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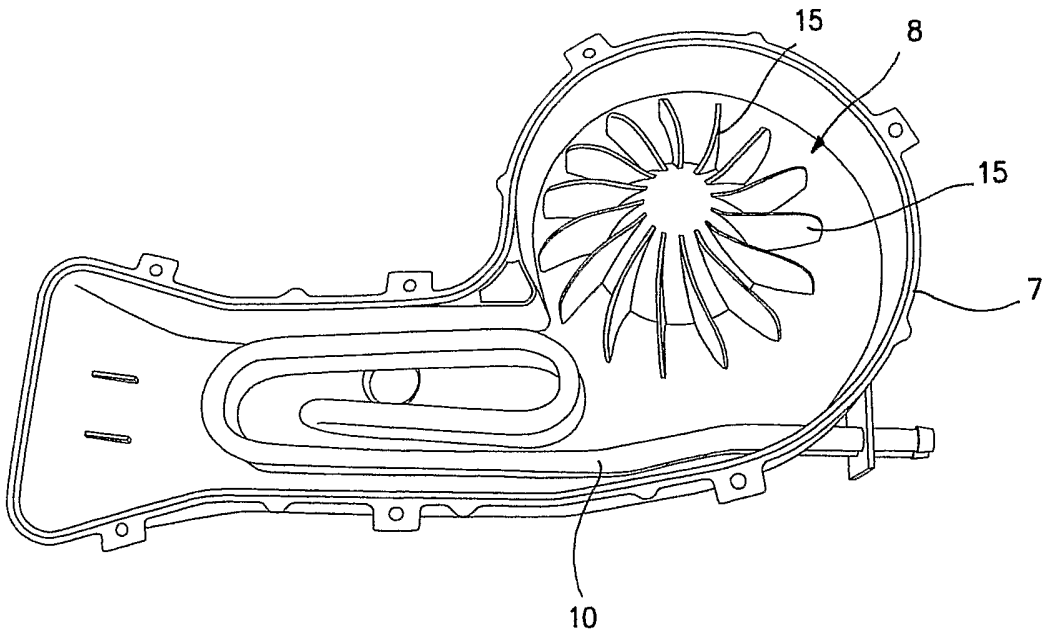
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** A FORCED AIR CIRCULATION SYSTEM FOR DRYING MACHINES AND WASHING/DRYING MACHINES, PARTICULARLY FOR DOMESTIC USE.



(57) **Abstract:** A forced air circulation system for drying and washing/drying machines particularly for domestic use, comprising an air feeder duct (4) with a fan (9) provided with a bladed impeller (8) in which the impeller blading comprises a plurality of blades (15) which extend substantially radially from a conical hub (1), from a smaller-diameter, front portion (12) thereof as far as a larger-diameter, rear portion (13) thereof, with a curved shape the curvature of which is reversed with respect to the direction of rotation of the impeller.

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DESCRIPTION

Technical field

The subject of the present invention is a forced air circulation system for drying machines and washing/drying machines, particularly for domestic use.

State of the art

It is known to produce washing/drying machines for domestic use that have a forced hot-air circulation system associated with the washing drum for at least partially drying the garments contained therein upon completion of the washing cycle.

The air circulation system usually comprises a feeder duct incorporating an electric fan, generally a centrifugal fan with a cylindrical drum impeller and axially extending blading, which promotes the circulation of the air between the washing drum and a condenser in which the moisture collected is condensed. An electrical resistor is also fitted in the feeder duct in order to heat the air before it is blown amongst the garments being dried in the washing drum.

Since garments tend to release fibres, fluff and dust during drying, known air circulation systems have to have a filter between the outlet from the washing drum and the fan. It has in fact been found that, if the filter is removed, the fibres tend to be retained by the fan impeller blading leading to a rapid loss of balance of the fan which, because of its fast rotation, is subjected to increasing vibrations to the extent that it may be damaged. There is also a rapid drop in the performance of the fan with increased drying times and potential clogging of the impeller blading.

However, the provision of filters leads to a major cost of the system and in turn requires periodic maintenance. Without adequate maintenance of the filters the hot-air flow passing through the garments in the drum progressively decreases as the filters gradually become clogged, with the result that the length of the drying cycle is once again increased.

Description of the invention

The technical problem underlying the present invention is that of providing a forced air circulation system which is intended particularly for incorporation in washing/drying machines for domestic use and which is designed structurally and functionally to overcome all of the disadvantages discussed with reference to the prior art mentioned. A principle object of the invention is to provide a forced circulation system which enables the filters that are conventionally provided to be omitted without compromising the good operation of the machine.

Brief description of the drawings

This problem, as well as these and other objects of the invention will be explained further by the detailed description of a preferred but not exclusive embodiment thereof which is described by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a schematic, perspective view of the main components of a washing/drying machine according to the invention,

Figure 2 is a perspective view of a detail of the machine of Figure 1,

Figures 3 to 7 are perspective, front, side, rear and partially-sectioned elevational views, respectively, of a further detail of Figure 2.

