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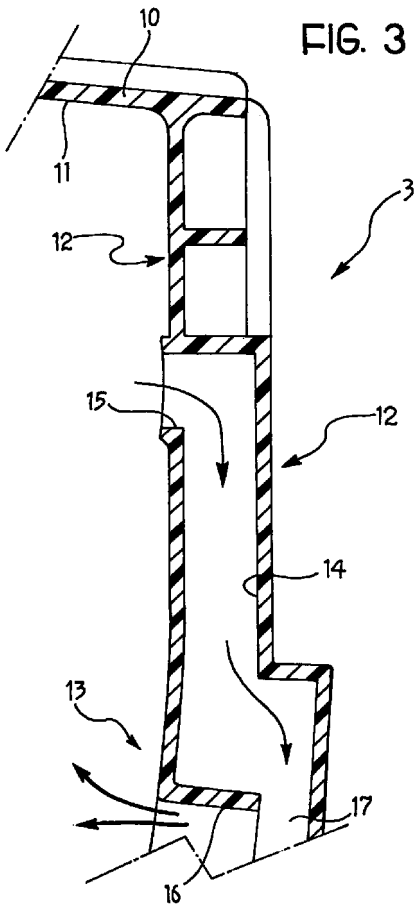
(54) Fan including a duct for cooling the motor

(57) The duct (3) includes an annular outer wall (10), defining internally an axial flow passage (11) and surrounding, in use, the rotor (4) of the motorized fan (2). Downstream of the motorized fan (2), the wall (10) is connected by a plurality of spokes (12) to a central support structure (13) to which the motor (8) of the motorized fan (2) is fixed. At least one spoke (12) is shaped so as to define a conduit (14) with a radially outer inlet aperture (15) acting to capture a portion of the air stream generated by the operation of the motorized fan (2), and a radially inner outlet aperture (16) facing the region occupied by the motor (8) of the motorized fan (2).

FIG. 3



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Description

[0001] The present invention relates to a duct for a motorized fan, for application in particular to a heat exchanger for an internal combustion engine.

[0002] More specifically, the invention relates to a duct comprising an essentially annular outer wall, defining internally an axial flow passage and which surrounds, in use, the rotor of the motorized fan; downstream of the motorized fan, the said wall is connected by means of a plurality of spokes to a central support structure to which the motor of the fan is fixed.

[0003] The object of the present invention is to provide a duct of the aforesaid type which enables the electric motor of the fan to be efficiently cooled.

[0004] This and other objects are achieved according to the invention by providing a duct of the type described above, characterised in that at least one blade is shaped so as to define a conduit with a radially outer inlet aperture, operable to capture a portion of the air stream generated by the fan in operation, and a radially inner outlet aperture, opening to the region occupied by the motor of the motorized fan.

[0005] The invention also relates to a cooling device which includes a motorized fan and a duct having the characteristics defined above.

[0006] Further characteristics and advantages of the invention will become apparent from the following detailed description, provided purely by way of non-limitative example, with reference to the appended drawings, in which:

Figure 1 is a longitudinally sectioned partial view of a cooling assembly which includes a motorized fan and a duct according to the invention;
Figure 2 is a rear view of the said cooling assembly, in the direction of the arrow II of Figure 1;
Figure 3 is a sectioned partial view taken on the line III - III of Figure 2.

[0007] In Figure 1, a cooling device is generally indicated 1, for application in particular to a heat exchanger, such as a radiator, of an internal combustion engine.

[0008] The cooling device 1 includes a motorized fan, generally indicated 2, and an associated duct, indicated 3.

[0009] The motorized fan 2 includes, in a manner known per se, a rotor 4 with a hub 5 having a plurality of blades 6 extending from the periphery thereof. In the embodiment shown by way of (non-limitative) example, the radially outer ends of the blades 6 of the rotor 4 are connected to an outer ring indicated 7.

[0010] Preferably, though not necessarily, the hub 5 of the rotor 4 is hollow and the associated electric drive motor 8 lies at least partially within it.

