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(54) **Noise attenuating cover**

(57) A noise attenuating cover (1) in particular for a compressor, said cover (1) comprising a bottom cover (2) having a bottom plate (3) and side plates (4a, 4b, 4c, 4d), wherein said bottom plate (3) has a recess and at least one of said side plates (4d) has a recess, said recess in one of said side plates (4d) extends over the complete height of said side plate (4d), and said recess in said

bottom plate (3) and said recess in said side plate (4d) form together an opening (7), and wherein said bottom plate (3) comprises holes (5) which enable a compressor to stand on means beneath said noise attenuating cover (1), when said compressor is in said bottom cover (2); a door (6) for closing said opening (7); and a compressor top cover, comprising at least a top head cover (8) and a stator cover (9).

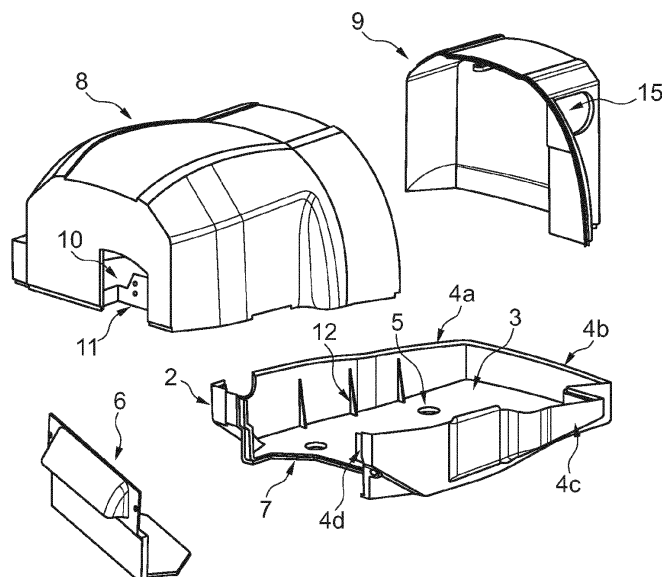


Fig. 1b

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Description

[0001] This invention relates in general to a noise attenuating cover, in particular a noise attenuating cover that can be used to reduce noise caused by a compressor.

[0002] Compressors are used in a plurality of technical areas in industrial environments as well as in domestic environments mainly for increasing the pressure of a gas or a liquid. However, compressors are relatively noisy. Therefore, in most applications the compressors are placed as far away as possible from the places where people work or live so that they are not affected by the noise.

[0003] A way of reducing compressor noise is for example shown in EP 0 603 752 A2. Here, a refrigerated cabinet is shown having a compressor motor and a compressor chamber which has a motor compartment wall. A thin-walled enclosure element made of a cellular material is arranged around the compressor motor to reduce noise caused by the compressor. The enclosure element may be able to reduce the noise up to a certain degree. However, the entire casing has to be removed in order to service the compressor.

[0004] US 2010/0239438 A1 describes a hermetically enclosed compressor for use in a fridge or freezer, wherein the lower part and the upper part are welded together. Although this arrangement may also be able to reduce the noise, it has also the disadvantage that the compressor could not be easily accessed such as for service. In addition, due to the welding, assembling of the compressor is much more complicated and much more time consuming.

[0005] An alternative noise reduction system is described in EP 1 596 067 A1. This system consists of different components that when placed together form a noise attenuating cover shell, which fully encloses the compressor. However, in order to be able to carry out service activities such as changing the oil or the like, disassembling of most of the cover is still necessary.

[0006] Therefore, there is a need for a cover which can be easily assembled around a compressor even in areas with only little space available and which enables that the compressor could be easily serviced. This need is fulfilled by the enclosure according to independent claim 1.

[0007] The noise attenuating cover according to the present invention, which in particular is intended to be used with a compressor, comprises a bottom cover having a bottom plate and side plates. The bottom plate of the bottom cover has a recess. At least one of the side plates of the bottom cover has also a recess which extends over the complete height of the side plate. The recess in the bottom plate forms together with the recess in one of the side plates an opening.

