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(54) **Air conveying system for internal combustion engine radiators**

Luftfördernde Vorrichtung für Kühler von Verbrennungsmotoren

Système de propulsion d'air pour échangeurs de chaleur pour moteurs à combustion interne

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## Description

[0001] This invention relates to a system for conveying the air flow generated by a fan and directed against a cooling radiator, such as the cooling radiator of an internal combustion engine.

[0002] To increase the efficiency of the air flow produced by the normal fans coupled to the cooling radiators of internal combustion engines, it has been usual for some time to channel said flow by means of suitable casings.

[0003] The fan is positioned generally downstream of or behind the radiator with reference to the vehicle running direction, in order to enhance the air flow spontaneously generated by the vehicle movement.

[0004] This arrangement, by which the fan draws air through the radiator, has also generally been used for industrial engines, which being stationary are unable to benefit from any air flow spontaneously traversing the radiator.

[0005] As stated, fans which draw air through the radiator are of poor efficiency, this being remedied by encasing them and at least partly tube-enveloping them by providing a cylindrical tube portion fixed to the ends of the fan blades.

[0006] This arrangement, which is very efficient from the efficiency viewpoint, has the drawback of being noisy to the point of encountering serious limitations on its application.

[0007] This has been remedied by providing a circular channel in proximity to the tube edge to receive the fan, this having largely solved the problem.

[0008] The fan draws peripheral external air through the space defined between the edge of the channel and the edge of the tube rigid with the fan blades, this air obviously not having passed through the radiator so that not only is the noise reduced, but also the fan efficiency.

[0009] An air conveying system is shown in EP-A-0543694, comprising a radiator, a casing connecting the edge of this latter to a circular hole and a tube-enveloped fan partly inserted into said hole, its direction of rotation being such that it generates an air flow directed towards the radiator, and the edge of the fan-surrounding tube which is distant from the radiator extending into a portion not containing blades.

[0010] The object of the present invention is to provide a conveying system for the fan-generated cooling air of a radiator, which has high efficiency and noiseless operation.

[0011] This object is attained according to the invention by a tube-enveloped and encased fan directing its air flow towards the radiator, its blades being rigid with an outer tube having that edge on the suction side of the fan contained in a stationary circular channel of U cross-section facing the fan.

[0012] The operational and constructional merits and characteristics of the invention will be more apparent from the detailed description given hereinafter with ref-

erence to the figures of the accompanying drawings, which illustrate a preferred embodiment thereof by way of non-limiting example.

[0013] Figure 1 is a partial vertical section through the invention. Figure 2 shows an enlarged detail of Figure 1.

[0014] The figures show a normal radiator 1 of the type used in internal combustion engines, its peripheral edge being provided with a casing 2 which converges in usual manner, not shown, into a hole 3.

[0015] A fan 4, the blades 5 of which are fixed to a hub 6, is partly inserted into the hole 3.

[0016] To the outer edge of the blades 5 there is fixed, for example by welding or formed integrally with the blades, a tube 7 having that edge more distant from the radiator 1 extending into a portion which is partly inserted into a stationary circular channel 8 having its concavity facing the fan 4.

[0017] The outer edge of the channel 8 is conveniently spaced from the edge of the hole 3 of the casing 2 to create a cylindrical aperture 9.

[0018] The direction of rotation of the blades 5 is such that they convey air towards the radiator 1.

[0019] The air conveyed by the blades is drawn partly from the central space of the channel in accordance with the arrows 10, and partly through the cylindrical aperture 9 in accordance with the arrows 11.

[0020] All the air conveyed by the blades is therefore directed against the radiator, from which the efficiency of the invention mainly derives.

[0021] It has also been surprisingly found that the presence of the secondary air flow conveyed through the channel 8 in accordance with the arrows 11 reduces air turbulence in the region close to the end of the blades, further increasing the system efficiency.

## Claims

1. An air conveying system for internal combustion engine radiators, comprising:

a radiator (1),  
a casing (2) connecting the edge of this latter to a circular hole (3),  
a fan (5) enveloped in a tube (7), partly inserted into said hole (3), its direction of rotation being such that it generates an air flow directed towards the radiator (1), the edge of the fan-surrounding tube (7) which is distant from the radiator (1) extending into a portion not containing blades,

characterised by comprising a stationary circular channel (8) having an outer edge positioned at a distance from the edge of the hole (3) of the casing (2) to create a cylindrical aperture (9), through which part of the air conveyed by the blades is drawn,

said edge of the fan-surrounding tube (7) being partly inserted into the cavity of the stationary channel (8).

