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(54) **Connection device**

(57) The present invention concerns a connection device (1) for use in ventilation systems for connection of a first plate element (2) and a second plate element (3), said plate elements (2,3) being spaced from each other. The device (1) comprises a first engagement means (4) for engaging the first plate element (2), and a

second engagement means (5) for engaging the second plate element (3), said first engagement means (4) comprising a first locking flange (6) for locking the first plate element in place, and a first sealing flange (7) adapted for preventing air-flow between the first plate element (2) and the second plate element (3). The invention further concerns an assembly for use in ventilation systems.

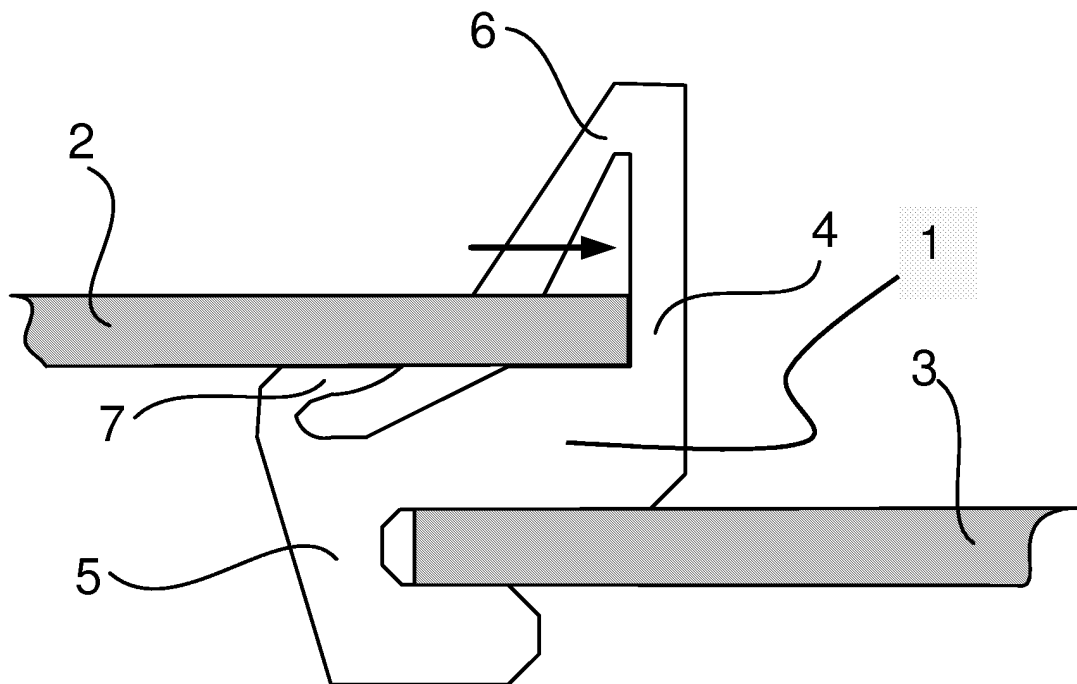


Fig. 1

Description

Technical Field of the Invention

[0001] The present invention concerns a connection device for use in ventilation systems for connection of a first plate element and a second plate element, said plate elements being spaced from each other. The invention further concerns an assembly for use in ventilation systems.

Background of the Invention

[0002] In the field of ventilation duct systems, connecting of different elements is an often performed operation. The elements concerned are typically various plates, pipes, rings, or ducts but can also be, for instance, panels or similar elements comprised in the outlet of the ventilation system and sometimes 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 often important to obtain a result that satisfies a number of different requirements. Firstly, the final installation has to be safely mounted, with minimized risk of the individual elements coming apart in use of the system. Secondly, the system typically 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 mounting, dismounting 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 disadvantage of difficult dismantling, thus making repairs and adjustments difficult.

