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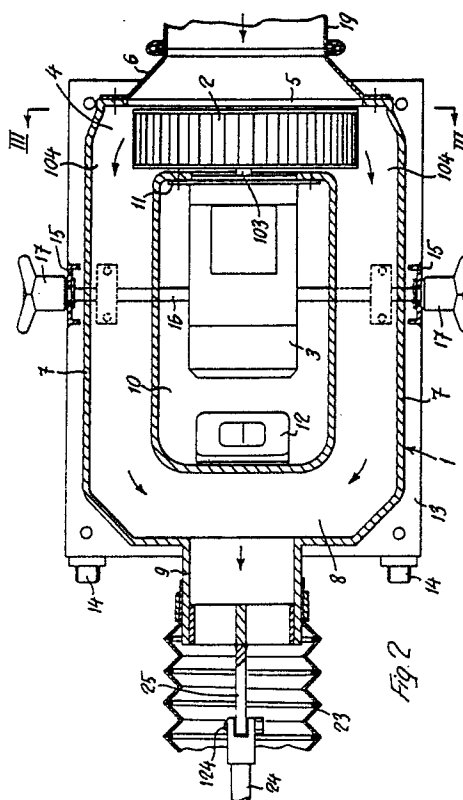
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54 Fan for removing exhaust gases generated by motor-vehicles.

57 This invention relates to a fan which is particularly designed for sucking away and removing hot noxious gases and/or polluted gases and/or gases containing explosive mixtures, for example, the exhaust gases of motor-vehicles in workshops or garages. Said fan comprises an annular hollow body (1) including the housing (4) for an impeller (2) and two delivery side-ducts (7) which are substantially parallel to the axis of said impeller (2) and communicate with the housing (4) at diametrically opposite positions. The two delivery side ducts (7) are in communication, additionally, through a connecting section (8), with a delivery union (9) which, preferably, is in a central position co-axial with the suction mouth (6) which, in turn, is co-axial with the impeller (2) and is mounted on the housing (4) for said impeller (2). The motor (3) for actuating the impeller (2) is co-axial with said impeller (2) and is arranged in the central opening (10) of the annular hollow body (1) outside of the path of travel of gases, so that it is not in contact therewith and cannot cause the ignition of any explosive mixture which might be contained therein.



**"Fan for removing exhaust gases generated by motor-vehicles".**

The invention relates to a fan which is particularly designed for sucking away and removing the polluting or noxious gases from closed rooms, workshops or the like, and particularly for sucking away the exhaust gases of motor-vehicles with running engines while in workshops, garages and the like, said fan comprising an impeller actuated by a co-axial electric motor and enclosed in a housing having a suction mouth and a delivery outlet both of which are substantially arranged parallel to the axis of the impeller and the motor.

Fans of this so-called "ducted" type are known wherein an impeller and its co-axial actuating motor are both arranged in a tubular housing through which the sucked gas is compelled to flow. Notwithstanding the advantages of this type of fans (namely, constructional simplicity, and compactedness, good performance, possibility to assure a static head), these fans cannot be used for excessively hot gases, or gases containing pollutants and/or explosive mixtures, such as, specifically, for exhaust gases of motor-vehicles, especially in case of malfunctioning of the engines thereof. In fact, motor-vehicle exhaust gases have a high temperature and cause, therefore, an excessive thermal stress of the electric motor which actuates the impeller and is surrounded by said flowing gases. Moreover, these gases contain pollutants which foul the brushes of the motor and often contain as well explosive mixtures which may be ignited by the sparks of the electric motor and may cause dangerous explosions.

The invention aims to overcome said disadvantages and to provide a fan of the type described in the preamble, which, while maintaining the constructional advantages afforded by the co-axial arrangement of the impeller and the actuating electric motor therefor, avoids any influence of gases on the motor and additionally avoids any risk of explosion due to the ignition of explosive mixtures possibly contained in said gases.

This problem is solved by the invention in that the sucking mouth and/or the delivery outlet of the housing for the impeller are arranged excentrically to the impeller, beside its actuating electric motor, the latter being mounted outside said housing.

In a preferred embodiment of the invention, wherein the electric motor (co-axial with the impeller) is arranged on the delivery side and the suction mouth is substantially co-axial with said impeller, said housing for the impeller comprises at least a pair of excentric delivery outlets which are diametrically opposed to each other and communicate, through a pair of respective delivery ducts extending beside said motor, with a common delivery

union arranged downstream of the motor and substantially co-axial with the suction mouth. A kind of "ducted" fan is thus obtained which comprises a suction mouth and a delivery union which are substantially co-axial with each other and with the impeller/motor unit, and wherein the electric motor is arranged outside within a space or opening which is surrounded by an annular hollow body including the housing for said impeller, by the two delivery side-ducts and by the delivery union.

