of the connecting element and the inner edge of the panel element. Other advantageous shapes and forms of sealing devices for use in the present invention will be evident to the skilled person.

[0026] Furthermore, the invention also concern a ventilation duct assembly or kit for use at an outlet end of a ventilation duct system, said assembly or kit comprising a connecting element, a sealing device and a panel element having an opening with an inner edge. The sealing device in a mounted position is adapted to fixate the panel element in relation to the connecting element so that the panel element is held in a secure position, and essentially preventing air flow between the inner edge of the panel element and the connecting element. Easy distribution or transport of the assembly or kit according to invention is thus obtained due to the fact that the assembly do not need to be assembled at the manufacturer.

[0027] Additionally, the present invention also relates to one method for connecting a panel element to a ventilation duct system by means of a connecting element having a first end, said method comprising the steps of

- placing the panel element on the connecting element,
- placing a sealing device in connection with said panel element so that the panel element is held in a secure position in relation to the connecting element, and essentially preventing air flow between an inner edge of the panel element and the connecting element, and
- mounting the connecting element in relation to the ventilation duct system. Advantageously, the panel element may be placed on the connecting element at the end opposite the first end of the connecting element.

[0028] Furthermore, the present invention also relates to a second method for connecting a panel element to a ventilation duct system by means of a connecting element having a first end, said method comprising the steps of:

- mounting the connecting element in relation to the ventilation duct system,
- placing the panel element on the connecting element, and
- placing a sealing device in connection with said panel element so that the panel element is held in a secure position in relation to the connecting element, and essentially preventing air flow between an inner edge of the panel element and the connecting element. Advantageously, the panel element may be placed on the connecting element at the first end of the connecting element.

[0029] Preferably, the sealing device may be placed in a groove defined between a first projection, such as a flange

or bead, and a second projection, such as a bead or flange, arranged at the end of the connecting device.

[0030] The step of mounting the connecting element in relation to the ventilation duct system may be performed either before or after the placing of the panel element and sealing device depending on the type of connecting element used.

5 Brief Description of the Drawings

[0031] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawings, which, for the purpose of illustration, show some non-limiting embodiments and in which

- 10 Fig. 1 shows a perspective view of the connecting element without either sealing device or panel element mounted, Fig. 2 shows a sectional view of a part of the connecting device with a sealing device and a panel element illustrated in mounted position,
 Fig. 3 shows a sectional view of a part of the connecting device with a sealing device and a panel element illustrated in mounted position,
 15 Fig. 4 shows a sectional view of a part of the connecting device with an H-profile sealing device and a panel element illustrated in mounted position, and
 Fig. 5 shows a sectional view of a part of the connecting device with an S-profile sealing device and a panel element illustrated in mounted position.

20 **[0032]** All figures are highly schematic and not necessarily to scale, and they show only parts which are necessary in order to elucidate the invention, other parts being omitted or merely suggested.

Detailed Description of the Invention

25 **[0033]** A connecting element 1 according to an embodiment of the invention is shown schematically in perspective view in Fig. 1. The connecting element 1 comprises an outer surface 2, a first projection in the form of a flange 3, a second projection in the form of a bead 4 and a groove 5 between the flange 3 and the bead 4.

[0034] In the embodiment illustrated in Fig. 1, the connecting element 1 has a first end 9 for receiving the panel element 6, and a second end 10 for connection to the ventilation duct system (not shown). The first end 9 adapted to receive the
 30 panel element 6 comprises a flange 3 and a bead 4. By the flange 3 and bead 4 being comprised in the end 9 is meant that the flange 3 and bead 4 are closer to said first end 9 than to said second end 10. The present invention is not limited to the positioning of the flange 3 and bead 4 according to the preferred embodiment shown in Fig. 1. For instance, the flange 3 and bead 4 may be positioned with the flange 3 closer to said second end 10 than the bead 4, that is, the opposite of what is illustrated in Fig. 1. According to the invention, a groove 5 is formed between the flange 3 and the
 35 bead 4. A sealing device 8 may be mounted in the groove 5 to hold the panel element 6 in place, the inner edge 7 of said panel element 6 resting on the flange 3. Although the embodiment of the present invention illustrated in Fig. 1 comprises a flange 3, a bead 4 and a groove 5, these are all optional features of the present invention, and may be excluded or only included in part. Moreover, it is within the inventive idea that the connecting element comprises two flanges or two beads. Furthermore, the size and individual spacing of these optional features may vary according to the
 40 different demands posed by different ventilation systems and users. The second end 10 illustrated in Fig. 1 comprises sealing lips 11 and a stop bead 12. These features are common in the field of connecting ventilation duct elements, and allows easy coupling of the second end 10 of the connecting element 1 to a ventilation duct system. However, the second end 10 may be shaped in any way advantageous for the interaction with a ventilation duct system, and may comprise other and more features than those illustrated in Fig. 1.