[0008] Assembling elements with screws or similar mechanical fastening means shares many disadvantages with the welding method, i.e. these methods are time-consuming, difficult to perform in confined spaces and may easily lead to improper assembly. Furthermore, these methods typically employ a large number of loose parts, i.e. fastening means such as screws or nails, which are undesirable in a ventilation duct system due to the risk of loosening as well as of noise from improperly tightened screws. Obviously there is also a significant risk of dropping the small fastening means 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 connection assembly for use i.a. with ventilation duct elements. Such a new assembly should be simple and safe to handle, preferably requiring only a single, unskilled person. There is also a need to provide an assembly which complies with the many requirements of ventilation duct systems, such as being airtight, noiseless and durable. There is moreover a need to provide an assembly of the kind mentioned, which is easy to transport and has few loose parts.

Summary of the Invention

[0010] It is an object of the present invention to provide a connection device for use in ventilation systems, which solves the above-mentioned disadvantages and problems of the prior art.

[0011] It is more specifically an object of the present invention to provide a connection device which makes assembly of elements of ventilation systems easy, and which eliminates the need for tools in such assembly. Furthermore, it is an object of the present invention to provide a connection device which may be produced in a simple and inexpensive manner. It is a further object of the invention to provide a connection device which ensures an air-tight connection of elements of a ventilation system. It is also an object to provide a connection device which may easily be dismantled, for instance when repair, maintenance or modification of the ventilation system is required.

[0012] 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 device comprises a first engagement means for engaging the first plate element, and a second engagement means for engaging the second plate element, said first engagement means comprising a first locking flange for locking the first plate element in place, and a first sealing flange adapted for preventing air-flow between the first plate element and the second plate element.

[0013] The matter is that such a device allows for easy and quick connection of elements of a ventilation system without requiring tools. The connection device may for instance be supplied with its second engagement means connected to a second plate element whereafter a first plate element may be easily mounted in the first engagement means, held in place by the first locking flange, while the connection between the two plate elements is kept air-tight by the first sealing flange. Preferably, the first locking flange may be flexible and/or elastic and thus allow for easy dismantling of the first plate element and the connection device.

[0014] Since the connection device according to the present invention makes it easy and quick to connect elements of e.g. a ventilation system, it also makes it more feasible to ship entire ventilation systems in un-assembled state and have local personnel assemble the systems on-site. This may dramatically lower the costs of shipping the systems, since the unassembled systems take up far less space than the assembled systems. Also, with a simple connection device not requiring tools, the time spent on assembly as well as the risk of wrong assembly is minimized, even when untrained personnel is used.

[0015] In the context of the present application, the term "plate element" is to be construed as referring to any element having e.g. an edge, rim or flange which

may be engaged in one of the engagement means of the connection device. Examples of such plate elements are sheet metal in different shapes, such as circular pieces of sheet metal for blocking holes, ventilation ducts of various shapes and designs, pipes, and panel elements.

[0016] Advantageously, the device may be made from a flexible material. A device wholly or partially made from a flexible material will typically facilitate engagement between the device and the plate elements. The device may for instance be made of an elastic polymer material such as natural or synthetic rubber, polyurethane, polyolefin or polyamide. Preferably, the device may be made in one piece and may further constitute a sealing means.

[0017] Preferably, the first flexible locking flange may be flexible in a radial direction in relation to an engaged position of said first plate element. By the term "radial direction" is meant the direction from a centre of the plate element in its engaged position to the edge of said plate element. By the first locking flange being flexible in a radial direction it is achieved that the edge of the plate element may easily be pushed past the first locking flange into engagement with the first engagement means. Thus, when pressing a plate element into engagement with the connection device, the first locking means may be pushed by the edge of the plate element in a radially outwards direction in relation to the plate element. When the edge passes the first locking flange, it will return to its starting position, thus locking the plate element in place.

[0018] Furthermore, the second engagement means may comprise a second flexible locking flange for locking the second plate element in place. Such a second locking flange may function in a manner similar to the first locking flange. The second engagement means may further comprise a second sealing flange adapted for preventing air-flow between the first plate element and the second plate element.

[0019] Furthermore, the invention also concerns an assembly for use in ventilation systems, said assembly comprising a connection device according to the present invention, a first plate element and a second plate element, said plate elements being spaced from each other, wherein said device comprises a first engagement means for engaging the first plate element, and a second engagement means for engaging the second plate element, said first engagement means comprising a first flexible locking flange for locking the first plate element in place, and a first flexible sealing flange adapted for preventing air-flow between the first plate element and the second plate element.

