

IN THE PATENT OFFICE OF THE UNITED STATES

--A FAN UNIT--

BACKGROUND OF THE INVENTION.

[0001] The invention relates to a fan unit comprising a housing, which possesses a first housing wall having an air inlet, and an opposite parallel second housing wall having an air outlet, and a side wall arrangement connecting the first housing wall with the second housing wall, a holding plate arranged between the first housing wall and the second housing wall adjacent to the air inlet for a suction blower for drawing air from the air inlet and having a blower motor, a blower impeller being arranged between the air inlet and the holding plate, said blower impeller being adapted to blow drawn in air radially outward.

THE PRIOR ART.

[0002] A fan unit disclosed in the German patent publication 19511158 C2 of this type requires a pot-shaped insert in the housing for even flow distribution over the area of a filter at the air outlet and more particularly for reducing noise. As an additional component this insert, which must be secured in the housing in a particular manner, increases the overall price of the arrangement and reduces efficiency.

SHORT SUMMARY OF THE INVENTION

[0003] One object of the invention is to create a fan unit of this type, which while having an improved efficiency and improved noise reduction is simpler in its mechanical design and accordingly is more economic.

[0004] In order to achieve these and/or other objects appearing from the present specification, claims and drawings, in the present invention the area of the holding plate is at least twice as large as the area of the air inlet and the holding plate together with the first housing wall constitutes a diffuser for the radially emerging blower air.

[0005] Owing to the diffuser the invention provides for a substantial increase in the aerodynamic and accordingly overall efficiency, the particular advantage being that as compared with conventional designs no extra components are necessary. Only the holding plate, which in any case is necessary, must be increased in size as regards its area in relation to the area of the air inlet, since together with the first housing wall, also present, it constitutes a flow guide means, namely the diffuser. The dynamic pressure is converted into a useful static increase in pressure. Owing to the pressure increase the speed of rotation may be reduced for a given operating point and accordingly in addition a reduction in noise is possible.

[0006] The measures recited in the dependent claims represent advantageous further developments of the fan unit claimed in claim 1.

[0007] In accordance with a convenient design development the blower motor of the suction blower consisting of the motor and the blower impeller is secured to the holding plate, more particularly screwed to it, the holding plate

being fixed by spacer elements, more especially to the first housing wall.

[0008] For a further reduction in noise the holding plate and/or the walls of the housing consist at least partially of noise muffling material or are provided, for example coated, with such a material.

[0009] In order to be able to employ the fan unit as a filter fan module, and more particularly as a clean room air filter fan module, the air inlet and/or the air outlet are preferably furnished with an air filter arrangement. In this respect the second housing wall may essentially consist of the air filter arrangement.

[0010] In order to have a compact arrangement the fan motor extends into the blower impeller or respectively is arranged essentially within the blower impeller.

[0011] For the induction of air in a flow enhancing manner the air inlet may have a round cross section and an air furthermore means.

[0012] At its end side facing away from the air inlet the blower impeller may have a terminal disk, which is positioned directly on the holding plate or is let into it. This terminal disk, driven by the motor, in this design increases efficiency and reduces blower noise.

[0013] The holding plate is preferably designed a round disk, the housing generally being disk-like or square in shape. In this respect the holding plate is preferably arranged parallel to the first housing wall.

[0014] Further advantageous developments and convenient forms of the invention will be understood from the following detailed descriptive disclosure of one embodiment thereof in conjunction with the accompanying

drawing, whose single figure shows a fan unit in cross section.

DETAILED ACCOUNT OF WORKING EMBODIMENT OF THE
INVENTION.

[0015] The fan unit depicted in the single figure comprises a square or block-like housing 10, which has a square top wall 11 and an opposite parallel bottom housing wall 12 spaced from it and having a matching rectangular structure. The top housing wall 11 is joined with the bottom housing wall 12 by means of side walls 13 of the housing 10. Instead of the square shape the housing 10 may in principle also have a cylindrical or, respectively, disk-like configuration, the top housing wall and the bottom housing wall being circular in design in the form of disks. Other shapes of housings are also possible.

[0016] A holding plate 14 with a circular disk-like configuration is secured parallel to and at a distance from the top housing wall 11 on the same by means of spacer elements 15 so that the holding plate 14 is located generally in the middle between the top housing wall 11 and the bottom housing wall 12.

[0017] The holding plate 14 may, in a different design, also be arranged eccentrically, for example nearer to the bottom housing wall 12. Furthermore a non-parallel arrangement of the holding plate 14 is possible in order for example to provide for systematic widening of the cross section of the narrow part of the air flow in the arrangement designed in the form of as a diffuser. The spacer element 15 could instead of being arranged on the top housing wall 11 be arranged on another housing wall, for example on the side walls.

[0018] Centrally in the top housing wall 11 there is an air inlet 16 in the form of an air aspiration opening 14 with a round cross section, which is arranged concentrically to the holding plate 14 underneath it. A flow guide arrangement 9 surrounding the air inlet 16 is designed in the form of a rounded bead and serves to improve the flow of the aspirated air.