According to a very advantageous construction of this embodiment of the invention the housing for the impeller, with its suction mouth, the two delivery side-ducts connected to the pair of excentric delivery outlets of said housing and the common delivery union to which said delivery ducts are connected, constitute a unitary annular hollow body, provided with a suction mouth and a delivery union which is arranged oppositely and, preferably, co-axially with said suction mouth. This annular hollow body, which, advantageously, may be made of plastics material, mounts interiorly the impeller of the fan and, exteriorly, in the opening enclosed thereby, the electric motor for actuating the impeller, which is co-axial with said impeller.

In its operative condition, said annular hollow body may be positioned as desired, with its central opening extending in a horizontal, vertical or inclined plane.

In any case, in the fan according to the invention, the electric motor for actuating the impeller is arranged away from the path of travel of the gases and, therefore, is not affected by them, particularly by the temperature of the exhaust gases of motor-vehicles and pollutants entrained thereby, and it cannot cause any ignition and explosion of inflammable or explosive mixtures contained in said gases.

The impeller of the fan according to the invention may be constructed as desired according to the type of the fan, which may be either of the centrifugal or axial (helical) types.

When the fan is of the centrifugal type, the housing for the impeller may have, in cross section transversely to the axis of rotation of said impeller, an outline with two or more scroll-shaped sectors which are angularly staggered from each other and which are connected, each with the wider end thereof, to a delivery outlet, the axis of which is substantially parallel to that of the impeller and of the respective actuating motor.

The fan according to the invention may be used, as a stationary or mobile unit, in any plant for sucking away noxious or polluting gases from any factory, workshop or the like, and specifically from

motor-vehicle repair shops and garages. Due to the constructional simplicity and compactedness, and to the lightweight of the fan according to the invention, the latter is particularly suitable to constitute a mobile, simple and relatively small aspirator which may be used individually for sucking and discharging the exhaust gases of a motor-vehicle from workshops and garages.

For this purpose, according to a further characteristic of the invention, said fan is mounted on a carriage or trolley, preferably so that its position and level may be adjusted, and its suction mouth is provided with a suction tube, preferably of the rigid and articulated type, which terminates with a funnel in front of the exhaust pipe of a motor-vehicle, while the delivery union is connected to a discharge tube, preferably of the flexible and corrugated type, which is connected to a discharge duct or is extended to the open air outside of the workshop or garage.

These and other characteristics of the invention and the advantages resulting therefrom will be apparent from the following description of some embodiments which are shown as non-limiting examples in the accompanying drawings, wherein:

Figure 1 is a side elevational view of a first embodiment of the fan, in the form of a carriage-aspirator for the exhaust gases of a motor-vehicle.

Figure 2 is an enlarged, fragmentary, horizontal sectional view of the fan of figure 1.

Figure 3 is a vertical cross sectional view thereof on the line III-III of figure 2.

Figure 4 shows a half top plan view and a half horizontal longitudinal sectional view of a modified embodiment of the fan of figures 1 to 3.

Figure 5 shows the fan of figure 4, a half in end view and a half in vertical cross sectional view on the line V-V of figure 4.

Figure 6 is a diagrammatic longitudinal sectional view of a further embodiment of the fan according to the invention.

In the figures 1 to 3 there is shown an aspirator for the exhaust gases of motor-vehicles, which is designed to prevent said gases from spreading in workshops, garages and other closed rooms. Said aspirator comprises a fan including a hollow body 1, an impeller 2 and an electric motor 3 for actuating said impeller 2.

As seen in top plan view, said hollow body has an annular, substantially rectangular shape and comprises, at the suction side, a transverse portion 4 constituting the housing for the impeller 2 and enclosing said impeller 2. At the outer end side, constituting the front suction side of the annular hollow body 1, said portion 4 constituting the housing for the impeller 2 is formed with a central

opening 5 which is co-axial with said impeller 2 and is in communication with an outer frusto-conical union or taper 6 which is secured to the body 1 and constitutes the suction mouth of the fan.

The annular hollow body 1 comprises as well two delivery side ducts 7 which are substantially parallel to each other and to the axis of rotation of the impeller 2 and which communicate, at diametrically opposite positions, each with a respective delivery outlet 104 of the housing 4 for the impeller 2. Said ducts 7 communicate with each other, at the opposite or delivery end of said annular hollow body 1, through a transverse portion 8 of said annular hollow body 1

At the outer end side constituting the rear delivery side of the annular hollow body 1 the transverse portion 8 of said body is provided with a central delivery union 9 which, preferably, is arranged substantially co-axial with the suction mouth 5 and with the axis of rotation of the impeller 2.

The electric motor 3 for actuating the impeller 2 is co-axial with said impeller 2 and is arranged within the intermediate opening or space 10 of the annular hollow body 1 of said fan, so that it is external with respect to the path of travel of gases. More particularly, said motor 3 is secured by means of a flange 11 to the inner end wall of the housing 4 for the impeller 2.

