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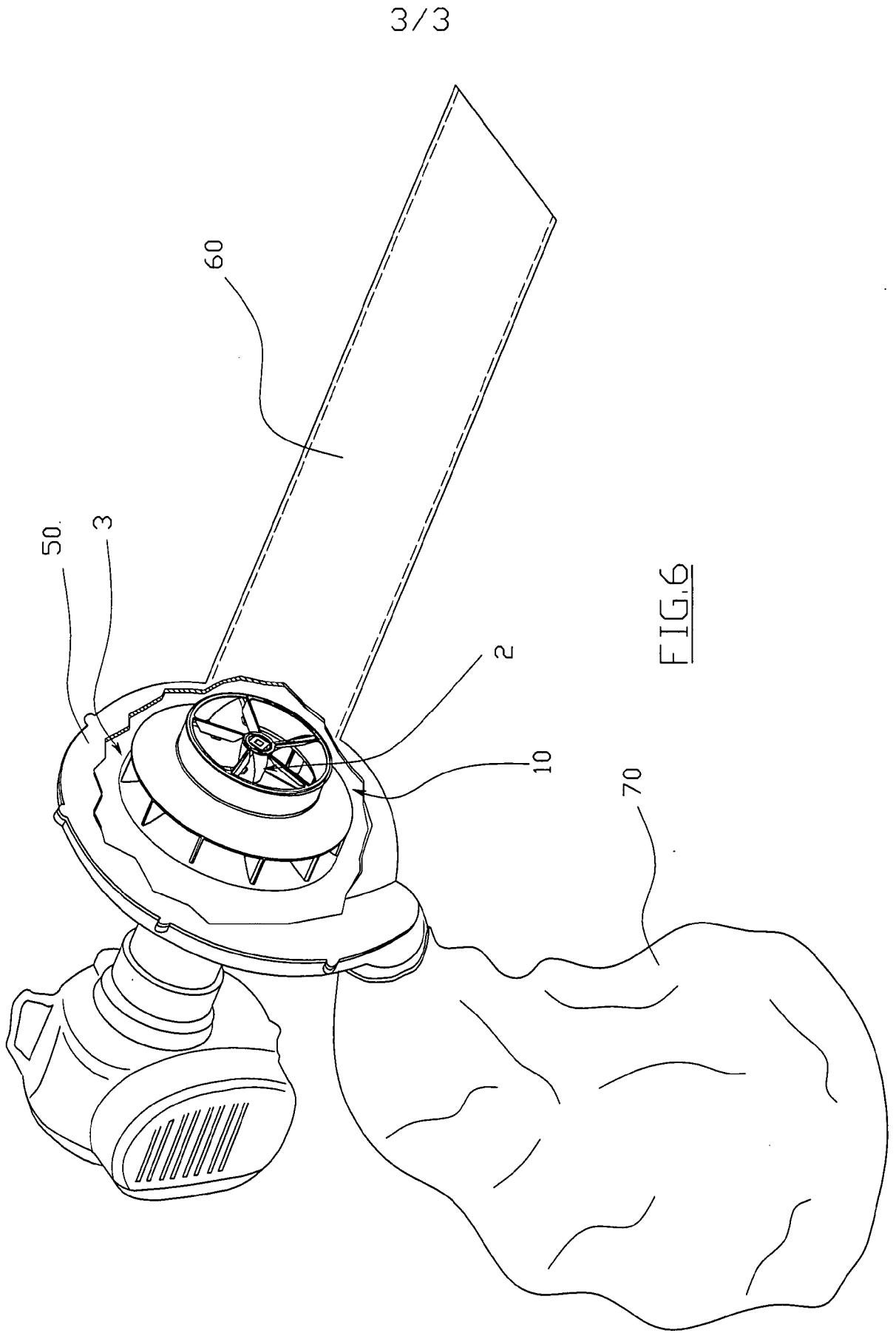
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(56) Related Art
US 6059541 A (Beckey et al.) 9 May 2000