Brief Description of the Drawings

[0020] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawing, which, for the purpose of illustration, show a non-limiting embodiment and in which

[0021] Fig. 1 shows a cross sectional view of an embodiment of a connection device according to the invention.

Detailed Description of Preferred Embodiments

[0022] A connection device 1 according to an embodiment of the invention is shown in Fig. 1. The connection device 1 is illustrated in engagement with a first plate element 2 and a second plate element 3. The device 1 comprises a first engagement means 4, a second engagement means 5, a first locking flange 6, and a first sealing flange 7. The device 1 is shown as a cross sectional view, but is typically in the shape of a closed ring. As is illustrated, the two plate elements 2,3 are spaced apart by the connection device 1 and overlap each other. In other embodiments, the connection device 1 may have other configurations and may for instance be shape to fit for a specific application.

[0023] The first engagement means 4 is illustrated in fig. 1 in engagement with a first plate element 2. The first engagement means 4 comprises both a first locking flange 6 and a first sealing flange 7. The two flanges 6,7 are both in contact with the first plate element 2, but on opposite surfaces of the first plate element 2. As can be seen from the figure, the first plate element 2 is locked in place by being pinched between the first locking flange 6 and the body of the connection device. Preferably, the first locking flange 6 is flexible in a radial direction in relation to the first plate element 2. Thus, the first plate element 2 may be mounted by pushing the edge of the first plate element 2 down past the first locking flange 6, which is consequently pushed in a direction away from the edge of the first plate element 2 as illustrated by the arrow on fig. 1. When the edge of the first plate element 2 passes the first locking flange 6, the first locking flange 6 returns to the position illustrated in fig. 1, in which it keeps the first plate element 2 locked in place. Optionally, the first plate element 2 may be removed simply by pressing the first locking flange 6 in the direction of the arrow and pressing or pulling the first plate element 2 out the same way it came in. However, although the dismantling is relatively easy, the first plate element 2 is firmly held in place by the connection device 1 while engaged.

[0024] The first sealing flange 7 form part of the first engagement means 4 and may preferably be shaped as an flange or lip extending from the body of the connection device 1 and bended back towards the body of the connection device as illustrated in fig. 1. The first sealing flange 7 is positioned on the opposite side of the first plate element 2 in relation to the first locking flange 6 and may serve the dual purpose of stabilizing the engagement of the first plate element 2 and providing an air-tight sealing between the first plate element 2 and the connection device 1, i.e. between the two plate elements 2,3. The matter is that the surface of the first plate element 2 which is in contact with the first locking flange 6 may be exposed to an air flow and also possible to an elevated

air pressure in relation to the surroundings. This could for instance be the case, at the inside of a ventilation duct system. In such a situation, air could possible leak between the first plate element 2 and the first locking flange 6 and into the groove formed by the first engagement means 4. It is also possible that air would escape around the edge of the first plate element 2, thus reaching the side of the first plate element 2 facing the first sealing flange 7. However, due to the preferable shape of the first sealing flange 7 illustrated in fig. 1 air could not leak past the first sealing flange 7. Thus, leakage of air from the ventilation system could be prevented. In other words, the first locking flange 6 and the first sealing flange 7 may be adapted to lead air pressure into the groove formed by the first engagement means 4, where the air will exert a force on the first sealing flange 7 pressing it against said first plate element 2 and thus increasing the sealing effect. The first sealing flange 7 may optionally be made in a different shape or positioned differently while still achieving the above mentioned effect.

[0025] The second engagement means 5 is illustrated in fig. 1 as a simple groove accommodating an edge of the second plate element 3. The second engagement means 5 may be shaped differently and may optionally comprise a second locking flange and/or a second sealing flange. Such second flanges may have shapes and effects similar to the first locking and sealing flanges 6,7.