The drive shaft 103 extends into the housing 4 for the impeller 2 and mounts said impeller 2. In the opening 10 of said annular hollow body 1, on the inner end wall of the transverse portion 8, there is secured a switch 12 for the motor 3.

Said annular hollow body 1 of the fan may be made of any suitable material, if desired, metallic material. However, in a preferred embodiment of the invention, it is made of suitable plastics material and the frusto-conical union 6 of the suction mouth is made of metal.

The fan described above is mounted, so that its level may be adjusted, on a carriage or trolley 13 which is preferably provided with swingable wheels 14. More particularly, said carriage 13 has secured thereto a pair of side uprights 15 receiving therebetween said annular hollow body 1 of said fan.

A transverse member 16 is secured to the bottom of said body 1 and its ends are slidably engaged in corresponding vertical guide slots 115 formed in the two uprights 15, and may be locked to these uprights by means of locking nuts 17 which are screwed on the ends of said transverse member 16. In order to relieve, at least partially, the annular hollow body 1 of the burden of motor 3, the latter may rest on the transverse member 16 through a support 18.

Secured to the outer end of the frusto-conical union 6 constituting the suction mouth of the fan is a suction tube 19 which terminates with means for connection with the exhaust pipe 21 of a motor-vehicle 22. Both the suction tube 19 and its means for connecting with the exhaust pipe 21 may be made in any manner. More particularly, the suction tube 19 may be rigid and extend in cantilever fashion from the body 1 of the fan, and it may terminate with a funnel-shaped portion 20 adapted to receive the exhaust pipe 21 of a motor-vehicle. The level of the body 1 is adjustable along the uprights 15 of the carriage 13 so as to bring the funnel 20 of the suction tube 19 to the level of the exhaust pipe 21. For the same purpose, said suction tube 19 may also be of the flexible type. In the embodiment of figure 1, the suction tube 19 is constituted by two rigid tube lengths 119, 219 which are mutually coupled so as to be rotatable with respect to each other with their ends made circular in a transverse plane 319 which is at an angle of 45° with respect to the axis of the two tube lengths 119 and 219. By rotating the tube length 219 in the inclined plane 319 with respect to the stationary tube length 119, the end of the tube length 219 provided with the funnel 20 will be displaced laterally and vertically at the same time.

The delivery union 9 of the annular hollow body 1 of the fan is connected to any duct or pipe through which said exhaust gases of the motor-vehicle 22 are conveyed out of the room (workshop, garage, or the like) where said vehicle 22 is present. In the exemplary embodiment shown herein, said delivery union 9 is connected to a flexible corrugated pipe 23 accommodating therein a rod 24 articulated at 124 to a bracket 25 which is secured to the delivery union 9. When the fan is at rest, the corrugated pipe 23 is axially pressed and contracted on the rod 24, and is held in this condition by means of a transverse pin 26, or the like, inserted crosswise through the free end portion of said rod, as shown in figure 1. In this condition, the rod 24 may be lifted angularly and be used as a handle for displacing manually the carriage 13 supporting said fan. In operation, the pin 26 is pulled out and the corrugated pipe is extended beyond the rod 24, for example, to bring the end of said pipe out of the door or the window of the workshop or garage. In these conditions, said rod 24 may even assume a horizontal position while remaining within the pipe 23.

During the operation, the impeller 2 sucks the exhaust gases of the motor-vehicle 22 through the funnel 20, the pipe 19 and the suction mouth 6, and impels them through the two delivery outlets 104 of the housing 4 and adjacent delivery side ducts 7 into the transverse portion 8 to flow out therefrom through the delivery union 9 and tube 23

to be conveyed out of the closed room. The motor 3 for actuating the impeller 2 is never contacted by the evacuated gases and, therefore, is not warmed up or fouled thereby and it cannot cause the ignition of any explosive mixture in said exhaust gases.

The impeller 2 is usually constructed so as to obtain a centrifugal fan. This type operation of the fan assures a sufficient even when the housing 4 for the impeller has not, interiorly, a scroll configuration and has instead a rectangular or square configuration with substantially rectilinear sides, as shown in figure 3. In the embodiment of figures 4 and 5, however, the portion 4 of the annular hollow body 1, which constitutes the housing for the impeller 2 has an inside configuration comprising two scroll-shaped sectors 204 which are staggered 180° from each other and communicate, through a respective delivery outlet 104 of the housing 4, with a delivery side duct 7, as clearly shown in the sectional view of figure 5. Under any other respect, the embodiment of figures 4 and 5 is substantially similar to the embodiment of figures 1 to 3, the similar parts being designated by the same reference numerals.

In the embodiment of the fan according to the invention, diagrammatically shown in figure 6, the housing 4 for the impeller comprises a front suction mouth 6 which is co-axial with the impeller 2 and, only on one side, a delivery outlet 104 connected to a single corresponding delivery duct 7 extending substantially parallelly to the axis of the impeller 2 beside its actuating motor 3 and terminating with a delivery union 9. The motor 3 is co-axial with the impeller 2 and is fixed to the outside the housing 4, for example, by means of a flange 11.