ABSTRACT

PORTABLE SUCTION DEVICE FOR CLEANING JOBS

5 A suction device for cleaning jobs comprising a bladed
impeller (1) actuated by a motor and suitable for being
housed inside a carcass provided with an inlet opening
for an airflow and an outlet opening, where said impeller
(1) comprises a first series of blades (2) and a second
10 series of blades (3), which rotate firmly fixed together,
coaxial to each other and distributed in a staggered
manner, suitable for respectively generating an axial
flow and a radial flow, said second series of blades (3)
being arranged downstream of the first series of blades
15 (2), with respect to the inlet opening, so that the air
sucked in is transmitted from the first series of blades
(2) to the second series of blades (3) before it reaches
the outlet opening.



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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

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Invention Title:	Portable suction device for cleaning jobs

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

PORTABLE SUCTION DEVICE FOR CLEANING JOBS

Field of the Invention

The present invention refers to a portable suction device for cleaning jobs.

More specifically, the present invention refers to a portable suction device
5 suitable for sucking up sawdust, leaves, grass cuttings and similar for cleaning jobs at
rural and/or urban locations.

Background of the Invention

As known, common portable suction devices comprise an impeller with centrally
closed disc fitted on a drive shaft suitable for making it rotate inside a closed housing
10 provided with an air inlet opening with which a suction mouth is associated and an outlet
opening with which a collection sack is associated.

Portable suction devices of the prior art comprise an impeller having a plurality
of blades with radial flow arranged close together so as to generate a sufficient static flow
to overcome the load loss due to the collection sack for the material that has been sucked
15 up. These blades inevitably have an unsuitable attachment angle near to the suction
opening where the predominant flow direction is axial to the impeller, whereas the motion
of the blades is in a tangential direction. This means low efficiency and lots of noise
during use.

Therefore, there is a great need to have a suction device for cleaning jobs that has
20 high efficiency and that produces little noise.

Object of the Invention

It is the object of the present invention to substantially overcome or at least
ameliorate one or more of the disadvantages of the prior art, or to provide a useful
alternative.

Summary of the Invention

25 In a first aspect the present invention provides a suction device for cleaning jobs
comprising:

a bladed impeller actuated by a motor and housed inside a carcass, said carcass
provided with only one inlet opening for an airflow and only one outlet opening,

30 wherein said impeller comprises a first series of blades and a second series of
blades, which rotate about a rotation axis and are firmly fixed together, coaxial to each
other and distributed in a staggered manner,

the first series of blades being generally flat and extending radially at an angle relative to the rotation axis for generating an axial flow directed to the centre of the second series of blades, and the second series of blades generating a radial flow,

said second series of blades being arranged downstream of the first series of blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one outlet opening.

In a second aspect the present invention provides a suction device for cleaning jobs comprising:

a bladed impeller actuated by a motor and housed inside a carcass, said carcass provided with only one inlet opening for an airflow and only one outlet opening,

wherein said impeller comprises a first series of blades and a second series of blades, which rotate firmly fixed together, coaxial to each other and distributed in a staggered manner,

the first series of blades generating an axial flow directed to the centre of the second series of blades and the second series of blades generating a radial flow,

said second series of blades being arranged downstream of the first series of blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one outlet opening,

in which said impeller comprises a circular hollow cylindrical body inside of which said first series of blades is fixedly arranged that projects from a central hub, and an outer circular crown fixed to said cylindrical body and provided with said second series of blades,

and in which said circular crown has a frusto-conical configuration with the smaller base associated with the cylindrical body.

In a third aspect the present invention provides a suction device for cleaning jobs comprising:

a bladed impeller actuated by a motor and housed inside a carcass, said carcass provided with only one inlet opening for an airflow and only one outlet opening,

wherein said impeller comprises a first series of blades and a second series of blades, which rotate firmly fixed together, coaxial to each other and distributed in a staggered manner,

the first series of blades generating an axial flow directed to the centre of the second series of blades, and the second series of blades generating a radial flow,

said second series of blades being arranged downstream of the first series of blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one-outlet opening, and

5 further comprising a blade-guard provided with protective elements suitable for engaging with the respective blades of the first series of blades so as to screen their inlet edge.

