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**A switchgear cabinet and associated ventilator assembly**

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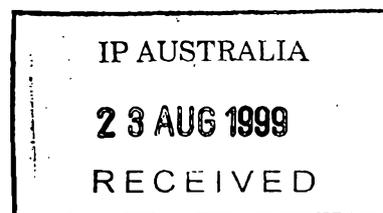
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(54) Title: ~~FAN FOR MOUNTING ON A WALL MEMBER OF A CONTROL CABINET~~

A switchgear cabinet and associated ventilator assembly

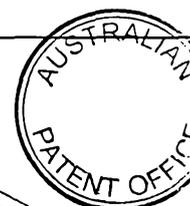
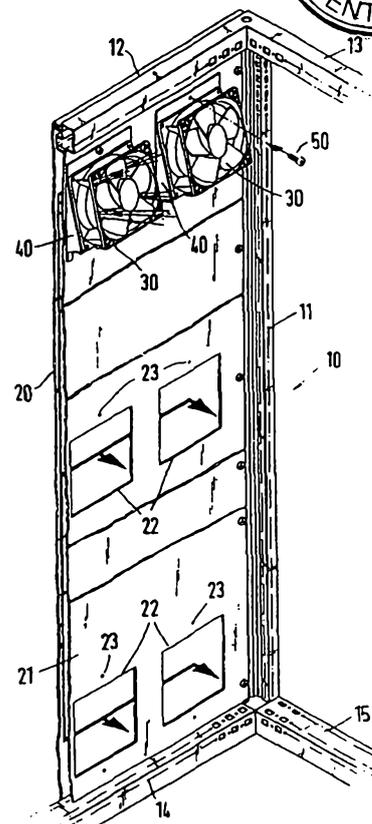
(54) Bezeichnung: LÜFTER ZUM ANBAU AN EIN WANDELEMENT EINES SCHALTSCHRANKES

(57) Abstract

The invention relates to a fan with an input mounting plane and an output mounting plane. The inventive fan is adapted to be mounted on a control cabinet wall member with an aeration passage. The aim of the invention aims is to enable the production of an air flow which is as dust-free and turbulence-free as possible. For this purpose, the input mounting plane and the output mounting plane form an acute angle.

(57) Zusammenfassung

Die Erfindung betrifft einen Lüfter mit Eingangs- und Ausgangs-Befestigungsebene zum Anbau an ein mit Lüftungsdurchbruch versehenes Wandelement eines Schaltschranks. Um einen möglichst wirbel- und staufreien Luftstrom zu erzielen, sieht die Erfindung vor, dass die Eingangs-Befestigungsebene und die Ausgangs-Befestigungsebene im spitzen Winkel zueinander stehen.



## A SWITCHGEAR CABINET AND ASSOCIATED VENTILATOR ASSEMBLY

5 The invention relates to a fan with an inlet mounting plane and outlet mounting  
plane for installation on a wall element, which is provided with a ventilation opening, of a  
switchgear cabinet, wherein a fan unit has fastening flanges on the inlet and outlet sides  
which are identical and are oriented parallel in respect to each other, wherein a fan unit has  
fastening flanges on the inlet and outlet sides, which are identical and are oriented parallel  
in respect to each other and is assembled from the fan unit and an additional housing.

10

Fan units of this type are known in the most diverse embodiments, wherein they  
can be directly connected with the wall element by means of the one or the other fastening  
flange. Such fan units are customary in commerce, can be provided in various sizes and  
can be bought for various requirements of use. As a rule, the air flow is here oriented the  
same in the area of the inlet and outlet fastening planes, as well as vertically in respect to  
these planes, as can be determined from WO 96/41511.

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As is known from Patent Abstracts of Japan, volume 18, No. 480 (E-1603),  
09/08/94, and JP 06 164175A (Ricoh Cp. Ltd.), such a fan unit only fastening planes  
extending parallel with each other can also be attached with an intermediate housing as a  
fan of the type mentioned at the outset wherein, however, its outlet plane continues to  
extend parallel with the wall element and does no cause a change in the flow direction of  
the fan unit. The direction of flow continues to remain vertically in respect to the  
fastening planes and to the ventilation opening of the wall element.