[0008] The bottom cover is preferably formed to accommodate the bottom side of the compressor. The side plates extend substantially upwards from the bottom

plate. Preferably, the bottom cover is designed to allow that the compressor could be easily placed in the bottom cover. This is achieved by said recesses in both the bottom plate and in one of the side plates. The recess in one of the side plates is located adjacent to the recess in the bottom plate and leaves the complete height of the side plate material free, such that together with the recess in the bottom plate, a material free space is formed. Due to this recess, it is not necessary to lift the compressor over the side plates. Therefore, if the compressor should be placed in a space having mainly the height of the compressor, the compressor could be easily placed in the bottom cover.

[0009] For a firm stand of the compressor, the bottom plate also comprises holes which enable the compressor to stand on means beneath the cover, when the compressor is inside the cover.

[0010] In a preferred embodiment, the compressor is placed in the bottom cover by means of mounting parts that are fixed underneath the stands of the compressor.

[0011] According to the invention, the cover comprises a door for closing the opening that is jointly formed by the recess in the bottom plate and the recess in one of the side plates. The door is part of the overall cover encapsulating the compressor. When the door is slid in the opening formed by the recesses, the bottom cover is closed. Further, the door also eases servicing the compressor, without completely dismantling the cover when the compressor is inside the cover. This service opening in the bottom cover has several advantages. With removing the relatively small service door, important areas of the compressor could be reached. For example, due to the recess in the bottom plate, there is enough space even for draining oil from the compressor. In addition, due to the recess there is no danger that the oil accumulates in the cover.

[0012] The noise attenuating cover according to the invention further comprises a compressor top cover, comprising at least two parts, a top head cover and a stator cover. Preferably, the top cover is attached to the bottom cover, completely encapsulating the compressor. By having such a top cover, a quick assembly of the overall cover around the compressor is ensured. When assembling the cover, the stator cover which may be smaller than the top head cover could be assembled first onto one part of the bottom cover. The top head cover could then be slid from the front onto the bottom cover and closing the complete noise attenuating cover. Advantageously, the means for connecting the various parts of the cover with each other are adapted to enable that there is no need to lift the top head cover onto the bottom cover from the top and thus allowing to assemble the casing in confined areas.

[0013] Due to these elements, the noise attenuating cover has a relative high noise attenuation and is easy to assemble and to dis-assemble, for example, to enable service of the covered device.

[0014] In a preferred embodiment of the noise attenu-

ating cover, the cover also comprises a control opening and connection means for fitting a control of the compressor in the control opening of the cover. The control which may be normally attached to the compressor can be dismounted from the compressor casing and mounted, for example, on a special bracket to the cover. In a further preferred embodiment, the top head cover has the control opening in which the control could be mounted. Such an opening allows the operator to easily access the control of the compressor. In addition, this arrangement minimizes the influence of vibrations from the compressor on the cover, since the control is now not part anymore of the compressor and does not experience its vibration. Thus, there is a lower likelihood that noise may leave the cover through openings which may be formed between the control and the cover due to the vibration of the compressor. This system also advantageously increases the life-span of the controls themselves, because the influences of mechanical vibrations become negligible.

[0015] In a further preferred embodiment of the noise attenuating cover, the bottom cover comprises reinforcement means each connecting the bottom plate with a respective side plate. According to the present invention, the top cover of the noise attenuating cover rests on the side plates of the bottom cover. When the top cover is assembled on the bottom cover, the weight of the top cover might bend the side plates of the bottom cover outwardly. As a consequence, the side plates may eventually lose their shape, so that a later assembly of the total cover becomes difficult, since the parts of the noise attenuating cover do not fit anymore to each other. The reinforcement means connect the bottom plate with a respective side plate and give the bottom cover a higher stiffness, so that the bottom cover can handle the entire weight of the top cover.