The present invention at least in a preferred embodiment provides a suction device having structural and functional characteristics such as to satisfy the
10 aforementioned requirements and at the same time to avoid the aforementioned drawbacks with reference to the prior art.

Further characteristics and advantages of the invention shall become clear from reading the following description provided as an example and not for limiting purposes, with the help of the figures illustrated in the attached tables, in which:

15 **Brief Description of the Drawings**

Preferred embodiments of the present invention will now be described, by way of examples only, with reference to the accompanying drawings wherein:

- figure 1 shows a perspective view of an impeller and respective blade guard of a suction device, in accordance with the present invention;
- 20 - figure 2 shows a perspective view of the impeller seen from the arrow A of figure 1;
- figure 3 shows a plan view of the impeller seen from the arrow A of figure 1;
- figure 4 shows a detail of figure 3;
- 25 - figure 5 shows a side view of the impeller seen from the arrow B of figure 3;
- figure 6 shows a perspective view, partially in section, of the overall suction device.

Detailed Description of the Drawings

30 With reference to figure 1, an impeller for a suction device (Fig. 6) in accordance with the present invention is globally indicated with 1.

The suction device in brief comprises an impeller 1, a motor for actuating the impeller 1 that is fitted centrally to the drive shaft, a carcass 50 (Fig. 6) for containing the

impeller 1 provided with an inlet opening with which a suction mouth 60 is associated and an outlet opening with which a collection sack 70 is associated.

In accordance with the present invention, the impeller 1 comprises a first series of blades, globally indicated with 2, and a second series of blades, globally indicated with s 3, coaxial to each other and distributed in a staggered manner. The first series of blades 2 is suitable for generating an axial flow whereas the second series of blades 3 is suitable for generating a radial

flow. The second series of blades 3 is arranged downstream of the first series of blades 2, with respect to the inlet opening, i.e. with respect to the side of attachment of the suction mouth.

5 Basically, the arrangement of the blade sets 2 and 3 is selected so that the air sucked in reaches first the first series of blades 2 that transmits it to the second series of blades 3 before it reaches the outlet opening and then the collection sack 70.

10 In particular, the impeller 1 comprises a hollow cylindrical body 4 inside which the first series of blades 2 is formed, said blades projecting from a common central hub 5, suitable for being fitted onto the drive shaft. Outside the cylindrical body 4 a circular crown 6
15 carrying the second series of blades 3 is coaxially fixed, said blades being staggered with respect to those of the first series 2.

In accordance with the preferred embodiment of the present invention, the circular crown 6 has a frusto-
20 conical configuration with the smaller base fixed firmly to the edge of the cylindrical body 4.

In order to improve the yield and further decrease the noise during use, the airflow is "helped" in the passage from axial motion to radial motion, i.e. in the passage
25 from the first series of blades 2 to the second series of blades 3 by making the surface of the circular crown 6 with a curvature having the concavity facing outwards.

The blades of the second series of blades 3 are arranged on the surface of the circular crown 6 opposite that for
30 the inlet of the airflow, i.e. on the convex side.

As can be seen from the figures, the number of blades in the first series of blades 2 is less than in the second series of blades 3; in the example the first series of blades 2 consists of four blades, whereas the second
35 series of blades 3 consists of eleven blades.

The particular configuration of the blades is selected according to the intended use of the suction device and according to current knowledge in the field.

5 The impeller 1 of the present invention can be easily obtained through known plastic forming processes.

Since during usual suction operations it is possible that debris may be sucked up that can damage the inlet edge of the blades of the first series 2, it is foreseen to use a blade guard 7, made from metal, provided with protective
10 elements 8 suitable for engaging with the respective blades of the first series of blades 2 so as to screen their inlet edge.

Each protective element 8 is in the form of a pair of concentric circular rings 10, 100 with the protective
15 elements 8 fanning out between them.

