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(71) Applicant: **Emerson Appliance Motors Europe S.r.l.**
10024 Moncalieri (Torino) (IT)

(72) Inventor: **MULCAHY, Nathaniel**
I-15057, TORTONA (Alessandria) (IT)

(74) Representative: **Quinterno, Giuseppe et al**
Jacobacci & Partners S.p.A.
Corso Emilia, 8
10152 Torino (IT)

(54) A composite fan rotor for a tangential fan

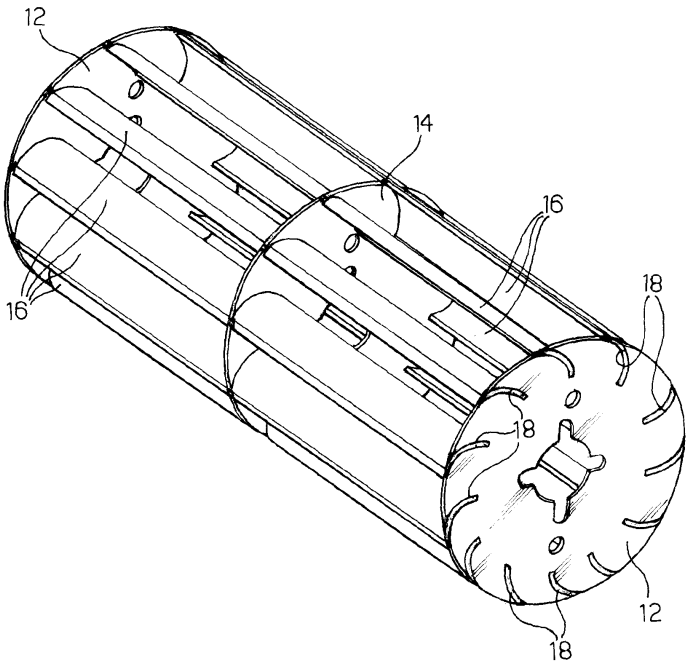
(57) A fan rotor, in particular for a tangential fan, comprises

two transverse terminal elements (12), substantially perpendicular to the axis of rotation of the rotor;

a plurality of longitudinal blades (16) arranged circumferentially about the axis of rotation of the fan rotor, parallel both to each other and to the axis, and which extend longitudinally between the transverse terminal elements (12); and in which

the transverse terminal elements (12) are made of metal and the blades (16) are moulded of a plastics material and fixed to the periphery of the transverse terminal elements (12).

FIG. 2



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Description

[0001] The present invention relates to a fan rotor, in particular for a tangential fan, comprising:

two terminal transverse support elements, substantially perpendicular to the axis of rotation of the rotor; and
a plurality of longitudinal blades disposed circumferentially about the axis of rotation of the fan rotor, parallel to each other and to the said axis, and extending longitudinally between the terminal transverse support elements.

[0002] Tangential fans are used in particular in air conditioning systems and for ventilating ovens. In the prior art, fan rotors for such fans have a cylindrical cage structure with at least two end discs and, frequently, intermediate discs too, with preferably arcuate blades extending longitudinally between them.

[0003] Such fan rotors are generally made of metal. More recently, fan rotors of plastics material have been available.

[0004] Fan rotors made completely of metal are typically made of pressed sheet metal, while plastics fan rotors are generally manufactured by injection moulding.

[0005] Fan rotors made of a metal offer good reliability even at high temperatures, but are limited as to the possible shape of the blades. In particular, the thickness of blades produced from sheet metal is essentially constant, so it is not possible to make blades with a more aerodynamically effective cross section, for example blades which have a wing profile. Plastics blades, on the other hand, can be moulded into a variety of shapes and thicknesses and can, in particular, be given a wing profile which offers high performance and low noise levels of the fan.

[0006] However, tangential fan rotors made entirely of plastics materials also carry some disadvantages.

[0007] A first disadvantage lies in the fact that the thermoplastic material used is subject to high temperatures in operation, at which the rotor can become deformed, with its structure being at risk of undergoing physical, chemical and dimensional alterations which can reduce its reliability.

[0008] A second disadvantage lies in the fact that the process for moulding a cage-structure fan rotor is highly complicated, with regard to dimensions and to the design of the moulds and with regard to the ease with which a fan can be extracted from the mould, this last being the reason why blades are often manufactured so as to project radially beyond one of the terminal discs. These radially projecting blades make the fan noisier in operation.