45 **[0035]** Advantageously, the connecting element 1 may be made of metal, plastic, fibre or any other material suitable for ventilation ducts. The important aspect in relation to choice of material is that the material is durable and may be made into a connecting element 1 according to the present invention. Use of other materials, which satisfy these demands, lies within the scope of the present invention. Preferably, the connecting element 1 may be made of a lightweight metal or a combination of lightweight materials, such as aluminium, brass or copper. In addition to being easy to handle and
 50 transport, lightweight materials are typically easy to shape, and may thus facilitate the manufacture of the connecting element 1. This is particularly advantageous when making a connecting element 1 from sheet metal, and especially so when the connecting element 1 has to comprise features such as the flange 3 and/or the bead 4.

[0036] Advantageously, the connecting element 1 may be manufactured in one piece, for instance from sheet metal. Typically such manufacture is accomplished by forming sheet metal into the desired shape. Such manufacture is inex-
 55 pensive and quick, and furthermore allows the formation of optional features, such as the flange 3 and/or the bead 4 if these are required.

[0037] In the embodiment illustrated in Fig. 1, a connecting element 1 is shown as being cylindrical in shape. However, according to the present invention, the connecting element 1 may preferably be in the shape of an essentially cylindrical

or rectangular duct- Typically, the dimensions and shape of the connecting element 1 will be adjusted to the ventilation duct system in which it is to be used.

[0038] A sectional view of a connecting element 1 in mounted position is shown schematically in Fig. 2. The mounted connecting element 1 comprises an outer surface 2, a first projection in the form of a flange 3, a second projection in the form of a bead 4, a groove 5, a panel element 6, an inner edge 7 of the panel element 6 and a sealing device 8, here schematically shown as being slightly elastic. The panel element 6 illustrated in Fig. 2 has an opening fitted around the connecting element 1 and allowing the inner edge 7 of the panel element to rest on the flange 3. The dimensions and shape of such an opening in a panel element 6 may be such as to fit a particular connecting element 1, or optionally possibly even a range of connecting elements 1. In regard to the preferred embodiments of a connecting element 1 illustrated in Fig. 1 and Fig. 2, the opening in the panel element 6 may advantageously be such so that the diameter of the opening is smaller than the outer diameter of the connecting element 1 at the flange 3 and larger than the outer diameter of the connecting element 1 at the bead 4. In this manner, the panel element 6 may easily be placed around the connecting element 1, with the inner edge 7 of the panel element 6 resting on the flange 3. In another preferred embodiment according to the invention, it may be the other way round, whereby the diameter of the flange 3 is smaller than the diameter of the opening of the panel element and the diameter of the bead 4 is larger.

[0039] When mounting a connecting element 1 of the type illustrated in Fig. 2, an opening, typically in the centre of the panel element 6, is placed around the connecting element 1 with the inner edge 7 of the panel element 6 in contact with the flange 3 of the connecting element 1. Subsequently, the sealing device 8 is placed in the groove 5. Thus, when mounted, the inner edge 7 of the panel element 6 is positioned between the flange 3 of the connecting element 1 and the sealing device 8. The panel element 6 is thereby held in place by a pressure exerted by the sealing device 8, which itself is held in place by the bead 4 on the one side and the inner edge 7 of the panel element 6 on the other side.

[0040] Advantageously, the sealing device 8 according to the present invention may be made of an elastic material, such as rubber or plastic. In addition to being easy to mount and, if necessary, remove, an elastic sealing device 8 may, as illustrated in Fig. 2, adjust to the surrounding materials, such as a bead 4 and a panel element 6. In adjusting to these materials, the elastic sealing device 8 will exert pressure on the materials, in this embodiment the bead 4 and the panel element 6, and will thus fixate the panel element 6 in place by pressing it towards the flange 3. In another embodiment of the present invention, illustrated in Fig. 3, the panel element 6 may be arranged on the other side of the sealing device 8, so that the panel element 6 is fixated between the sealing device 8 and the bead 4. Preferably, an elastic sealing device 8 may have a cross-sectional diameter which exceeds the spatial dimensions of the groove 5 in which it is to be placed. In this manner, the elastic sealing device 8 will be squeezed together when it is placed in the groove 5 and in contact with the inner edge 7 of the panel element 6, and will thus exert pressure on the panel element 6 and thereby hold it securely in place.