20

As USP 4,648,007 shows, such fan units can be fastened in a housing to be  
ventilated at areas, which have various inclinations, of a wall element in order to change  
the direction of the air flow. For reasons of space this is not practical in connection with a  
flat wall element of a switchgear cabinet, because the fan unit must be attached at different  
locations of the wall element, depending on the way the switchgear cabinet is equipped.

25



It is also known to employ specially designed ventilators in cooling devices. In this case the inlet and the outlet fastening planes of the fan unit extend at an acute angle with each other, wherein the action of the fan as a suction or pressure fan is predetermined, as shown in WO 88/01127. Furthermore, depending on the location where they are used, 5 the fans can also be designed as a fan with a filter, as shown in USP 5,528,454.

Particular requirements must be met when using such fans in the interior of a switchgear cabinet. The air will need to be aspirated from different locations in the cabinet interior and must also be supplied to the cabinet interior at different locations. 10 This presumes a flexible installation, which must be matched to the existing conditions. In this case the wall element is often designed to be double-walled and is used as an air conduit, and is often even used as a heat exchanger housing. The wall element made of an outer and an inner leaf forms a very flat air conduit which leads to congestion of the air, since the air flow which is aspirated and fed into the air conduit impacts on the outer wall 15 element, which results in eddy formation. Moreover, the aspirating direction of the air flow cannot be optimally matched to the existing circumstances if fan units, which are customary in commerce, are to be used.

It is an object of the invention to design a fan of the type mentioned at the outset in 20 such a way that not only can it be selectively installed as a suction or a pressure fan on the wall element, but also that the flow direction of the aspirated or blown out air flow can be matched to the existing conditions in respect to the wall element with the ventilation opening.

25 According to the present invention there is provided a switchgear cabinet for housing electrical installations in the interior thereof, the cabinet including an outer wall element; an inner wall element spaced from the outer wall element so that there is a space therebetween which space is adapted to serve as a heat exchanging zone; openings in the inner wall element in upper and lower regions thereof; a ventilator assembly including 30 ventilator support housing for supporting a ventilator fan, said housing including mounting flanges disposed on opposite sides of the ventilator fan, an intermediate housing which



includes a first mounting section which is operatively connectible to the inner wall element in the region of one of said openings and a second mounting section to which a selected one of the mounting flanges of the ventilator support housing can be operatively connected, the mounting sections being inclined at an acute angle with respect to one another; the arrangement being such that the ventilator unit can operate as suction unit or pressure unit depending upon which of said flanges is connected to the intermediate housing.

10 Preferably, the mounting flanges are of generally rectangular or square configuration.

The first mounting section of the intermediate housing may be provided with mounting bores for fastening screws, which can be screwed into screw receiving parts in the region of the through-holes of the inner wall element. The intermediate housing may include side wall sections between the first and second mounting sections.

The ventilator assembly may be designed as a filter ventilator, and can be operated as suction or pressure ventilator.

The invention will be explained in greater detail by means of an exemplary embodiment represented in the drawings. Shown are in :

20 Fig. 1, a partial section of a switchgear cabinet with a double-walled wall element with fans in accordance with the invention attached thereto; and

Fig. 2, a cube-shaped fan, customary in commerce, which has fastening flanges extending parallel with each other and which can be connected with an intermediate housing, whose fastening planes extend at an acute angle in respect to each other.