[0009] A third disadvantage is related to the mounting of elastomeric hubs on the longitudinal ends of the fan rotor. These hubs are generally either co-moulded with the terminal portions of the fan rotor or inserted into the said terminal portions and such operations can give rise to problems.

[0010] One object of the invention is to overcome these disadvantages of the prior art and to provide a fan rotor of the type described above, which is reliable at high temperatures, has a structure which is both simple and compact and is characterised by low operating noise, is simple and economical to manufacture and offers a high operating efficiency.

[0011] This object is achieved according to the invention by providing a fan rotor of the type specified, in which the terminal transverse elements are made of metal and the blades are made of moulded plastics material and are secured to the periphery of the said terminal transverse elements.

[0012] Thanks to these characteristics, the fan rotor provides enhanced reliability and improved performance. A fan rotor of this type is easier to produce since only the blades are injection-moulded, thereby eliminating the need to form the entire cage structure in a single mould, with the blades then being fitted to the transverse portions using the same method and machinery used to assemble fan rotors made entirely of metal. Finally, the blades do not need to project radially from the terminal support elements of the fan rotor, providing the considerable advantage of reducing fan noise.

[0013] Further characteristics of the invention will become apparent from the detailed description which follows, with reference to the drawings provided purely by way of non-limitative example, in which:

Figure 1 is a plan view of a tangential fan including a fan rotor according to the invention;
Figure 2 is a perspective view of a fan rotor according to the invention;
Figure 3 is a view of a transverse element of a fan rotor according to the invention; and
Figure 4 is a perspective view of a blade usable in a fan rotor according to the invention.

[0014] In Figure 1, a tangential fan of a type which is known per se is generally indicated 1, having a support structure or shroud 2 also for conveying air and made of sheet metal or a plastics material.

[0015] A fan rotor 10 is mounted for rotation in the structure 2, rotatable by means of an electric motor 3, preferably an alternating current electric motor, for example a screened pole asynchronous motor.

[0016] In the embodiment shown by way of example in Figure 1, the structure 2 includes two facing end walls 4, 5 and at least one side wall 9 extending about the axis of the fan rotor 10, between the said end walls. Two supports, indicated 6, are provided for the rotation of the fan rotor 10, which in operation rotates about an axis indicated A.

[0017] In the embodiment illustrated by way of example, the fan rotor 10 has a cage-like structure, generally cylindrical in shape, with two transverse elements or

discs 12 and an intermediate transverse disc element 14 with a circumferential arrangement of blades 16 around it, all preferably arcuate in section. For especially long fans, it is possible to use a plurality of intermediate discs.

[0018] Figure 2 shows a perspective view of the fan rotor 10 with the blades 16 fitted onto the transverse elements 12, 14. These latter are made of metal, have notches 18 in their perimeter (see Figure 3), and are usually produced by pressing. The transverse terminal elements 12, which can also be made of aluminium, carry rotary supports 6 (see Figure 1) of a polymeric material, for example, which can either be moulded onto the said transverse terminal elements 12, or manufactured separately and then secured (by interference fit, for example) onto the terminal transverse elements 12.

[0019] With reference in particular to Figure 4, the blades 16 are produced, for example, by injection moulding of a thermoplastic material and are coupled to the transverse elements 12, 14 at the notches 18. These latter are preferably of a complementary arcuate configuration able to house and retain corresponding portions of the blades 16, by means of interference fit coupling, for example.

[0020] It is advantageous for the plastic blades 16 to be made with an optimised fluid-dynamic section, of a wing profile, for example. In this event, portions 22 of each blade 16 intended to be inserted into corresponding grooves 18 in the transverse terminal elements 12 (and in any intermediate transverse element or elements 14) can have a modified section, in particular thinner, with respect to the rest of the blade, in order to facilitate this insertion operation.

[0021] The manufacture of only the blades of a plastics material also makes it possible to use blades which need not be straight, but could be curved in various ways in order to improve performance, a possibility which is not available when an entire fan rotor is moulded in a plastics material.

[0022] Naturally, the principle of the invention remaining unchanged, manufacturing details and embodiments may vary widely from those described and illustrated, without departing thereby from the scope of the present invention.