The inner ring 10 is suitable for cooperating in engagement with the hub 5 and the outer ring 100 is suitable for cooperating in engagement with the edge of the circular body 4.

20 Each protective element 8 is provided with an appendix 9 suitable for snap-engaging in a corresponding slot 11 formed on each blade of the first series of blades 2.

As can be appreciated from what has been described, the suction device according to the present invention allows
25 the requirements to be satisfied and allows the drawbacks mentioned in the introductory part of the present description with reference to the prior art to be overcome.

Of course, a man skilled in the art can bring numerous
30 modifications and variants to the suction device described above in order to satisfy contingent and specific requirements, all of which are covered by the scope of protection of the invention, as defined by the following claims.

The claims defining the invention are as follows:

1. A suction device for cleaning jobs comprising:
a bladed impeller actuated by a motor and housed inside a carcass, said carcass provided with only one inlet opening for an airflow and only one outlet opening,
5 wherein said impeller comprises a first series of blades and a second series of blades, which rotate about a rotation axis and are firmly fixed together, coaxial to each other and distributed in a staggered manner,
the first series of blades being generally flat and extending radially at an angle relative to the rotation axis for generating an axial flow directed to the centre of the
10 second series of blades, and the second series of blades generating a radial flow,
said second series of blades being arranged downstream of the first series of blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one outlet opening.
- 15 2. The suction device according to claim 1, in which said impeller comprises a circular hollow cylindrical body radially inside of which said first series of blades is substantially fully fixedly arranged and circumferentially enclosed, said first series of blades project from a central hub, and an outer circular crown fixed to said cylindrical body and provided with said second series of blades.
- 20 3. The suction device according to claim 2, in which said circular crown has a frusto-conical configuration with the smaller base associated with the cylindrical body.
4. The suction device according to claim 3, in which the surface of said circular crown has a curvature with a concavity facing towards the inlet opening for the
25 airflow.
5. The suction device according to claim 3, in which the blades of said second series of blades are arranged on the surface of the circular crown opposite the one for the inlet of the airflow.
6. The suction device according to claim 1, in which the number of blades
30 in the first series of blades is less than the number of blades in the second series of blades.
7. The suction device according to claim 1, furthermore comprising a blade-guard provided with protective elements suitable for engaging with the respective blades of the first series of blades so as to screen their inlet edge.

8. The suction device according to claim 7, in which each protective element is provided with an appendix suitable for snap-engaging in a corresponding slot formed on each blade of the first series of blades.

9. The suction device according to claim 1, in which said impeller is made
5 from plastic.

10. The suction device according to claim 1, in which a suction mouth is fitted onto said inlet opening and a collection sack is fitted onto said outlet opening.

11. A suction device for cleaning jobs comprising:

a bladed impeller actuated by a motor and housed inside a carcass, said carcass
10 provided with only one inlet opening for an airflow and only one outlet opening,

wherein said impeller comprises a first series of blades and a second series of blades, which rotate firmly fixed together, coaxial to each other and distributed in a staggered manner,

the first series of blades generating an axial flow directed to the centre of the
15 second series of blades and the second series of blades generating a radial flow,

said second series of blades being arranged downstream of the first series of blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one outlet opening,

20 in which said impeller comprises a circular hollow cylindrical body inside of which said first series of blades is fixedly arranged that projects from a central hub, and an outer circular crown fixed to said cylindrical body and provided with said second series of blades,

and in which said circular crown has a frusto-conical configuration with the
25 smaller base associated with the cylindrical body.

12. The suction device according to claim 11, in which the surface of said circular crown has a curvature with concavity facing towards the inlet opening for the airflow.

13. The suction device according to claim 11, in which the blades of said
30 second series of blades are arranged on the surface of the circular crown opposite the one for the inlet of the airflow.