Preferred embodiment of the invention

In Figure 1, a washing/drying machine formed in accordance with the present invention comprises, in known manner, a drum 1 rotatable inside a tank 2, as well as a forced air circulation system generally indicated 3. The system 3 in turn is composed of a feeder duct 4 extending between a condenser 5 and an opening 6 for the delivery of the air to the drum.

The feeder duct 4 comprises a shell 7 which is closed by an opposing shell portion, not shown, and which houses an impeller 8 of an electric fan 9 and an electrical resistor 10 for heating the air to be introduced into the tank and drum assembly.

The shell 7 defines a diffuser with a cyclone configuration housing the impeller 8 and a section which connects the diffuser to the opening 6. The circulation of the air in the system 3 is shown schematically by the arrows F.

The impeller 8 is moulded from plastics material and comprises a conical hub 11 having an ogival-shaped front portion. The terms front and rear in the following context relate to the direction of the air flow. The blading of the impeller 8 comprises a plurality of blades 15 which extend substantially radially from the hub 11, from a smaller-diameter, front portion 12 thereof as far as a larger-diameter, rear portion 13 thereof. The blades 15 have a curved shape the curvature of which is reversed with respect to the direction of rotation of the impeller 8.

The blades 15 are characterized by curved leading edges 16 which, starting from a front, base portion 17 on the hub in the vicinity of the

smaller-diameter, front portion thereof, have a first portion 16a which diverges progressively from the surface of the hub to reach a substantially radial arrangement and which is connected by a large-radius curve to a second portion 16b having a substantially axial arrangement, as the leading edge extends towards the rear portion of the hub.

By virtue of this particular geometrical arrangement, which could reasonably be defined as a mixed axial-radial geometrical arrangement, and by virtue of the reversed curvature of the blades, of the conical or at least tapered shape of the hub, and of the curved leading edges of the blades with the particular shape of the leading edge just described, it has been found that fibres, fluff and dust pass freely through the impeller without being deposited on the blading, allowing the filters which, according to the prior art, are generally placed between the condenser and the feeder duct, to be omitted.

CLAIMS

1. A forced air circulation system for drying and washing/drying machines, particularly for domestic use, comprising an air feeder duct (4) with a fan (9) provided with a bladed impeller (8) and characterized in that the impeller blading comprises a plurality of blades (15) which extend substantially radially from a conical hub (11), from a smaller-diameter, front portion (12) thereof as far as a larger-diameter, rear portion (13) thereof, with a curved shape the curvature of which is reversed with respect to the direction of rotation of the impeller.

2. A forced circulation system according to Claim 1 in which the blades (15) have curved leading edges (16) which, starting from a front, base portion (17) on the hub in the vicinity of the smaller-diameter, front portion thereof, have a first portion (16a) which diverges progressively from the surface of the hub to reach a substantially radial arrangement and which is connected by a large-radius curve to a second portion (16b) having a substantially axial arrangement, as the leading edge gradually extends towards the rear portion (13) of the hub.

3. A forced circulation system according to Claim 2 in which the front portion (12) of the hub has an ogival shape.

4. A forced circulation system according to one or more of the preceding claims in which the impeller (8) is mounted in a diffuser having a cyclone configuration.

5. A forced circulation system according to one or more of the preceding claims in which a resistance heater (10) is mounted in the diffuser, downstream of the cyclone portion thereof.