Claims

1. A fan rotor (10), in particular for a fan of tangential type (1), including:

two transverse terminal support elements (12) substantially perpendicular to the axis of rotation (A) of the fan rotor (10);
a plurality of longitudinal blades (16) arranged circumferentially about the axis of rotation (A) of the fan rotor (10), parallel to each other and to the said axis (A) and extending longitudinally between the terminal transverse support elements (12); and in which
the transverse terminal elements (12) are made of metal while the blades (16) are moulded in a plastics material and are fixed to the periphery of the said transverse terminal elements (12).

2. A fan rotor (10) according to Claim 1, in which the blades (16) are fitted in peripheral grooves (18) formed at the outer perimeter of the transverse terminal elements (12).

3. A fan rotor (10) according to Claim 1 or Claim 2, further comprising at least one intermediate transverse support element (14), also made of metal and into which the blades (16) are also fixed; the said intermediate element (14) being substantially perpendicular to the axis of rotation (A).

4. A fan rotor (10) according to any of the preceding Claims, in which the blades (16) are not of constant thickness in cross section, having a cross section which is like a wing section.

5. A fan rotor (10) according to any preceding Claim, in which the cross section of the blades (16) is modified at the portions (22) intended to be coupled to the transverse support elements (12, 14).

6. A fan rotor (10) according to any preceding Claim, in which the transverse support elements (12, 14) are made of aluminium.