25 The partial view in accordance with Fig. 1 shows a vertical frame leg 11 of a rack 10 of a switchgear cabinet, on which the horizontal frame legs 12 and 13 are attached at the top, and the horizontal frame legs 14 and 15 on the bottom. One side of the rack 10 is closed by means of a double-walled wall made of an inner wall element 21 and an outer wall element 20. The inner wall element 21 has square openings 22, which are connected with each other via the space between the two wall elements 20 and 21. In the exemplary embodiment, the openings are cut in pairs in the



upper, central and lower areas of the wall element 21. The space between the two wall elements 20 and 21 can also be divided into air conduits, which vertically connect the openings with each other. In this embodiment the double-walled wall is used as a heat exchanger, when the aspirated warm air from the switchgear cabinet comes into contact with the outer wall element cooled by the outside air, so that it can return cooled into the interior of the switchgear cabinet through the openings 22 which are not closed off by fans. The inner wall element 21 can be put together from several partial wall elements.

The fans are now designed in such a way that the inlet fastening plane and the outlet fastening plane are arranged at an acute angle to each other. Therefore the fans, which are fastened in accordance with Fig. 1, aspirate the air obliquely from above, i.e. from the warmest location under the sheet metal cover of the switchgear cabinet. The aspirated air flow has a downward inclination and encounters the outer wall element 20 with a downward directed component. Therefore the impact on the outer wall element 20 does not lead to any noticeable eddy formation and to no congestion, so that an essentially advantageous course of the aspirated air flow over the heat exchanger is achieved. This results in a considerably improved efficiency of the heat exchanger.

There are several options for achieving the inclination at an acute angle between the inlet and the outlet fastening planes of the fan. The fan housing can be divided into two parts, wherein the closing fastening flanges of the housing elements extend at an acute angle to each other when assembled. In this case the fan unit can be inserted into the assembled fan housing, so that the fan can be designed as a suction or a pressure fan.



Fig. 2 shows an advantageous embodiment of the fan, using a cube-shaped fan unit 30 customary in commerce. The fan unit 30 terminates in fastening flanges 31 and 32, which define fastening planes 35 and 36 extending parallel with each other. The two fastening flanges 31 and 32 are identical, are preferably embodied to be square and have fastening receivers 33 and 34 in an identical arrangement. So that the installation of the fan on the wall can take place in the inclined position, the fan unit 40 is connected with an intermediate housing 40, wherein there is again the option of connecting the fastening flange 31 or the fastening flange 32 with the inlet fastening plane 41 of the intermediate housing. Therefore fastening receivers 47, which match fastening receivers 33, or respectively 34, of the fan unit 30, have been cut in the area of the inlet fastening plane 41 of the intermediate housing 40. The inlet fastening plane 41 of the intermediate housing 40 has a centered inlet opening 42. Together with frame elements, the walls 43, 44 and 46 on the outlet side of the intermediate housing 40 form an outlet fastening plane 49, which extends at an acute angle in respect to the inlet fastening plane 41. Together with the frame elements, the walls 43, 44 and 46 leave an outlet opening 45 in the outlet fastening plane 49. The fan unit 30 is fastened on the intermediate housing 40 by means of screws 51.

The fan assembled from the fan unit 30 and the intermediate housing 40 is fastened on the inner wall element 21 with fastening screws 50. The screws 50 are passed through the fastening bores 48 of the frame element of the intermediate housing 40 and are screwed into screw receivers 23 of the inner wall element 21, which are arranged in the area of the openings 22.



In the application in accordance with Fig. 1, the fan is used as a suction fan. If it is designed as a pressure fan, it can be turned by 180° and attached in a different, downward extending inclination in the area of the lower openings 22. In this case the air is aspirated via the heat exchanger and is introduced cooled into the lowest part of the interior of the switchgear cabinet.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS :

1. A switchgear cabinet for housing electrical installations inn the interior thereof, the cabinet including

- 5 (i) an outer wall element;
- (ii) an inner wall element spaced from the outer wall element so that there is a space therebetween which space is adapted to serve as a heat exchanging zone;
- (iii) openings in the inner wall element in upper and lower regions thereof;
- (iv) a ventilator assembly including
- 10 (a) ventilator support housing for supporting a ventilator fan, said housing including mounting flanges disposed on opposite sides of the ventilator fan
- (b) an intermediate housing which includes a first mounting section which is operatively connectible to the inner wall element in the region of one of said openings and a second mounting section to which a selected one of the
- 15 mounting flanges of the ventilator support housing can be operatively connected, the mounting sections being inclined at an acute angle with respect to one another; the arrangement being such that the ventilator unit can operate as suction unit or
- pressure unit depending upon which of said flanges is connected to the intermediate housing.