[0041] Advantageously, the sealing device 8 may be in the form of an O-ring. Especially an elastic O-ring would be preferable for easy mounting and secure fastening of the sealing device 8. However, the sealing device 8 according to the present invention may also be in the form of an S-profile or H-profile ring. Both types of rings may serve the purposes of sealing and fixating and are easy to mount. Embodiments of the present invention utilising Hand S-profile rings are illustrated in Fig. 4 and Fig. 5, respectively.

[0042] Although the invention above has been described in connection with preferred embodiments of the invention, it will be evident for a person skilled in the art, that several modifications are conceivable without departing from the invention as defined by the following claims.

Claims

1. A connecting element (1) for a ventilation duct system, said connecting element (1) comprising a first end (9) being adapted for connection to a panel element (6) and a sealing device (8), said panel element (6) comprising an opening with an inner edge (7), **characterized in that** the sealing device (8) in a mounted position is adapted to fixate the panel element (6) in relation to the connecting element (1) so that the panel element (6) is held in a secure position, and essentially preventing air flow between the inner edge (7) of the panel element (6) and the connecting element (1).
2. A connecting element (1) as claimed in claim 1, wherein the connecting element (1) comprises a first projection (3), such as a flange, substantially at said first end (9) and an outer surface (2), said first projection (3) forming an angle of approximately 90° with said outer surface (2), whereby said first projection (3) in a mounted position supports the panel element (6) and/or the sealing device (8).
3. A connecting element (1) as claimed in claim 2, wherein said first projection (3) extends circumferentially wholly or partially around the outer surface (2) of the connecting element (1).

4. A connecting element (1) as claimed in claim 2 or 3, wherein a groove (5) is arranged adjacent to said first projection (3) of the connecting element (1) and wherein the sealing device (8) in a mounted position is arranged in said groove (5).
- 5 5. A connecting element (1) as claimed in claims 2-4, wherein a second projection (4), such as a bead, is arranged at a predetermined distance from said first projection (3) of the connecting element (1), said groove (5) thereby being formed between the first projection (3) and the second projection (4).
- 10 6. A connecting element (1) as claimed in claim 5, wherein said second projection (4) extends circumferentially wholly or partially around the outer surface (2) of the connecting element (1).
7. A connecting element (1) as claimed in any one of the preceding claims, wherein the connecting element (1) is manufactured in one piece from, for example sheet metal.
- 15 8. A connecting element (1) as claimed in any one of the preceding claims, wherein the connecting element (1) is in the shape of an essentially cylindrical or rectangular duct.
9. A connecting element (1) as claimed in any one of the preceding claims, wherein the sealing device (8) is made of an elastic material, such as rubber.
- 20 10. A connecting element (1) as claimed in any one of the preceding claims, wherein the sealing device (8) is in the form of an O-ring, an S-profile ring or an H-profile ring.
- 25 11. A ventilation duct assembly for use at an outlet end of a ventilation duct system, said assembly comprising a connecting element (1) according to any one of the preceding claims, a sealing device (8) and a panel element (6) having an opening with an inner edge (7), **characterized in that** the sealing device (8) in a mounted position is adapted to fixate the panel element (6) in relation to the connecting element (1) so that the panel element (6) is held in a secure position, and essentially preventing air flow between the inner edge (7) of the panel element (6) and the connecting element (1).
- 30 12. A method for connecting a panel element (6) to a ventilation duct system by means of a connecting element (1) having a first end according to any one of the claims 1-10, said method comprising the steps of:
 - placing the panel element (6) on the connecting element (1),
 - 35 - placing a sealing device (8) in connection with said panel element (6) so that the panel element (6) is held in a secure position in relation to the connecting element (1), and essentially preventing air flow between an inner edge (7) of the panel element (6) and the connecting element (1), and
 - mounting the connecting element (1) in relation to the ventilation duct system.
- 40 13. A method as claimed in claim 12, wherein the panel element is placed on the connecting element at the end opposite the first end of the connecting element.
- 45 14. A method for connecting a panel element (6) to a ventilation duct system by means of a connecting element (1) having a first end according to any one of the claims 1-10, said method comprising the steps of:
 - mounting the connecting element in relation to the ventilation duct system,
 - placing the panel element on the connecting element, and
 - placing a sealing device in connection with said panel element so that the panel element is held in a secure position in relation to the connecting element, and essentially preventing air flow between an inner edge of the panel element and the connecting element.
 - 50
- 55 15. A method as claimed in claim 14, wherein the panel element is placed on the connecting element at the first end of the connecting element.
16. A method as claimed in claim 12 or claim 14, wherein the sealing device (8) is placed in a groove (5) defined between a first projection (3) and a second projection (4) arranged at the first end (9) of the connecting device (1).