6. A forced circulation system according to one or more of the preceding claims, characterized in that it has no filter.

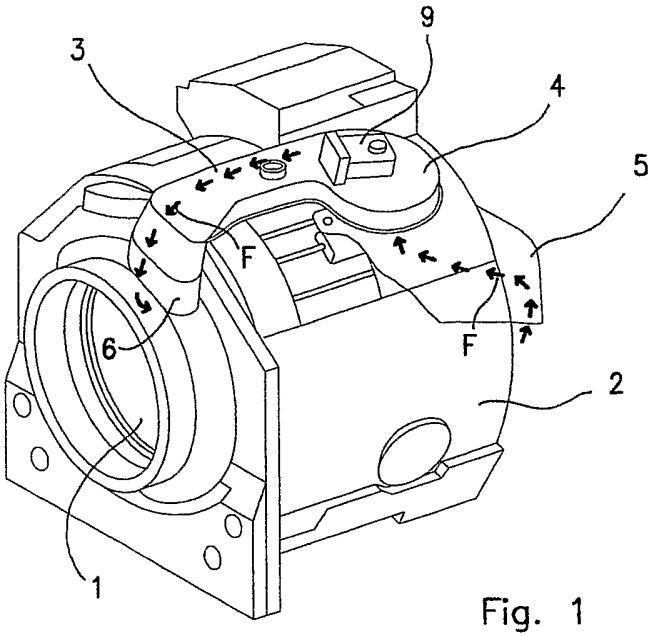

Fig. 1

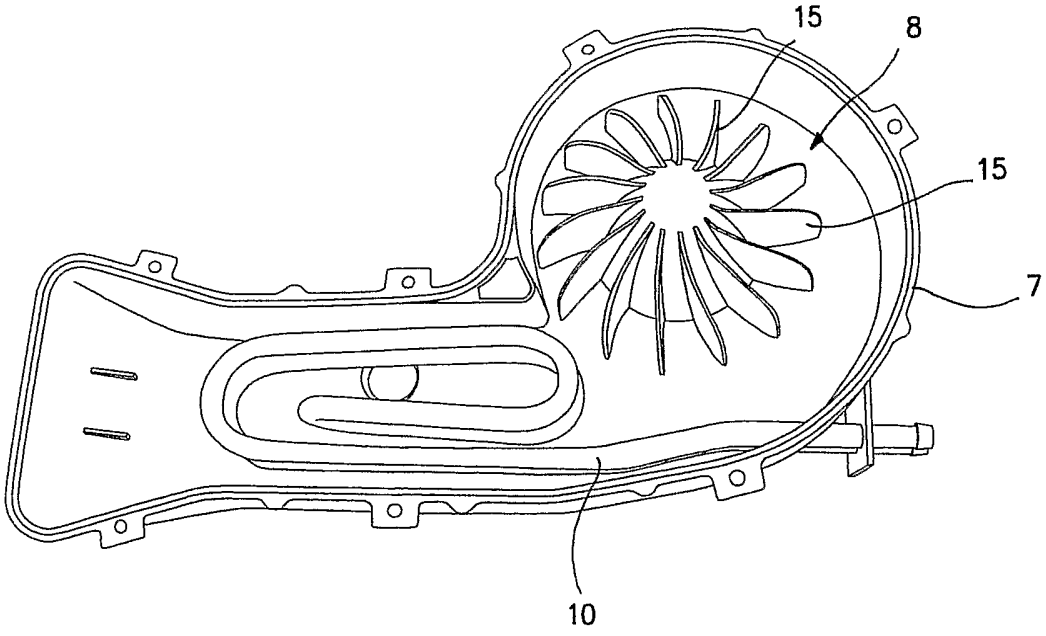

Fig. 2

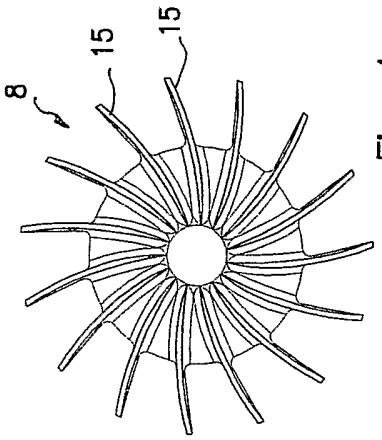

Fig. 4

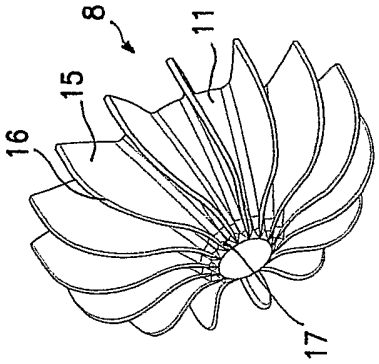

Fig. 3

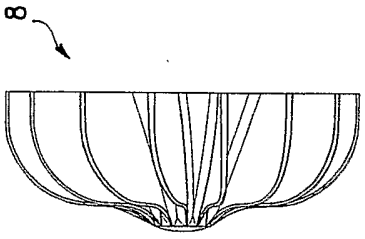

Fig. 5

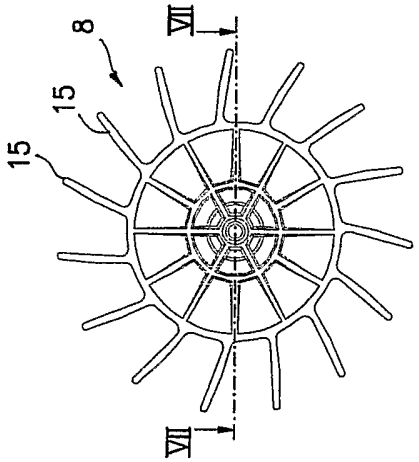

Fig. 6

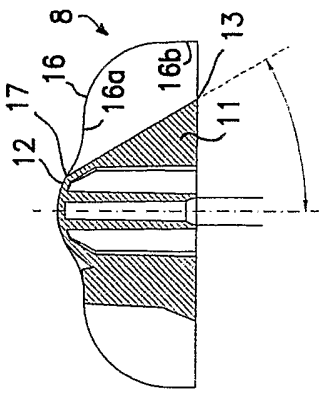

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2006/000269

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F58/04 F04D29/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D06F F04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 566 476 A (ESSWEIN S.A) 20 October 1993 (1993-10-20) column 1, lines 5-36 column 2, lines 14-43 figure 1	1-6
A	EP 0 328 250 A (CREDA LIMITED) 16 August 1989 (1989-08-16) column 2, line 40 - column 4, line 18 claims 1,6; figures 1-5	1,4-6
A	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2005 058658 A (TOSHIBA CORP; TOSHIBA CONSUMER MARKETING CORP; TOSHIBA KADEN SEIZO KK), 10 March 2005 (2005-03-10) abstract	1,4-6

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
8 August 2006	17/08/2006

Name and mailing address of the ISA/	Authorized officer
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International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No
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