[0016] In a further preferred embodiment, the individual parts of the noise attenuating cover are interconnected by means of overlaps and counterparts of overlaps. These connection means have the advantage that all parts of the cover can be reliably interconnected, without the aid of special tools. Thus, allowing to assemble the cover in a very short period of time. In a further preferred embodiment, the overlaps and the counterparts are formed by walls along the connection surfaces of the respective parts of the noise attenuating cover, wherein one part comprises the outer wall and one part comprises the inner wall. In a further preferred embodiment, the bottom cover comprises the outer wall, whereas the top cover comprises the inner wall of the overlap. With respect to the connection of the parts of the top cover, it is preferred that the top head cover comprises the outer wall and the stator cover comprises the inner wall.

[0017] In yet another preferred embodiment of the noise attenuating cover, the service door is adapted to be fixed to the cover by means of one or more screws. These screws ensure that the door is held in place during operation of the compressor.

[0018] In another preferred embodiment, the door has an L-Shape to close the opening jointly formed by the recess in the bottom plate and the recess in one of the side plates of the bottom cover. In yet another preferred embodiment, the door comprises a handle. Due to this design, the relevant areas of the compressor could be easily and quickly reached by a service person without degrading the noise attenuation.

[0019] In a preferred embodiment of the noise attenuating cover, the cover shell comprises several layers. The outer housing is preferable formed by a Elastoflex®-Layer, such as Elastoflex® E 3631/ 103/BLK as distributed by BASF. The inner housing is preferably formed by a foam layer, such as a PU foam like ISOPOL T / PES UL of ipse srl. Such a foam may be fixed to a noise attenuating layer which may be formed by VIBROGUM CO1 of ipse srl. In a preferred embodiment, some or all of the layers are connected by a Velcro®-Layer. Due to this layered construction of the cover, the cover has not only a high noise attenuation, but provides also a stiff shell on the outside, providing mechanical support, but which at the same time is still soft enough to slightly bend for connecting the different parts of the cover. The Velcro®-Layer allows to easily attach the layers to each other. In addition, the Velcro®-Layer allows that the cover could be easily dis-assembled into the various layers in order to ease the recyclability of the cover. Advantageously, the Foam-Layer serves two purposes, (1) dampening the noise and (2) quenching a smoldering fire due to overheating or malfunction of the compressor.

[0020] In yet another preferred embodiment, the stator cover comprises a suction-slot. The suction-slot is an opening through which a suction channel of the compressor could be guided to the outside of the sound attenuating cover and which could be sealed around the suction channel with additional means.

[0021] By the above described noise attenuating cover for the first time a cover which can easily assembled around a compressor, especially in areas with only little space and which is still easily serviceable is provided.

[0022] In the following the further described by reference to the schematic illustrations shown in the figures, wherein:

- 45 Figure 1a is a perspective view of an embodiment of a cover for a compressor according to the invention;
- Figure 1b is a exploded view of an embodiment of a cover for a compressor according to the invention;
- 50 Figure 2 is a perspective view of a door for the embodiment of the enclosure according to invention, as shown in figures 1a, 1b; and
- 55 Figure 3 is a view of a overlap - counterpart of overlap connection mechanism for the embod-

iment of the cover, as shown in figures 1a, 1b.

[0023] Figure 1a shows a perspective view of an embodiment of a cover 1 for a compressor according to the invention. Figure 1b shows an exploded view of the embodiment of cover 1 according to the invention, as shown in figure 1a. However, this example shall not be limiting and it is evident for a person skilled in the art that the cover according to the invention is also suitable to be used with other machinery. In the here shown embodiment, cover 1, for example, comprises four main parts, namely the top head cover 8, the stator cover 9, the bottom cover 2 and the door 6.

[0024] In the here shown embodiment, the bottom plate 3 has four side plates 4a, 4b, 4c, 4d arranged at the four edges of the bottom plate to form the bottom cover 2. As could be seen in figure 1b, the bottom cover 2 has one recess in the bottom plate 3 and one side plate 4d has also a recess. Both recesses form the opening 7. The recess in the side plate could be formed by completely removing the side plate. However, in the example shown in the Figures, at the left corner and at the right corner, there are still parts of this side plate. The remaining part of the side plate is removed over the complete height of the side plate so that there is a recess through which a compressor may be placed in the bottom cover. The recess in the bottom plate has a corresponding extend so that both recesses form together one opening.