14. A suction device for cleaning jobs comprising:
a bladed impeller actuated by a motor and housed inside a carcass, said carcass provided with only one inlet opening for an airflow and only one outlet opening,
wherein said impeller comprises a first series of blades and a second series of
5 blades, which rotate firmly fixed together, coaxial to each other and distributed in a staggered manner,
the first series of blades generating an axial flow directed to the centre of the second series of blades, and the second series of blades generating a radial flow,
said second series of blades being arranged downstream of the first series of
10 blades, with respect to the only one inlet opening, so that all the air sucked in is transmitted from the first series of blades to the second series of blades through a space therebetween before it reaches the only one-outlet opening, and
further comprising a blade-guard provided with protective elements suitable for
engaging with the respective blades of the first series of blades so as to screen their inlet
15 edge.
15. The suction device according to claim 14, in which each protective element is provided with an appendix suitable for snap-engaging in a corresponding slot formed on each blade of the first series of blades.
16. A suction device substantially as hereinbefore described with reference
20 to Figures 1 to 6 of the accompanying drawings.

Dated 5 October, 2010

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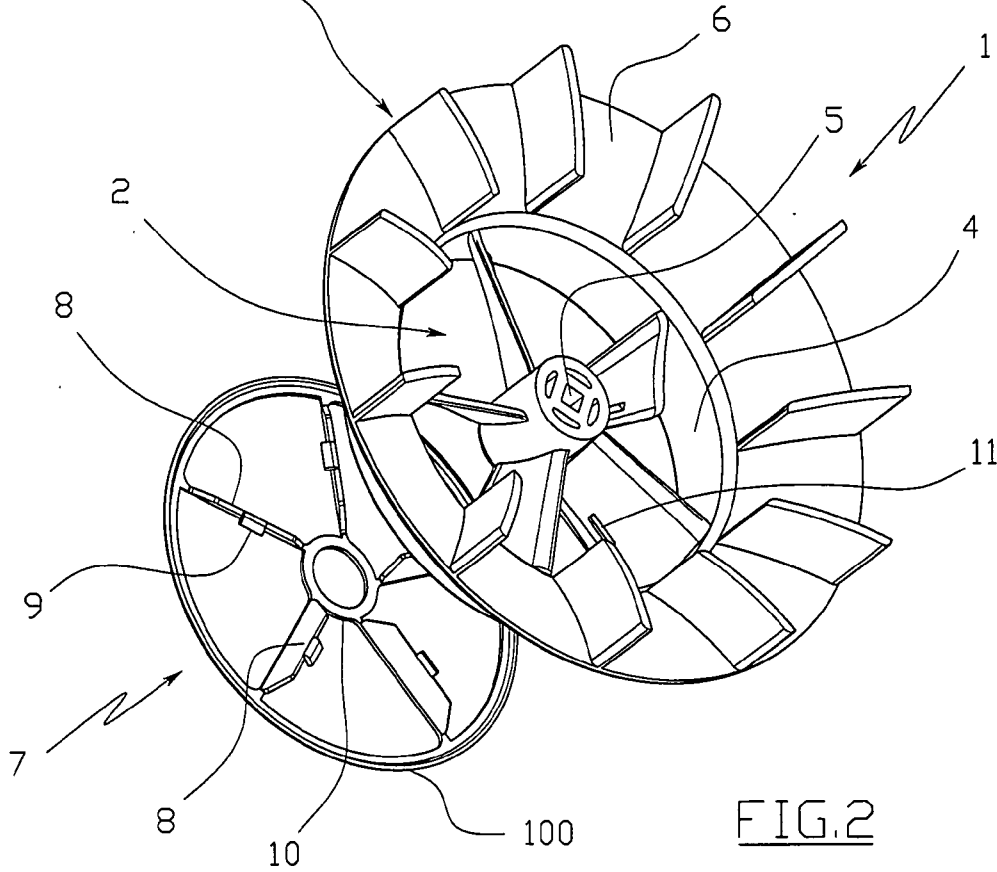
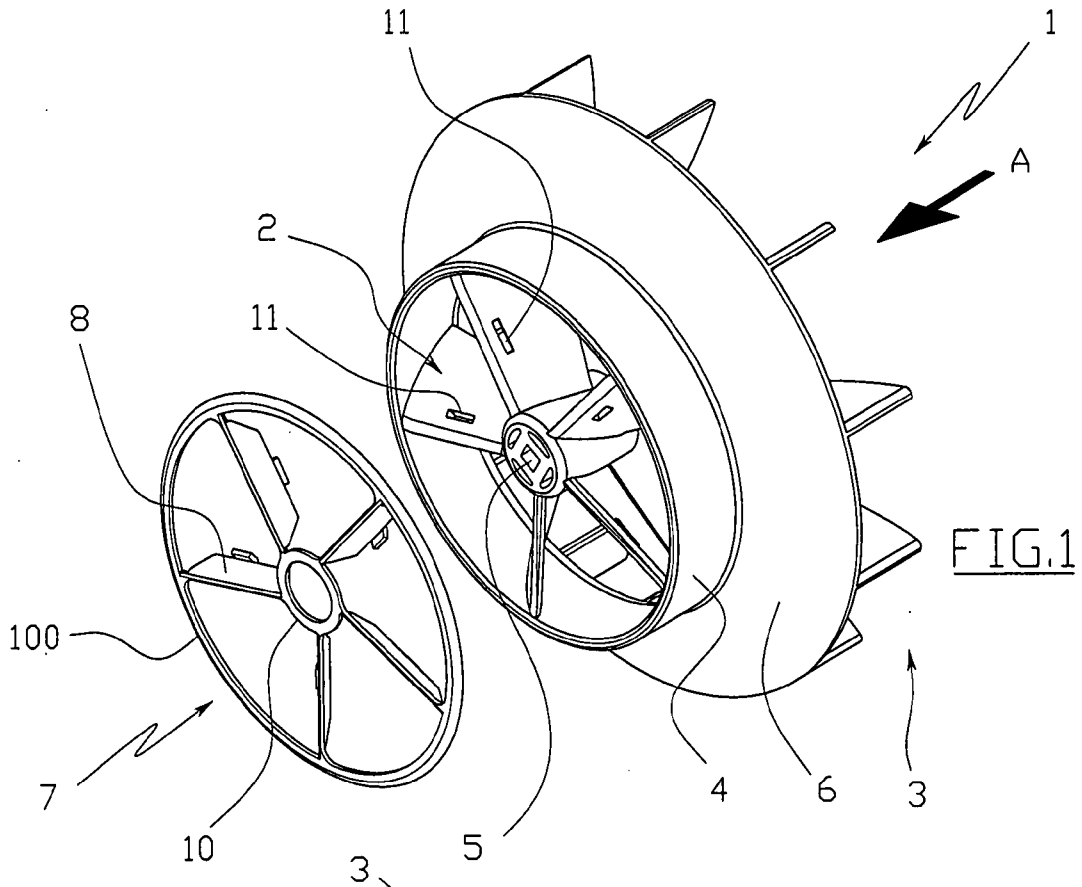