7. A fan (1) including a fan rotor (10) according to any of the preceding Claims.

FIG. 1

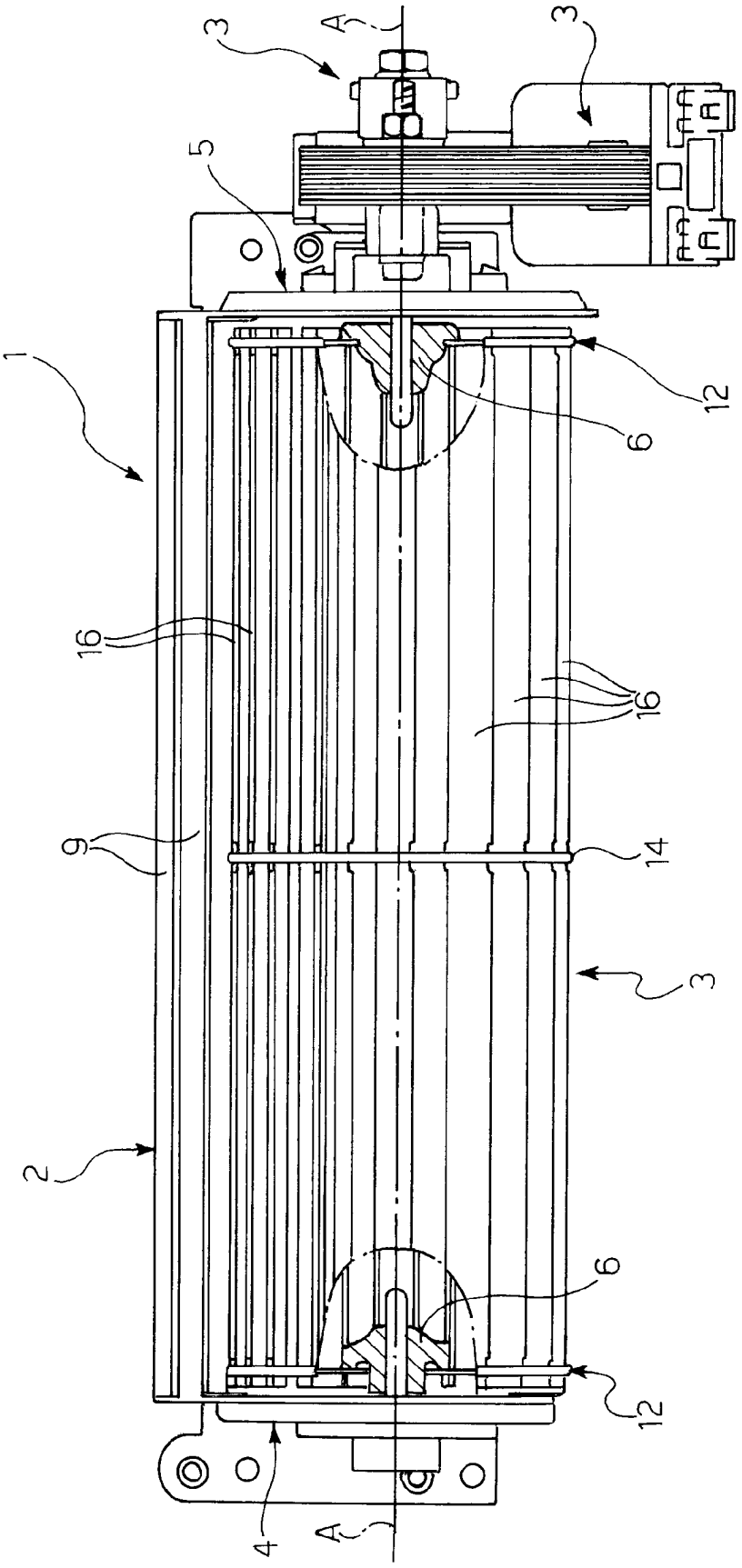