Of course, the invention is not limited to the exemplary embodiments described and shown herein, and broad changes and modifications, especially of constructional nature, may be made thereto. Specifically, the fan according to the invention may be used for sucking away not only the exhaust gases of motor-vehicles, but as well any other noxious or polluting gases from closed rooms and workshops, in any aspirator systems or plants, in aspirator kitchen-hoods or the like, and as well for any other use wherein the fan of the invention may show useful. Moreover, it is apparent that the fan according to the invention may be used with no carriage, and it may be fixedly arranged within any suction or delivery duct.

## Claims

1. A fan, particularly suitable for sucking away and removing noxious or polluting gases from closed rooms, workshop or the like, specifically for sucking away the exhaust gases of motor-vehicles

with running engines while in workshops, garages and the like, comprising an impeller (2) actuated by a co-axial electric motor (3) and housed in a housing (4) having a suction mouth (6) and a delivery outlet (104) both disposed substantially parallel to the axis of said impeller (2) and motor (3), characterized in that said suction mouth (6) and/or delivery outlet (104) of the housing (4) of said impeller (2) are arranged excentrically to said impeller (2), beside its actuating electric motor (3) which is mounted outside of said housing (4).

2. A fan according to claim 1, wherein said electric motor (3) co-axial with said impeller (2) is arranged on the delivery side and said suction mouth (6) is substantially co-axial with said impeller (2), characterized in that the housing (4) for the impeller (2) comprises at least two excentric and diametrically opposite delivery outlets (104) which communicate, through two respective delivery ducts (7) extending beside said motor (3), with a common delivery union (9) arranged downstream of the motor and preferably substantially co-axial with said suction mouth (6).

3. A fan according to claim 2, characterized in that it comprises an annular hollow body (1) formed by the housing (4) for said impeller (2), by two delivery side ducts connected to the housing (4) for the impeller (2) and by a transverse connecting portion (8) which connects the two delivery side ducts (7) and comprises a delivery union (9) which, preferably, is arranged centrally and is co-axial with said suction mouth (6) of the housing (4) for the impeller (2), while the motor (3) for actuating the impeller (2) is arranged in the intermediate opening or space (10) of said annular hollow body (1).

4. A fan according to claim 3, characterized in that said annular hollow body (1) is made of plastics material.

5. A fan according to one or more of the claims 1 to 4, characterized in that it is constructed of centrifugal type and the housing (4) for the impeller (2) has, in cross section with respect to the axis of the impeller (2), a rectangular or a square configuration.

6. A fan according to one or more of the claims 1 to 4, characterized in that it is constructed of centrifugal type and the housing (4) for the impeller (2) has, in cross section with respect to the axis of the impeller (2), a configuration with two or more scroll-shaped sectors (204), angularly staggered from each other and each of which is connected at the wider end thereof to a delivery outlet (104) the axis of which is substantially parallel to that of the impeller (2) and actuating motor (3) therefor.