FIG. 2

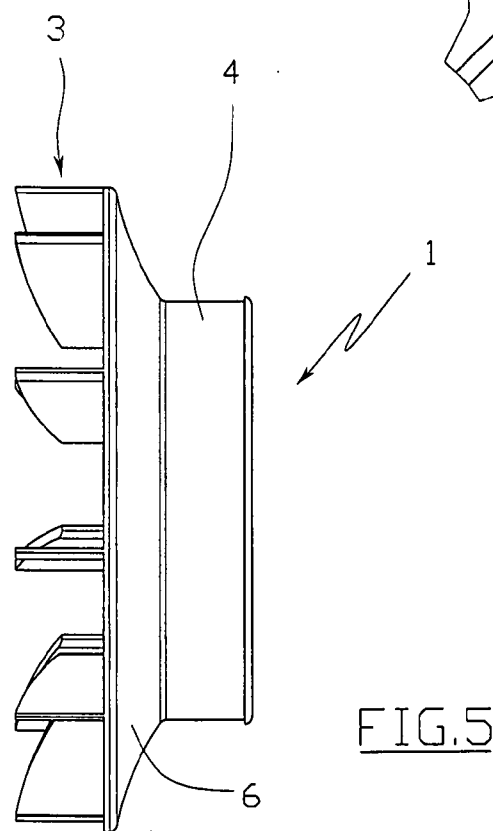
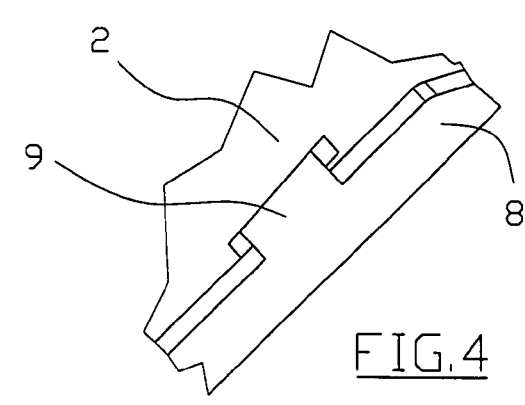
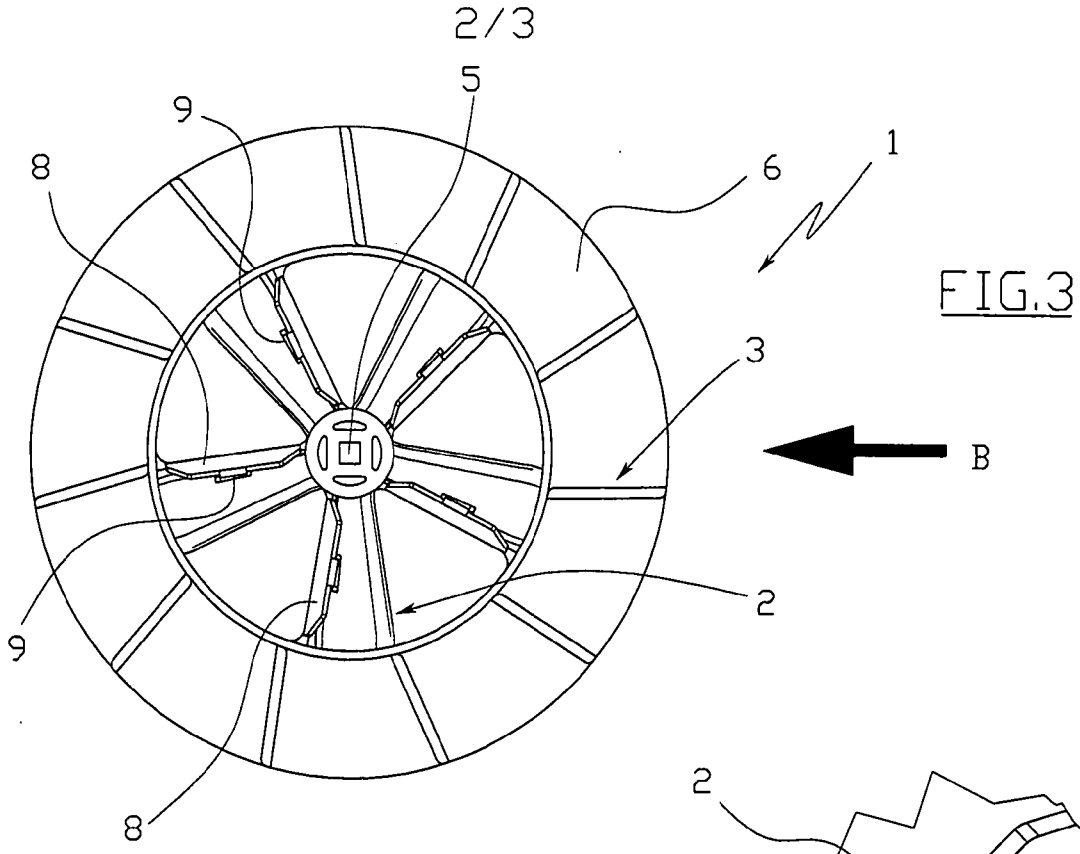


FIG. 3

FIG. 4

FIG. 5