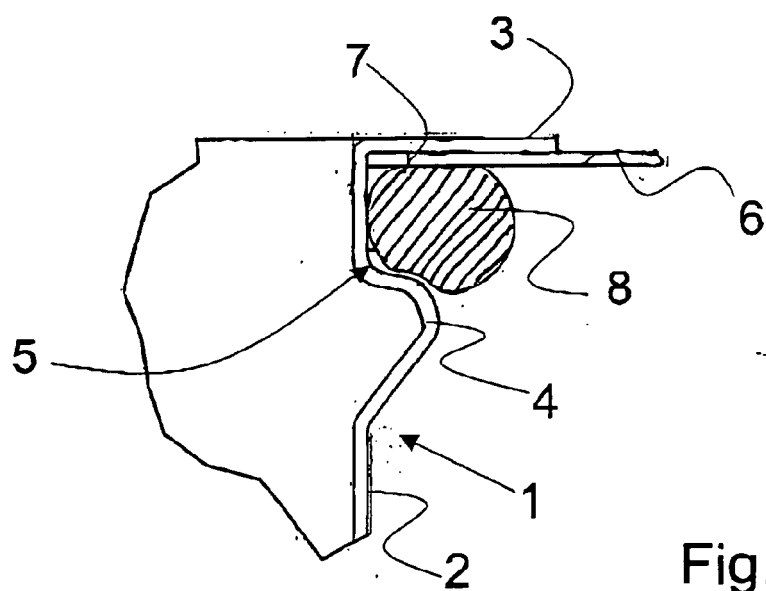
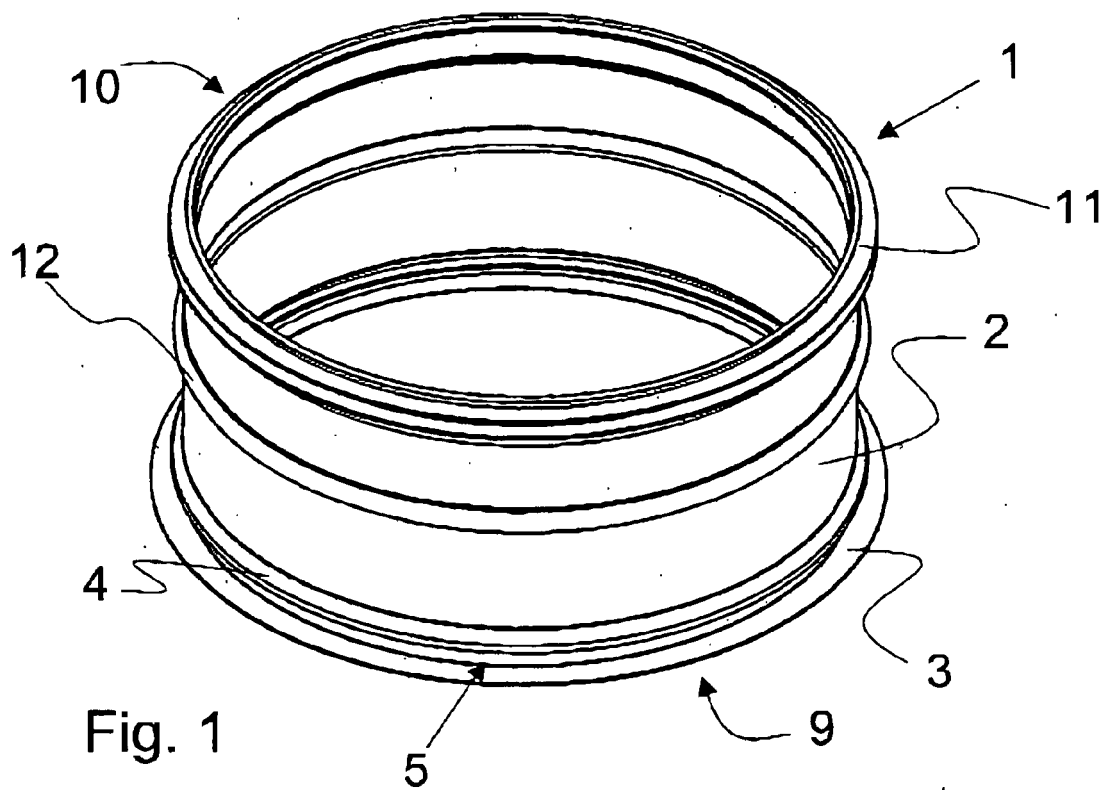
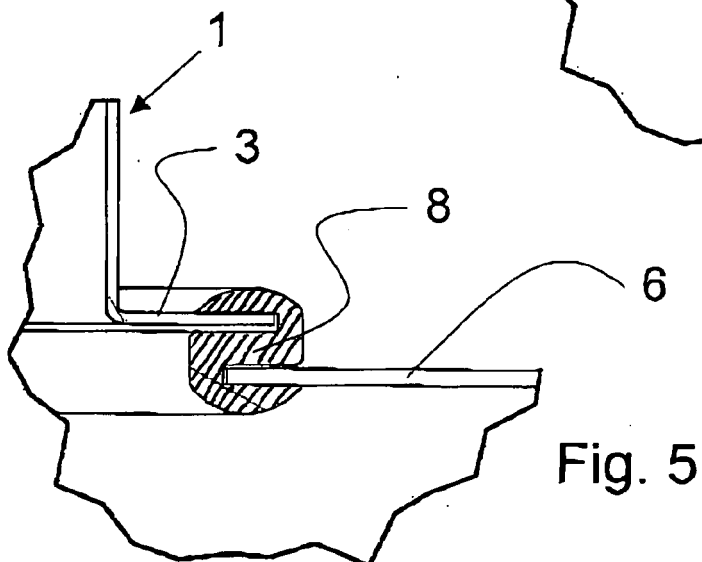
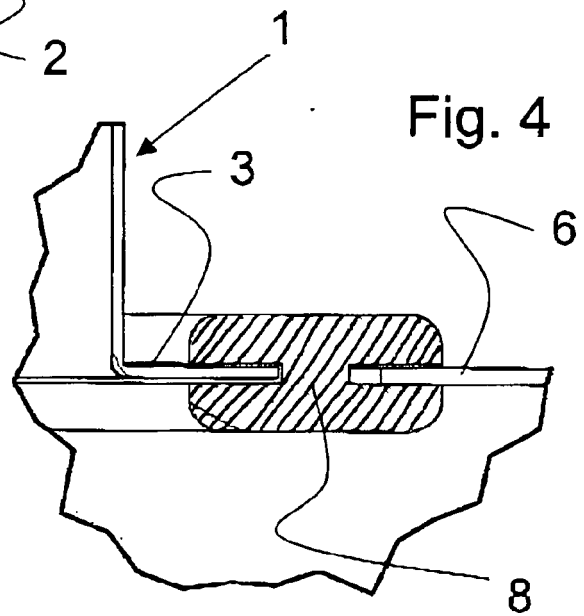
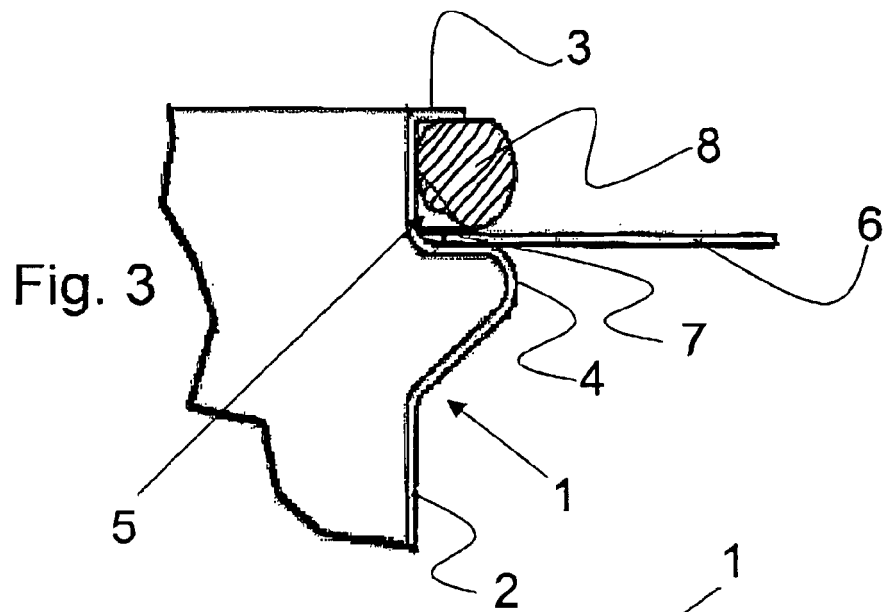


Fig. 2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 00 3711

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.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 July 2005	Examiner Lienhard, D
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 00 3711

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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01-07-2005

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