[0025] The noise attenuating cover comprises also a door 6 which is adapted to close the opening 7 formed by these recesses. Figure 2 shows a side view of such a door 6. This door 6 may be fixed to the cover by means of screws. In order to simplify the removing of the door 6, the door 6 has a handle.

[0026] The bottom plate further comprises reinforcement means 12 each connecting the bottom plate 3 with a respective side plate 4a, 4b, 4c, 4d. The bottom plate 3 of the noise attenuating cover 1 further comprises holes 5 through which the stands of the compressor may reach the surface under the cover.

[0027] On top of the bottom cover 2, the top cover is placed. The top cover comprises at least two parts. In the present example, there is a top head cover 8 and a stator cover 9. The stator cover 9 may comprise an opening 15 which may be used as suction slot. In the example shown in the figures, the top head cover 8 also comprises an opening 10. This opening is called control opening 10 and may be used to place a control of the compressor in the cover 1, for example, with corresponding connection means 11.

[0028] The top cover 8, 9 sits on the bottom cover 2, wherein the parts of the cover are interconnected by means of overlaps and corresponding counterparts. For example, figure 1b shows that the overlaps and the counterparts are formed by walls along the connection surfaces of the respective parts of the noise attenuating cover. In figure 1b, the bottom cover 2 comprises an outer

wall at the connection surface to the top cover 8, 9. Consequently, the top cover 8, 9 comprises - as shown in figure 3 - the inner wall of the overlap. With respect to the connection of the parts of the top cover 8, 9, figure 3 shows that top head cover 8 comprises the outer wall and the stator cover 9 comprises the inner wall.

[0029] Where necessary, the parts could be connected in addition by means of other connection members such as screws. Figure 3 shows the cover 1, as shown in figure 1a, 1b, with removed top head cover 8. On the connection edges of the top head cover 8 and the stator cover 9 overlaps 14 are arranged that fit into counterparts of overlaps 13 arranged on the bottom cover 2.

Claims

1. A noise attenuating cover (1) in particular for a compressor, said cover (1) comprising:

a bottom cover (2) having a bottom plate (3) and side plates (4a, 4b, 4c, 4d), wherein said bottom plate (3) has a recess and at least one of said side plates (4d) has a recess, said recess in one of said side plates (4d) extends over the complete height of said side plate (4d), and said recess in said bottom plate (3) and said recess in said side plate (4d) form together an opening (7), and wherein

said bottom plate (3) comprises holes (5) which enable a compressor to stand on means beneath said noise attenuating cover (1), when said compressor is in said bottom cover (2); a door (6) for closing said opening (7); and a compressor top cover, comprising at least a top head cover (8) and a stator cover (9).

2. The noise attenuating cover (1) of claim 1, wherein said noise attenuating cover (1) further comprises an control opening (10) and connection means (11) for fitting a control of said compressor in said control opening (10).
3. The noise attenuating cover (1) of any of claims 1 or 2, wherein the bottom cover (2) comprises reinforcement means (12) each for connecting said bottom plate (3) with a respective one of said side plates (4a, 4b, 4c, 4d).
4. The noise attenuating cover (1) of any of claims 1 to 3, wherein said bottom cover (2), said door (6), said top head cover (8) and said stator cover (9) are interconnected by means of overlaps (14) and counterparts of overlaps (13).
5. The noise attenuating cover (1) of any of claims 1 to 4, wherein said door (6) is adapted to be fixed to said bottom cover (2) or to said top cover by means of

one or more screws.