[0019] A blower motor 17 of a suction blower 18 is arranged centrally on the holding plate 14 and drives a blower impeller 19 arranged between the holding plate 14 and the top housing wall 11. The blower impeller 19 possesses a terminal disk 20 (which is directly mounted on the holding plate 14) driven by the blower motor 17 and it may even be let into the holding plate 13. This serves to improve flow. On the terminal disk 20 blower vanes 21 are arranged annularly which extend as far as a position in the air inlet 16 and hence draw in air axially and blow out the air radially within the housing 10. The blower motor 17 here extends into the blower impeller 19 or, respectively, is surrounded thereby.

[0020] In the working embodiment illustrated the holding plate 14 has a diameter twice as large as that of the air inlet 16 and thus has fourth times its area. Accordingly it overlaps the air inlet 16 on all sides, the overlapping parts, together with the opposite part of the top housing wall 11, forming a radial air guide arrangement, which constitutes the above mentioned diffusor. This diffusor serves to increase the aerodynamic and accordingly overall efficiency of the suction blower 18. Additionally the dynamic pressure is converted into a useful static pressure increase, something which contributes to increasing the static efficiency. Owing to the pressure

increase the speed of rotation may be reduced, something leading to a quieter operation. In order to produce this effect the area of the holding plate 14 must be at least twice the size of the area of the air inlet 16 so that the overlapping portions together with the opposite region of the top housing wall 11 constitute an effective diffuser.

[0021] The holding plate 14 possesses a metal grid structure, the parts of the holding plate 14, which radially project outward at the terminal disk 20 of the blower impeller 19, being filled with noise muffling material 22. The same applies for the top housing wall 11 and the side walls 13, the side walls 13 being completely filled with noise reducing material 23 and the top housing wall 11 being only filled at the parts (which constitute the diffuser) opposite the holding plate 14, with noise reducing material 24. In other respects the top housing wall 11 possesses a top terminal plate 25. In principle it is however possible to fill the top housing wall 11 and the holding plate 14 completely with noise muffling material.

[0022] The bottom housing wall 12 is designed in the form of an air filter or includes an air filter arrangement 28. For instance a corresponding grid structure may be provided with filter material or may be filled therewith. The bottom housing wall 12 here constitutes the air outlet for the fan unit.

[0023] The air inlet 16 is provided with an air inlet grid 26, which serves as a protective cover for the blower impeller 19 and as an alternative or in addition may also be in the form of a prefilter or an additional filter.

[0024] Instead of the above described grid structure for the walls and the holding plate 14 same may be also

consist of sheet metal or shaped parts of metal or plastic, which internally are coated at suitable positions with noise reducing material. Furthermore the described grid structure may possess external terminal sheet metal elements or, respectively, impermeable terminal areas.

[0025] Holding elements 27 are arranged on the top housing wall 11 which may serve as handles for better handling of the fan unit as a whole and/or as attachment elements.

Claims

5 1. A fan unit comprising a housing, which possesses a first housing wall having an air inlet, and an opposite parallel second housing wall having an air outlet, and a side wall arrangement connecting the first housing wall with the second housing wall, a holding plate arranged between
10 the first housing wall and the second housing wall adjacent to the air inlet for a suction blower for drawing air from the air inlet and having a blower motor, a blower impeller being arranged between the air inlet and the holding plate, said blower impeller being adapted to blow drawn in air
15 radially outward, wherein the area of the holding plate is at least twice as large as the area of the air inlet and the holding plate together with the first housing wall constitutes a diffuser for the radially emerging blower air.

20 2. The fan unit as set forth in claim 1, wherein the blower motor of the suction blower comprising same and the blower impeller is secured and more especially screwed to the holding plate.

25 3. The fan unit as set forth in claim 1, wherein the holding plate is secured to one of the first housing walls by means of spacer elements and is more particularly secured to the first housing wall.

30 4. The fan unit as set forth in claim 1, wherein the holding plate and/or the first housing wall and/or the side wall arrangement of the housing are at least partially made

of noise silencing material or are provided or coated with such material at least in flow relevant areas.

5 5. The fan unit as set forth in claim 1, wherein the air inlet and/or the air-outlet is provided with an air filter arrangement.

10 6. The fan unit as set forth in claim 5, wherein the second housing wall consists essentially of the air filter arrangement.

7. The fan unit as set forth in claim 1, wherein the blower motor is inserted into the blower impeller.

15 8. The fan unit as set forth in claim 1, wherein the blower impeller possesses a terminal disk on its end side facing face away from the air inlet, such disk being directly positioned on the holding plate or being let into it.

20 9. The fan unit as set forth in claim 1, wherein the air inlet possesses a round cross section and preferably has an air guide means.

25 10. The fan unit as set forth in claim 1, wherein the holding plate is designed in the form of a round disk and/or is arranged parallel to the first housing wall.

30 11. The fan unit as set forth in claim 1, wherein the housing is in the form of a circular disk or is rectangular.