[0011] The shaft 9 of the electric motor 8 is operatively connected to the hub 5 of the rotor.

[0012] The duct 3 comprises an essentially annular outer wall 10 which defines internally an axial flow passage 11 and surrounds the rotor 4 of the motorized fan.

[0013] Downstream of the motorized fan 2, the wall 10 of the duct is connected by means of a plurality of spokes 12 to a central support structure 13 to which the housing of the electric motor 8 is fixed in a manner known per se.

[0014] As may be seen in Figure 3, it is convenient if at least one and preferably each spoke 12 of the duct 3 is shaped so as to define a conduit 14 having a radially outer inlet aperture 15, acting to capture a portion of the air stream generated by the operation of the motorized fan 2.

[0015] The stream of air captured through the aperture 15 flows through the conduit 14 in the direction of a radially inner outlet aperture 16 directed towards the region occupied by the motor 8 of the motorized fan.

[0016] In the embodiment illustrated by way of example in Figure 3, a spoke, or each of the spokes 12, has a substantially tubular structure. On the other hand, this spoke could simply have a channel-shape structure.

[0017] In the embodiment illustrated, a chamber 17 is formed in the vicinity of the central support structure 13, into which the conduit 14 formed in one or each spoke 12 of the duct opens. The outlet or discharge aperture 16 is most conveniently formed essentially in the wall of this chamber facing the electric motor 8.

[0018] Thanks to the arrangement described above, a portion of the air stream generated by the motorized fan is conveyed through the spoke or spokes of the ducts in the direction of the electric motor 8 of the motorized fan, thus ensuring that the latter is efficiently cooled.

[0019] The cooling of the motor 8 of the motorized fan can be further improved by the provision of a plurality of blades 18 (Figure 1) which extend from the inner surface of the hub of the rotor, generating in operation a stream which washes over the outer surface of the motor 8.

[0020] Naturally, the principle of the invention remaining unchanged, the embodiments and manufacturing details thereof may be varied widely from those described and illustrated here by way of non-limitative example, without departing thereby from the scope of the invention, as claimed in the appended Claims.

Claims

1. A duct (3) for a motorized fan (2), in particular for application to a heat exchanger for an internal combustion engine; the duct (3) comprising an essentially annular outer wall (10), which defines internally an axial flow passage (11) and surrounds, in use, the rotor (4) of the motorized fan (2); downstream of the motorized fan (2), the said wall (10) being connected by means of a plurality of spokes (12) to a central support structure (13) to which the

motor (8) of the motorized fan (2) is fixed; the duct (3) being characterised in that at least one

spoke (12) is shaped so as to define a conduit (14) with a radially outer inlet aperture (15), acting to capture a portion of the air stream generated in use by the motorized fan (2), and a radially inner outlet aperture (16), directed towards the region occupied by the motor (8) of the motorized fan (2).

2. A duct according to Claim 1, characterised in that the said at least one spoke (12) has a substantially tubular structure.