6. The noise attenuating cover (1) of any of claims 1 to 5, wherein said door (6) has an L-shape to close said recesses in said bottom plate (3) and in said side plate (4d) of said bottom cover (2). 5
7. The noise attenuating cover (1) of any of claims 1 to 6, wherein said door (6) comprises a door handle. 10
8. The noise attenuating cover (1) of any of claims 1 to 7, wherein the cover (1) comprises two or more layers, including on or more of:
- a Elastoflex®-Layer; 15
 - a Velcro®-Layer; and/ or
 - a Foam-Layer.
9. The noise attenuating cover (1) of any of claims 1 to 8, wherein the stator cover (9) comprises a suction slot (15). 20

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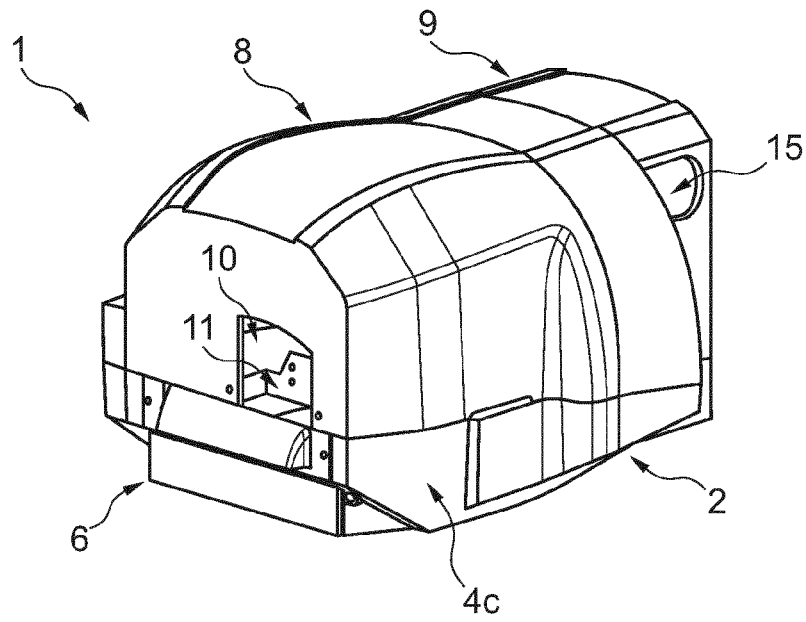