[0026] 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 connection device (1) for use in ventilation systems for connection of a first plate element (2) and a second plate element (3), said plate elements (2,3) being spaced from each other, said device (1) comprising a first engagement means (4) for engaging the first plate element (2), and a second engagement means (5) for engaging the second plate element (3), **characterized by** said first engagement means (4) comprising a first locking flange (6) for locking the first plate element in place, and a first sealing flange (7) adapted for preventing air-flow between the first plate element (2) and the second plate element (3).
2. Device (1) according to claim 1, **characterized by** the device (1) being made from a flexible material.
3. Device according to claim 1 or 2, **characterized by** the first locking flange (6) being flexible in a radial direction in relation to an engaged position of said first plate element (2).

4. Device according to any of the preceding claims, **characterized by** said second engagement means (5) comprising a second locking flange for locking the second plate element (3) in place. 5
5. Device according to any of the preceding claims, **characterized by** said second engagement means (5) comprising a second sealing flange adapted for preventing air-flow between the first plate element (2) and the second plate element (3). 10
6. An assembly for use in ventilation systems, **characterized by** said assembly comprising a connection device (1) according to any of the preceding claims, a first plate element (2) and a second plate element (3), said plate elements (2,3) being spaced from each other, wherein said device (1) comprises a first engagement means (4) for engaging the first plate element (2), and a second engagement means (5) for engaging the second plate element (3), said first engagement means (4) comprising a first locking flange (6) for locking the first plate element in place, and a first sealing flange (7) adapted for preventing air-flow between the first plate element (2) and the second plate element (3). 15 20 25

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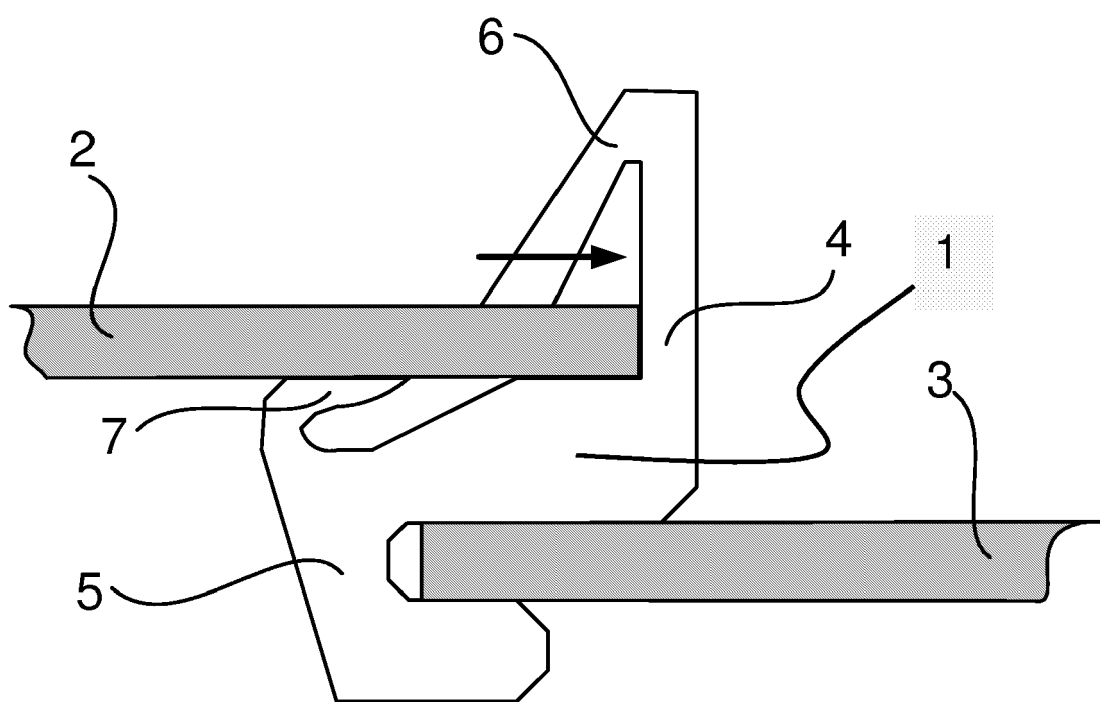


Fig. 1



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 0265

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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