20 2. A switchgear cabinet according to claim 1, wherein the mounting flanges are of generally rectangular or square configuration.

25 3. A switchgear cabinet according to claim 1 or 2, wherein the first mounting section of the intermediate housing is provided with mounting bores for fastening screws, which can be screwed into screw receiving parts in the region of the through-holes of the inner wall element.

30 4. A switchgear cabinet according to any one claims 1 to 3, wherein intermediate housing includes side wall sections between the first and second mounting sections.

5. A switchgear cabinet according to any one of claims 1 to 4, wherein the ventilator



assembly is designed as a filter ventilator.

6. A switchgear cabinet according to any one of claims 1 to 5, wherein the ventilator assembly can be operated as suction or pressure ventilator.

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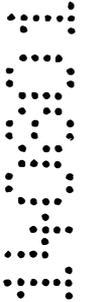
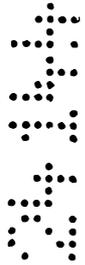
7. A switchgear cabinet substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 13<sup>th</sup> day of August, 2001

10 **RITTAL-WERK RUDOLF LOG GmbH & CO KG**

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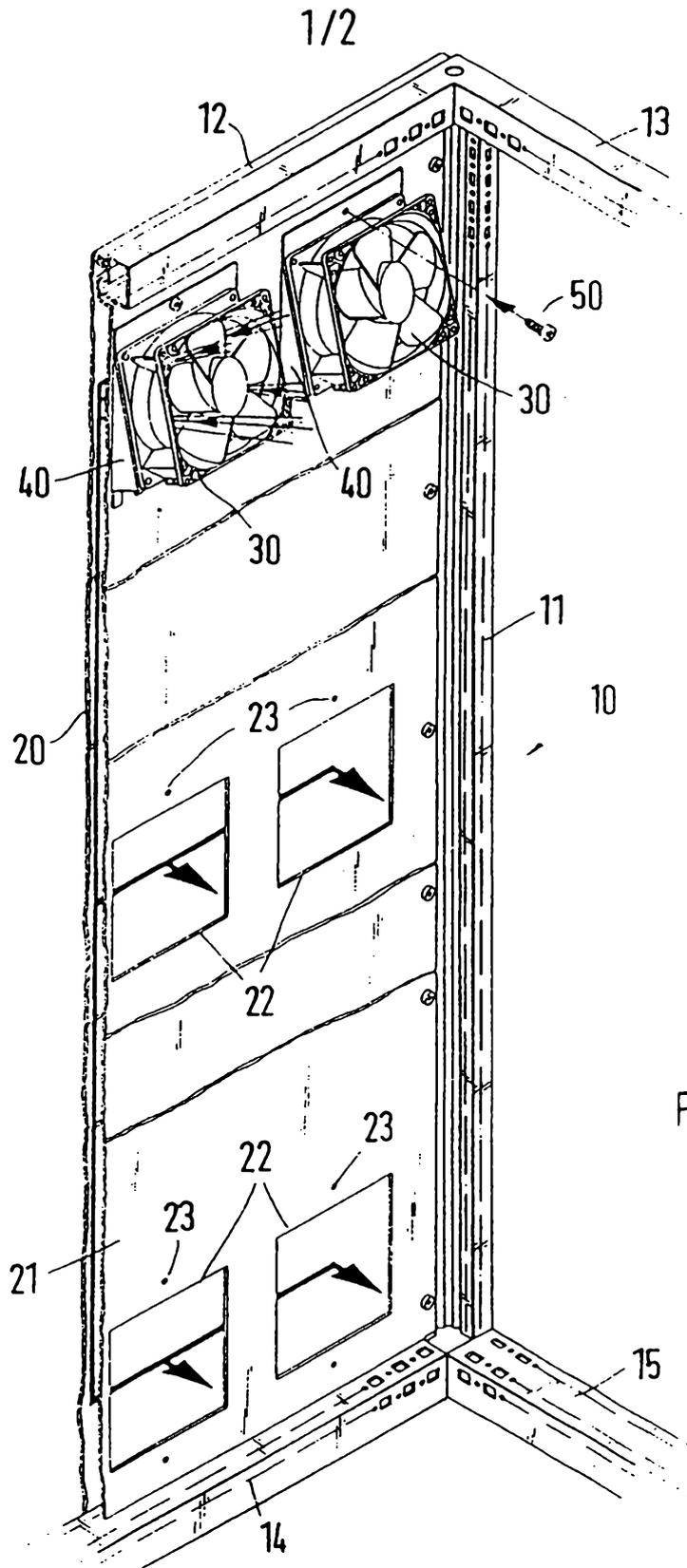