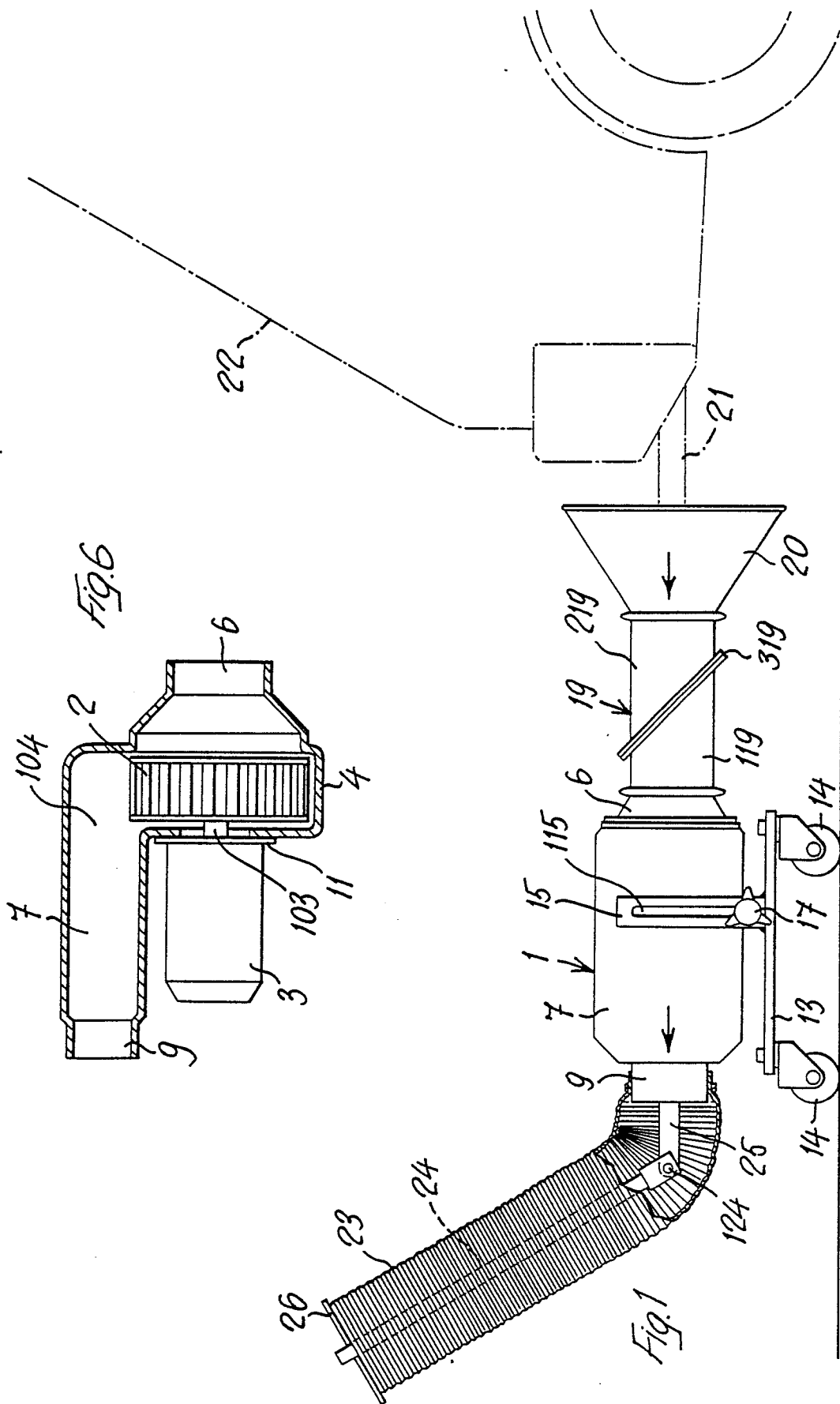
7. A fan according to one or more of the claims 1 to 6, characterized in that it is mounted on a carriage (13,14), preferably, so that its position and level may be adjusted.

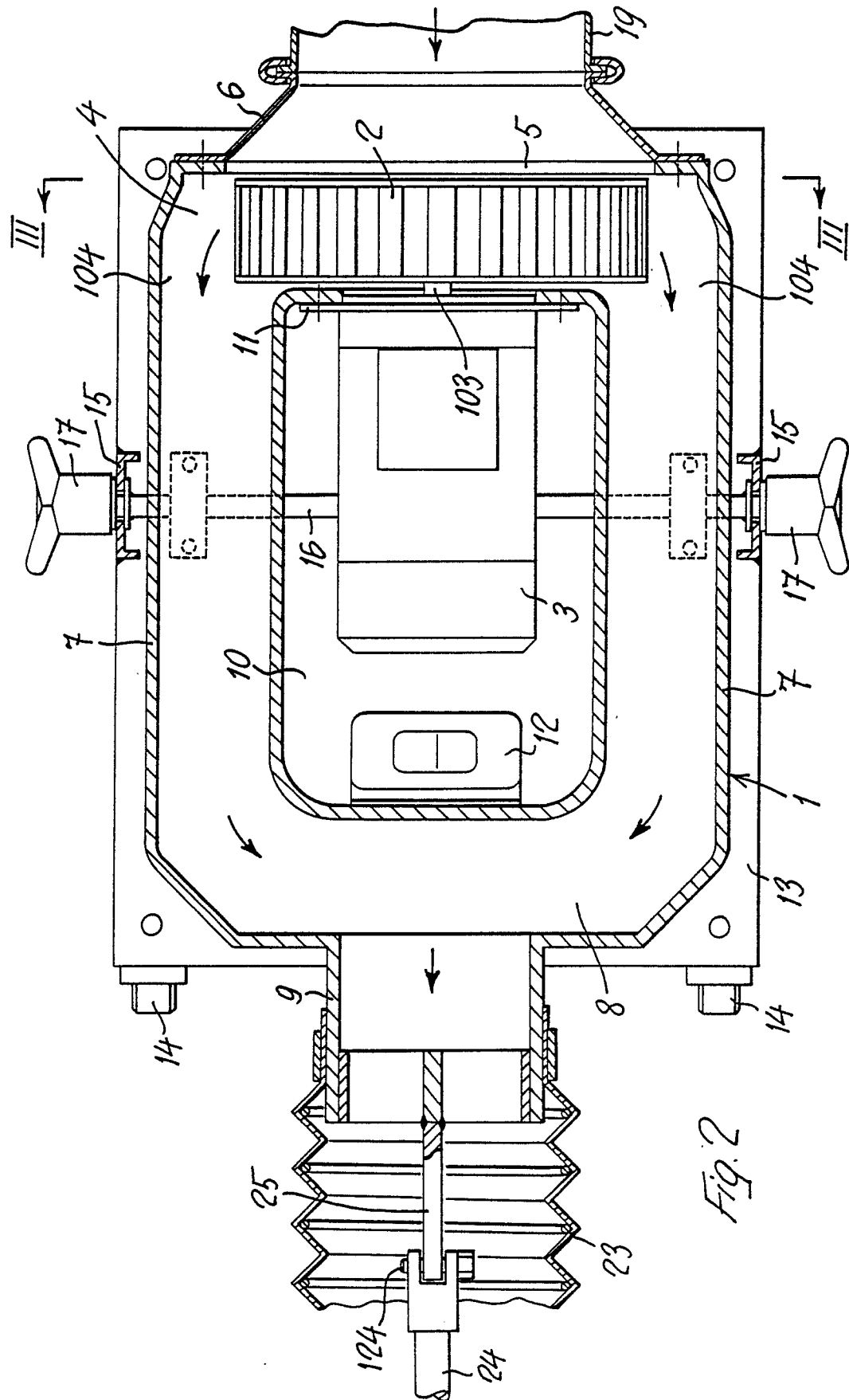
8. A fan according to one or more of the claims 1 to 7, characterized in that its suction mouth (6) is connected to a suction pipe (19), preferably, rigid and extending in cantilever fashion and terminating with a funnel (20).