FIG. 2

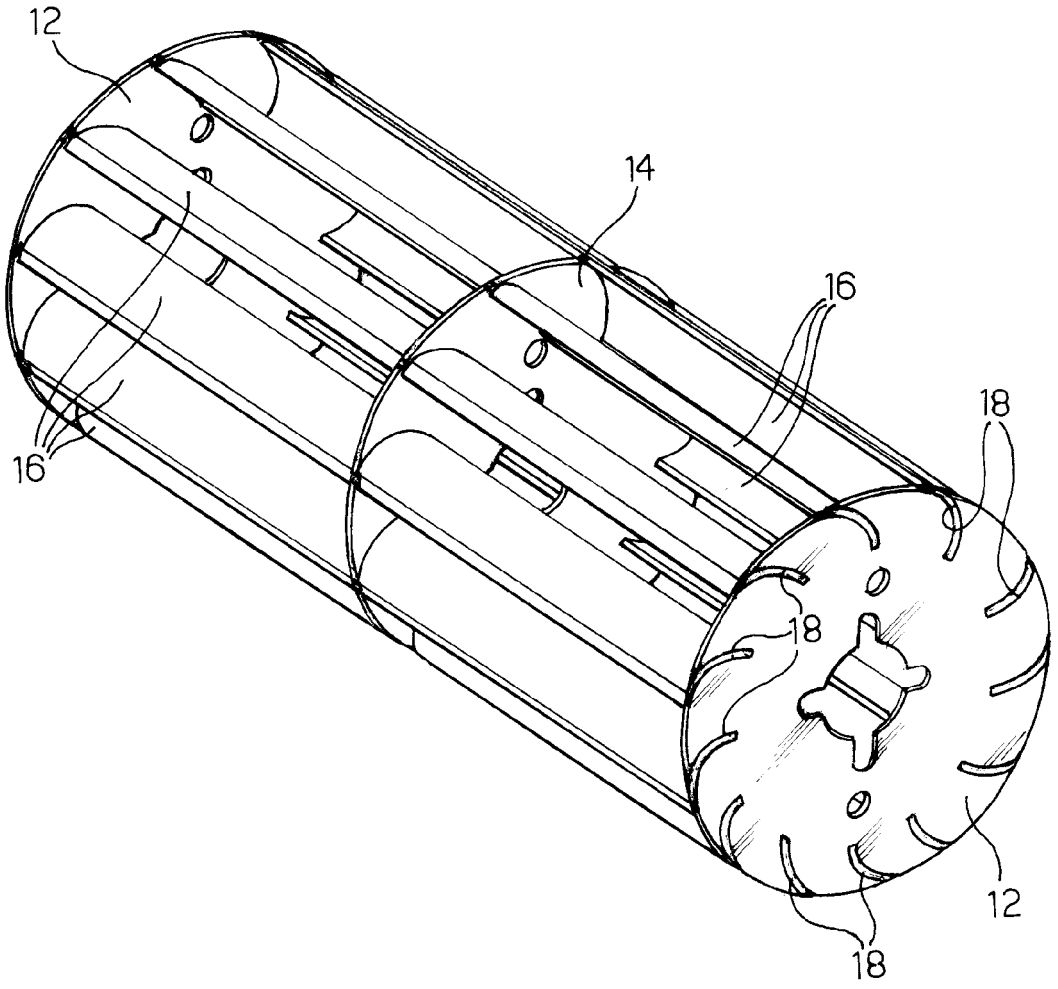

FIG. 3

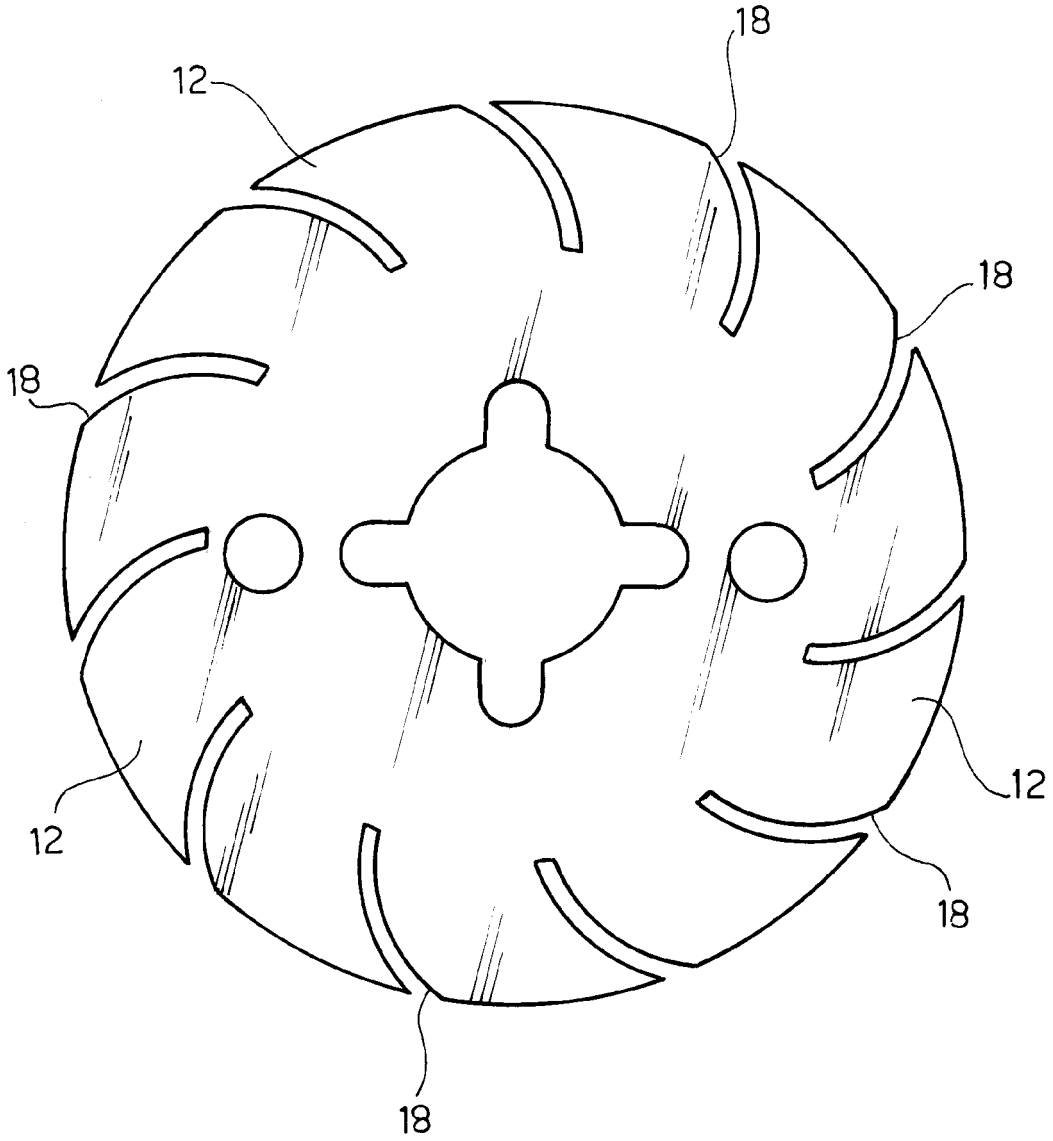

FIG. 4