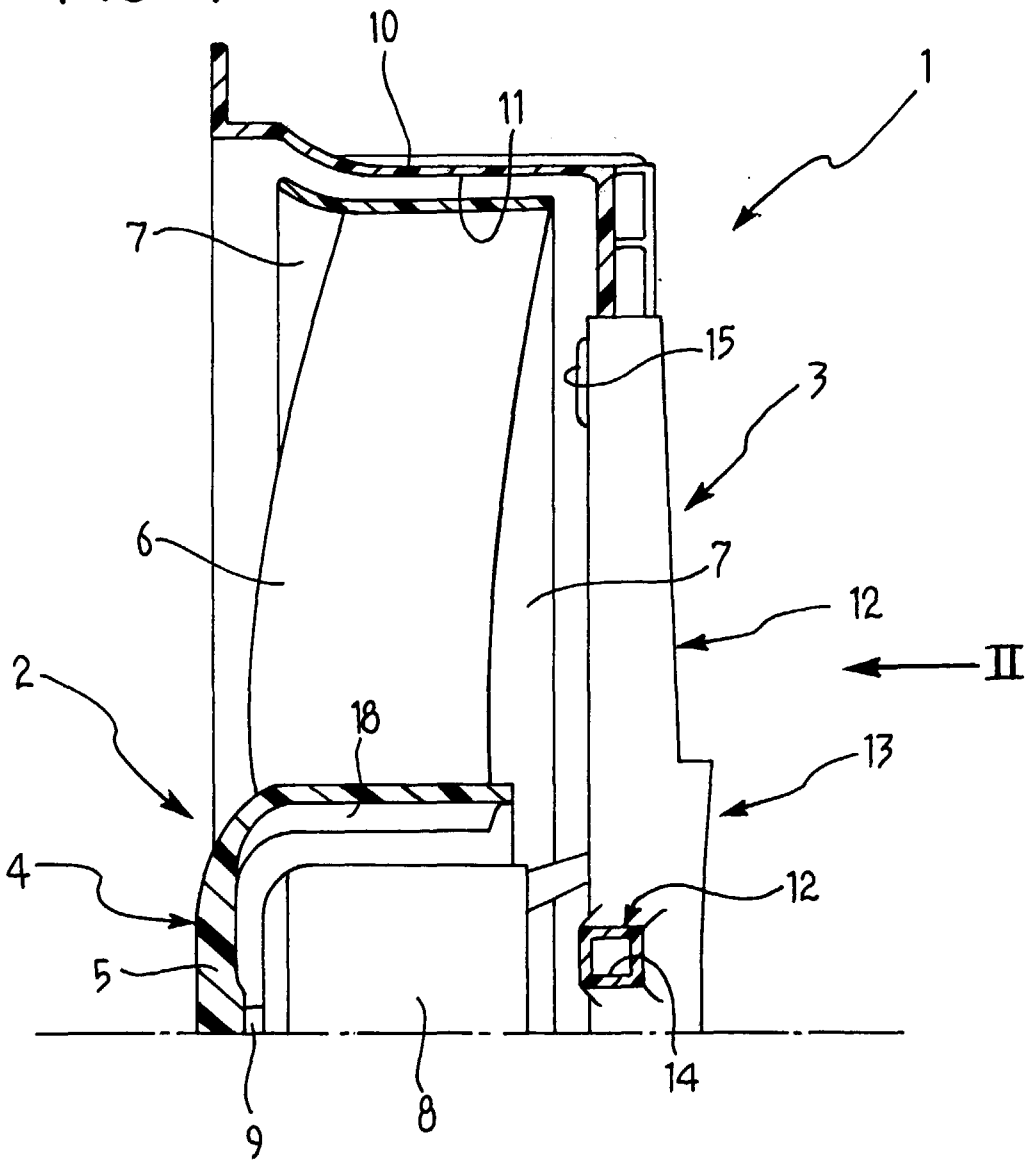
3. A duct according to Claim 1 or Claim 2, characterised in that a chamber (17) is formed in the vicinity of the central support structure (13) with an outlet aperture (16) facing the region occupied by the motor (8) of the motorized fan (2), and in that the conduit (14) formed in the or each said spoke (12) opens into the said chamber (17).

4. A cooling device (1), in particular for a heat exchanger of an internal combustion engine, which includes a motorized fan (2) and a duct (3) according to one or more of the preceding Claims.

5. A cooling device according to Claim 4, in which the rotor (4) of the motorized fan (2) has a hollow hub (5) operatively coupled to the shaft (9) of the motor (8) of the motorized fan (2);

characterised in that a plurality of blades (18) extend from the inner surface of the hub (5) of the rotor (4) acting, in operation, to generate a stream of air which washes over the motor (8) of the motorized fan (2).