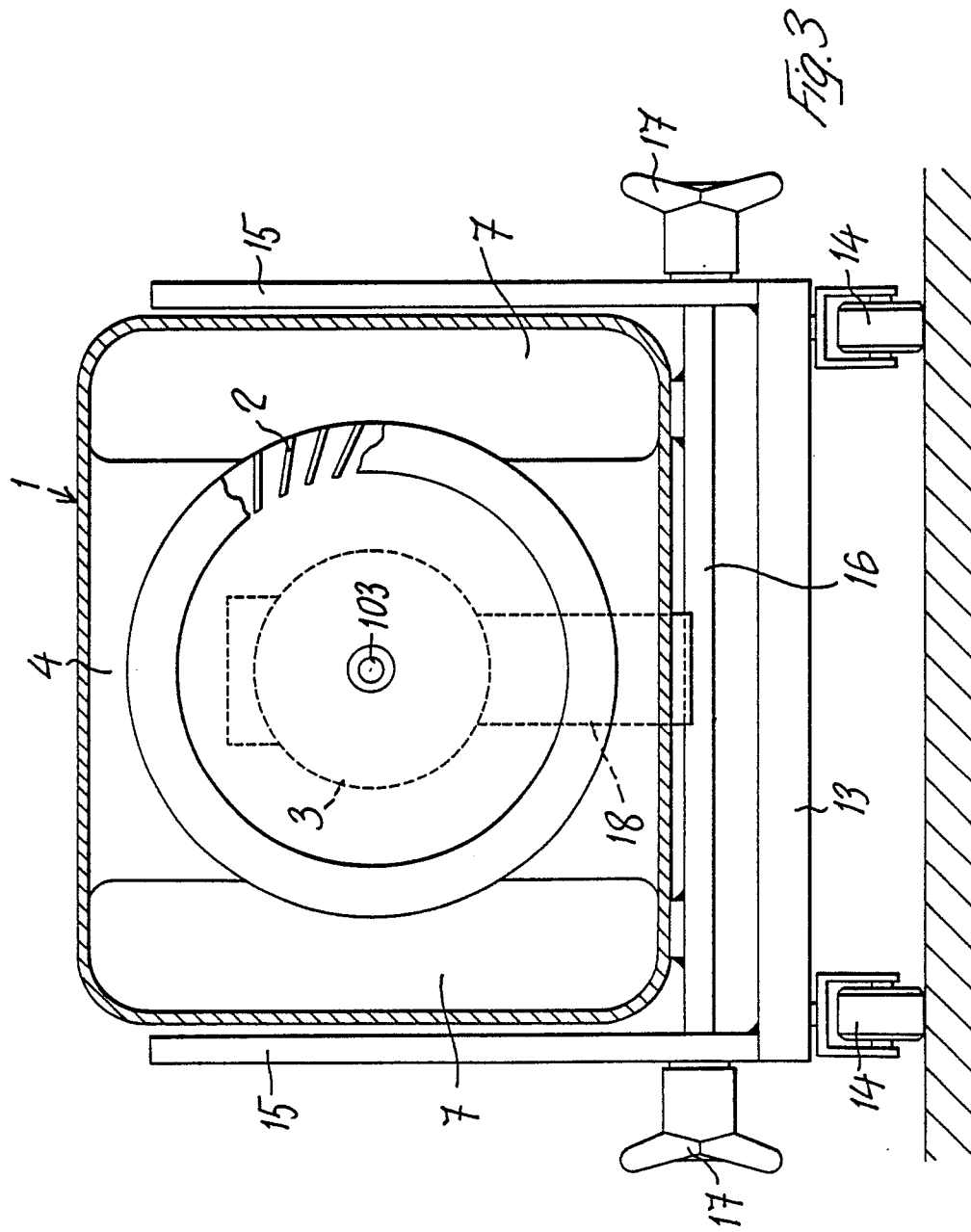
9. A fan according to claim 8, characterized in that said suction pipe (19) comprises at least one articulation.