Fig. 1

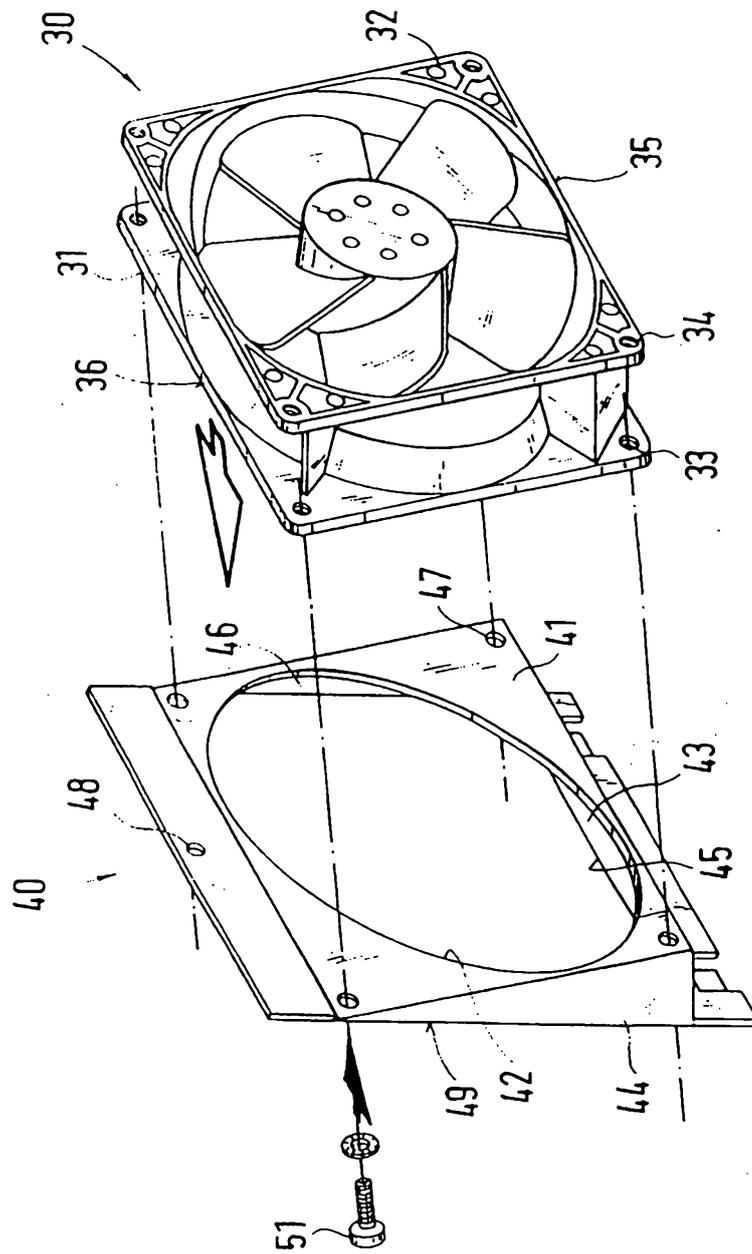


Fig. 2