Fig. 1a

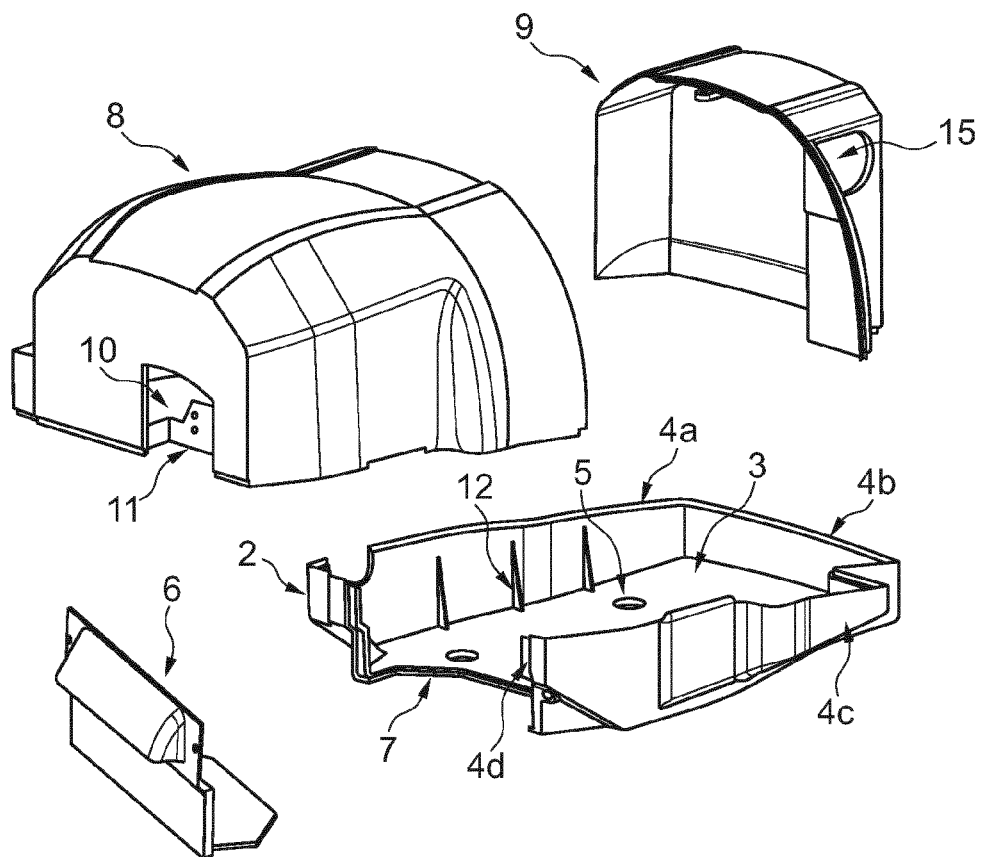


Fig. 1b

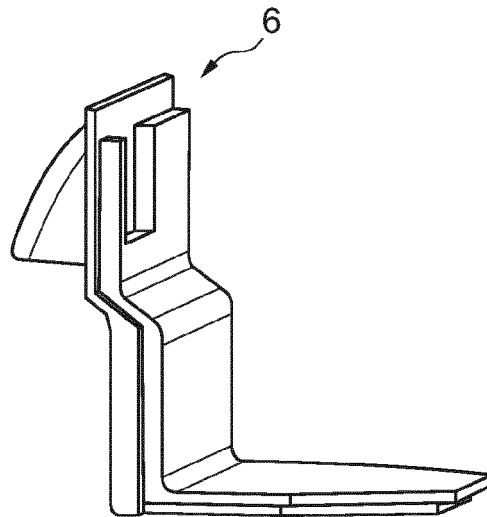


Fig. 2

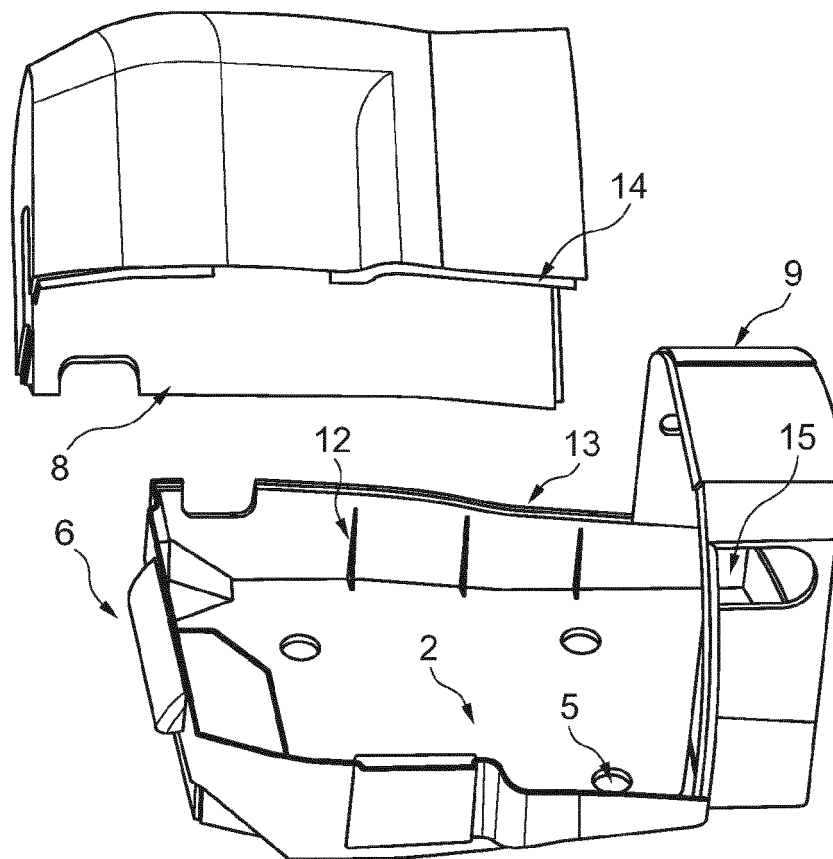


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 0243

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Place of search Munich		Date of completion of the search 14 June 2012	Examiner Descoubes, Pierre
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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