10. A fan according to the claims 8 and 9, characterized in that said suction pipe (19) comprises two pipe lengths (119,219) the mating ends of which are made circular in a transverse plane (319) at an angle of 45 and which are mutually coupled so as to be rotatable with respect to each other.

11. A fan according to one or more of the claims 2 to 10, characterized in that said delivery union (9) is connected to a flexible, corrugated delivery pipe (23) adapted to be contracted, in an axially pressed condition, on an internal rod (24) which is hinged to the delivery union (9) and comprises at the free end thereof means (26) co-operating with the free end of said delivery pipe (23) so as to maintain said pipe in its contracted condition on said rod (24).







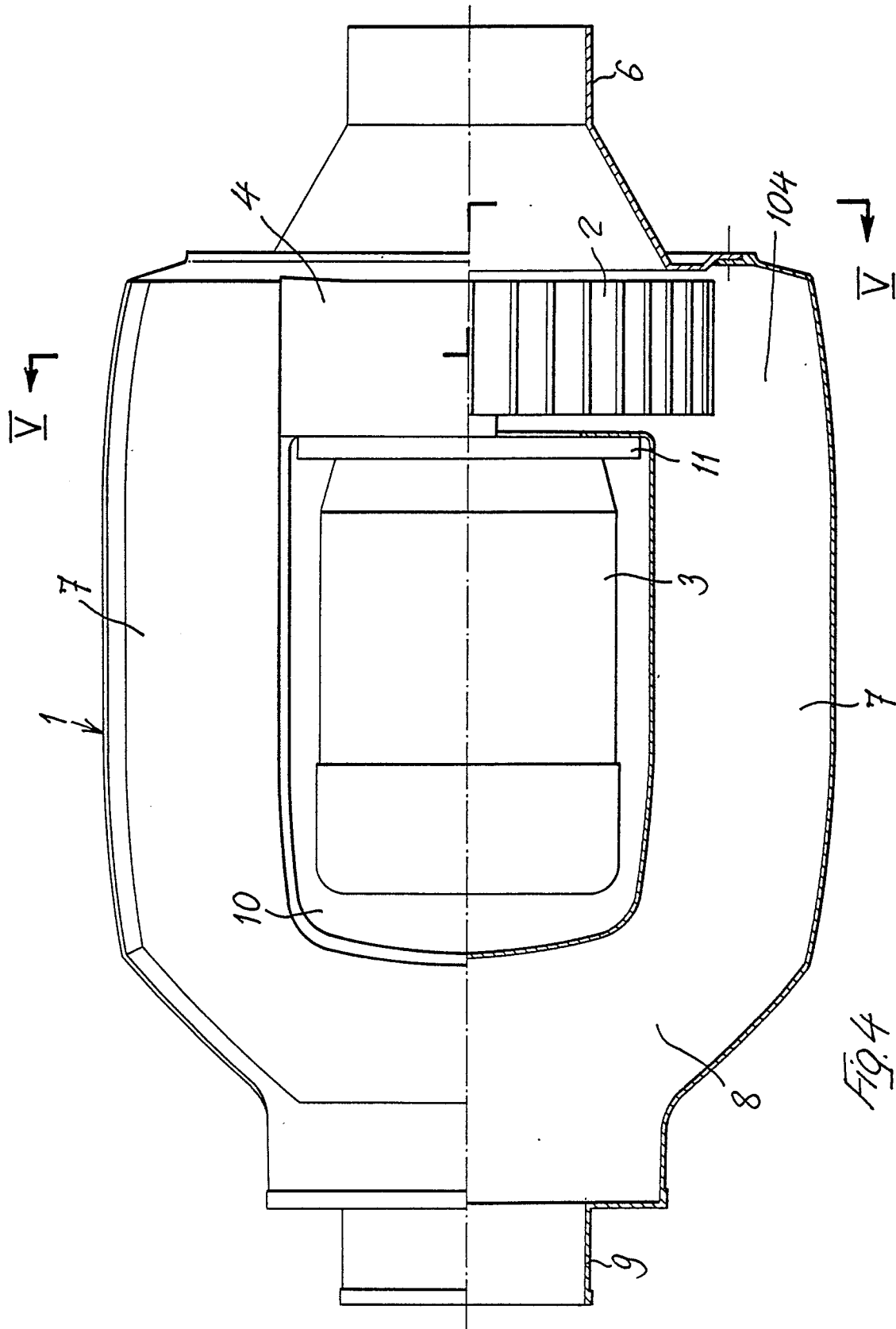
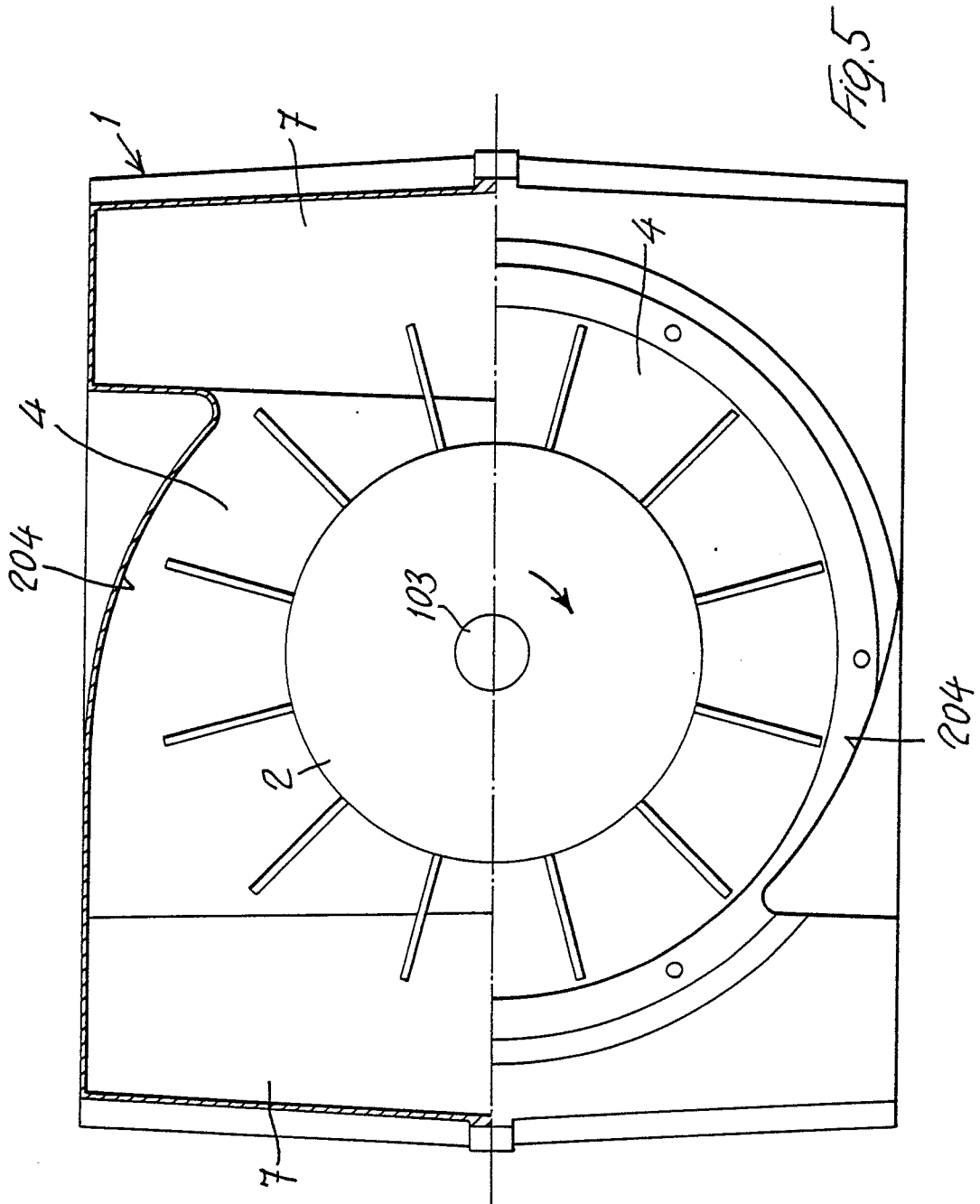


Fig. 4





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 87 11 1314

| 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. 4) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US-A-2 066 683 (GRUBELIC)<br>* Whole document *<br>---                        | 1                                              | B 08 B 15/00                                   |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US-A-4 102 254 (GRANT)<br>* Whole document *<br>---                           | 1                                              |                                                |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US-A-2 598 884 (BRADY)<br>-----                                               | 1                                              |                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               |                                                | TECHNICAL FIELDS SEARCHED (Int. Cl. 4)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               |                                                | B 08 B<br>B 23 K                               |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                               |                                                |                                                |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                               | Date of completion of the search<br>08-12-1987 | Examiner<br>VOLLERING J.P.G.                   |
| <div>CATEGORY OF CITED DOCUMENTS</div> <div><div>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</div><div>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>-----<br/>&amp; : member of the same patent family, corresponding document</div></div> |                                                                               |                                                |                                                |