FIG. 1



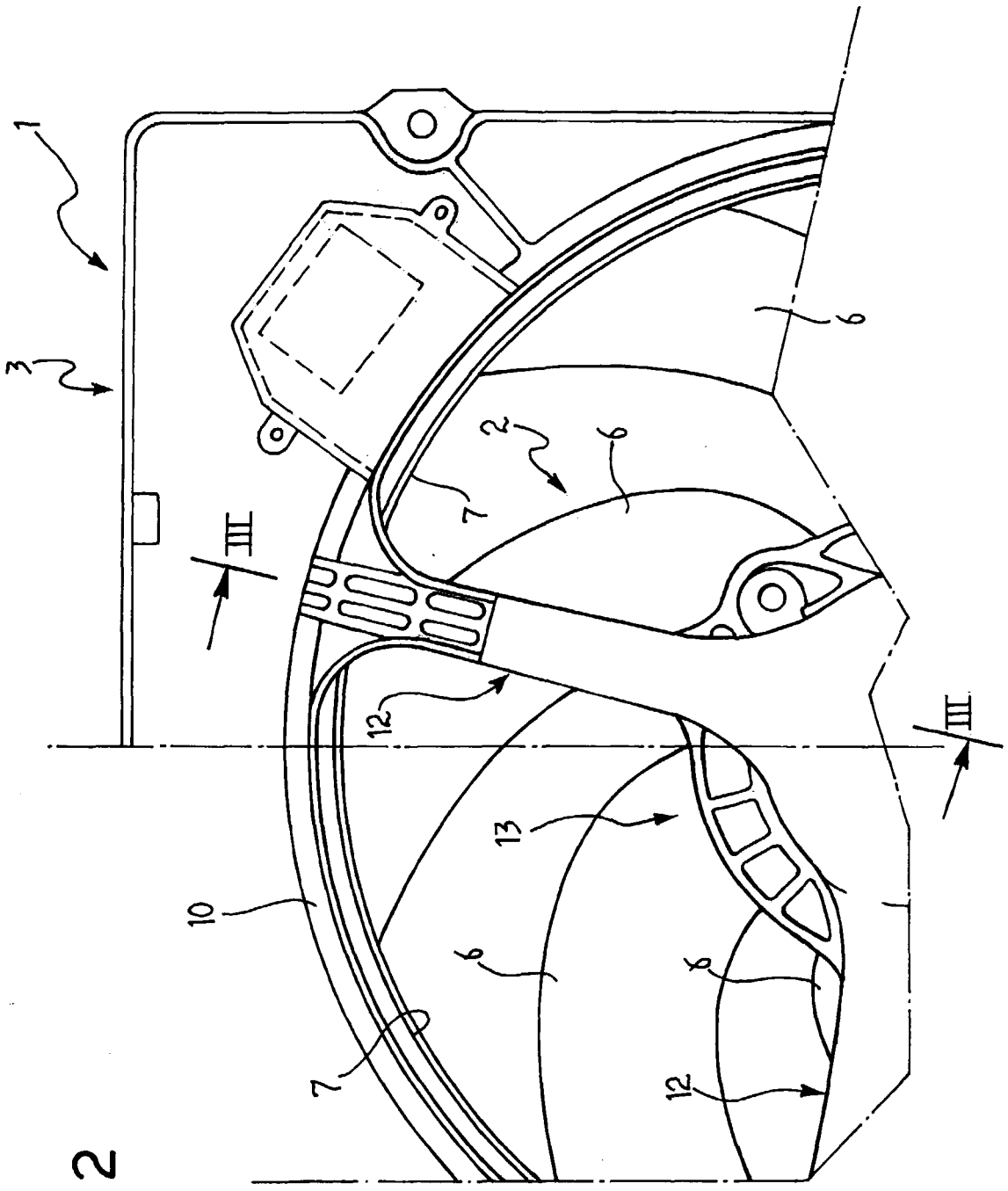
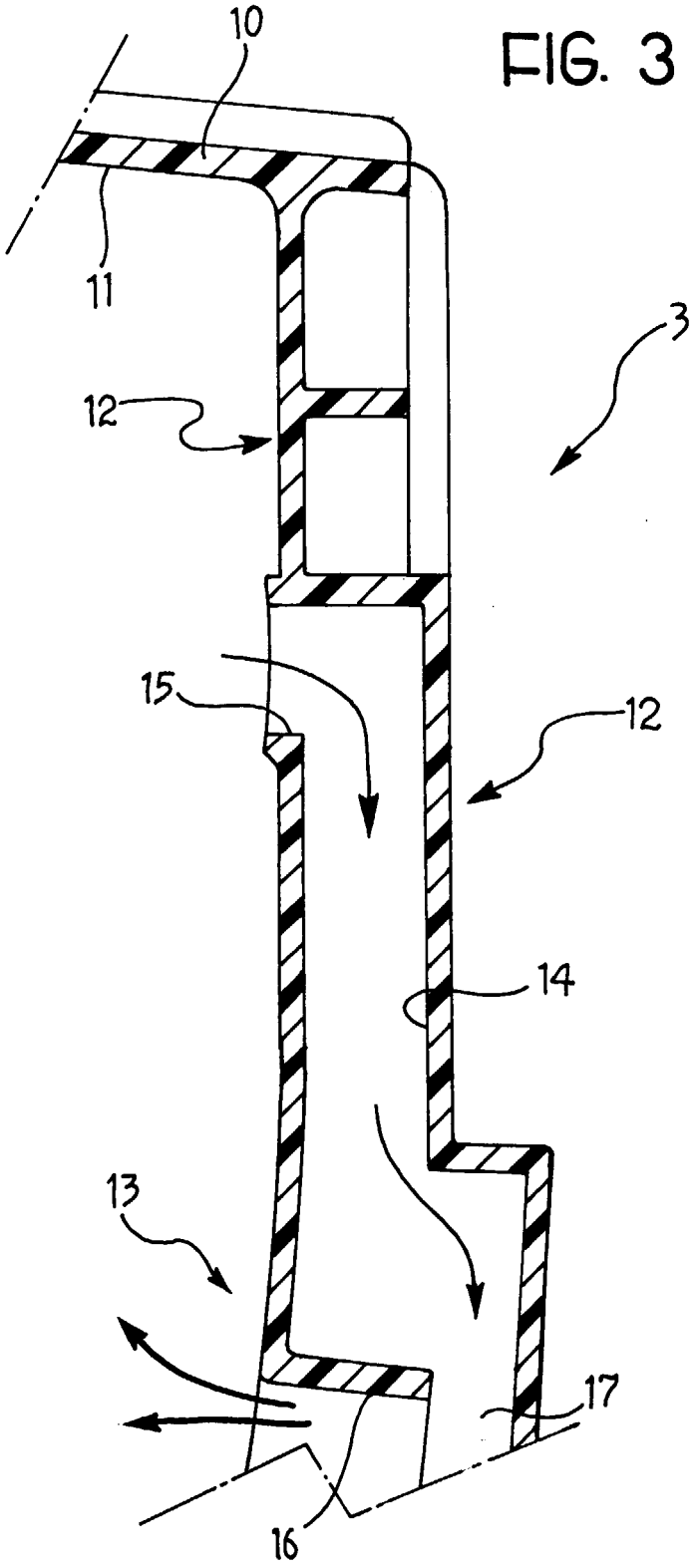


FIG. 2

FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 9896

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.7)
A	US 1 466 364 A (ILG) 28 August 1923 (1923-08-28) * page 1, line 67 - page 2, line 64; figures 1,2 *	1-3	F04D25/08
A	US 1 487 766 A (SURCLIFFE) 25 March 1924 (1924-03-25) * the whole document *	1-3	
A	US 5 180 279 A (MCLANE-GOETZ LEE A M ET AL) 19 January 1993 (1993-01-19) * column 2, line 4 - column 3, line 30; figures 1-4 *	1-5	
A	GB 2 029 125 A (SMITHS INDUSTRIES LTD) 12 March 1980 (1980-03-12) * page 1, line 106 - page 2, line 122; figures 1,2 *	1-5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 January 2000	Teerling, J

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 11 9896

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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10-01-2000

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82