2. A system as claimed in claim 1, **characterised in that** said radiator (1), is of square shape. 5
3. A system as claimed in claim 1, **characterised in that** said radiator (1), is of rectangular shape. 10
4. A system as claimed in claim 1, **characterised in that** the channel (8) is of C cross-section. 15

#### Patentansprüche

1. Luftfördersystem für Kühler von Verbrennungsmotoren, mit:
  - einem Kühler (1) 20
  - einem Gehäuse (2), welches die Kante dieses letzteren mit einem kreisförmigen Loch (3) verbindet,
  - einem Lüfter (5), welcher von einem Rohr (7) ummantelt ist, welches teilweise in das Loch (3) eingeschoben ist, und dessen Drehrichtung derart ist, daß er einen zu dem Kühler (1) hin gelenkten Luftstrom erzeugt, wobei sich die Kante des den Lüfter umgebenden Rohrs (7), welche von dem Kühler (1) entfernt liegt, in einen Bereich erstreckt, der keine Lüfterblätter aufweist, 25 30

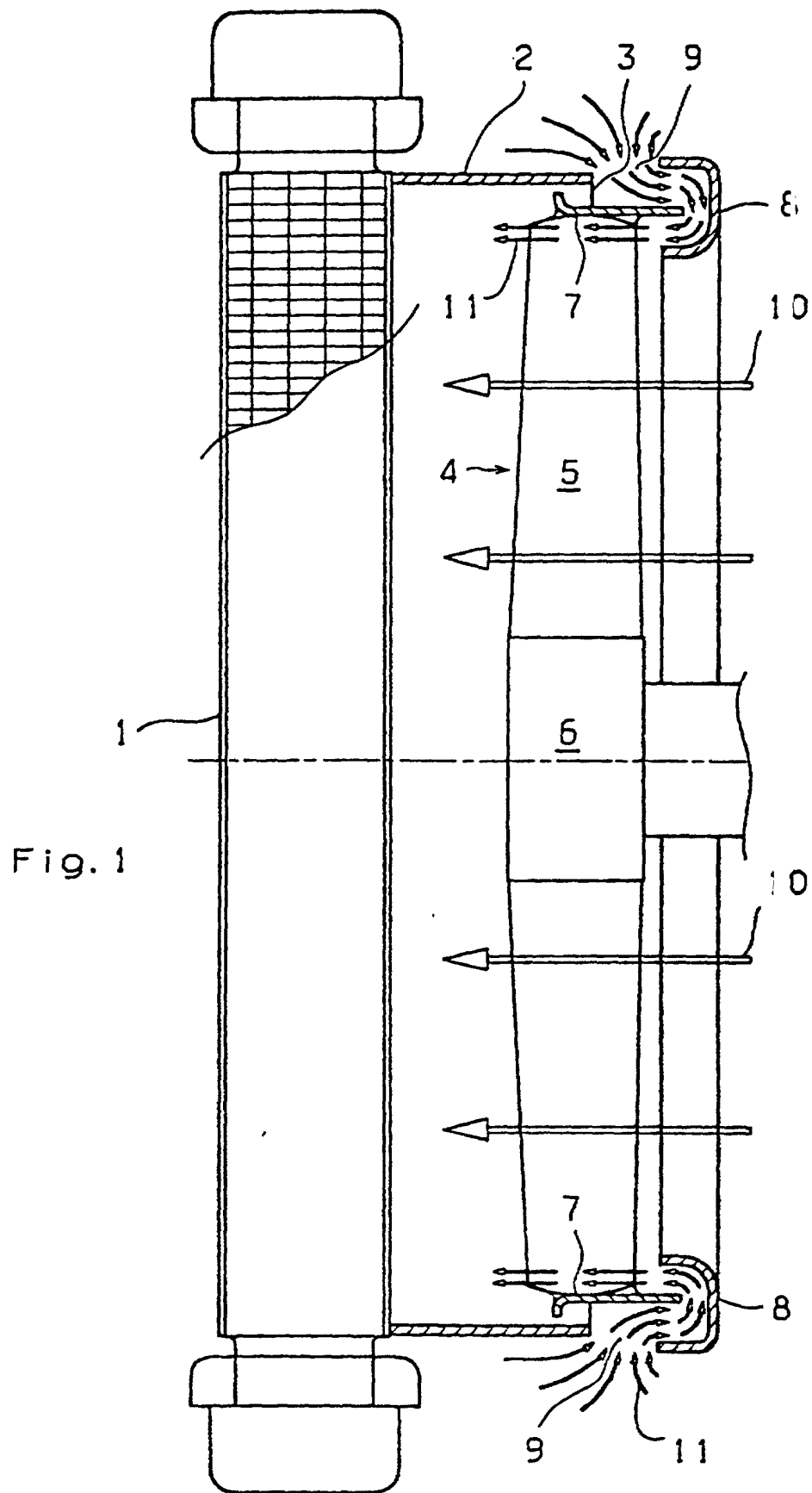
**dadurch gekennzeichnet, daß** es einen stationären kreisförmigen Kanal (8) aufweist, welcher eine Außenkante aufweist, die mit einem Abstand von der Kante des Lochs (3) des Gehäuses (2) angeordnet ist, um eine zylindrische Öffnung (9) auszubilden, durch welche ein Teil der von den Lüfterblättern geförderten Luft eingezogen wird, wobei die Kante des den Lüfter umgebenden Rohrs (7) teilweise in den Hohlraum des stationären Kanals (8) eingeführt ist. 35 40
2. System gemäß Anspruch 1, **dadurch gekennzeichnet, daß** der Kühler (1) eine quadratische Form aufweist. 45
3. System gemäß Anspruch 1, **dadurch gekennzeichnet, daß** der Kühler (1) eine rechteckige Form aufweist. 50
4. System gemäß Anspruch 1, **dadurch gekennzeichnet, daß** der Kanal (8) einen C-förmigen Querschnitt aufweist. 55

#### Revendications

1. Système d'acheminement d'air destiné à des radiateurs de moteur à combustion interne, comprenant :
  - un radiateur (1),
  - une gaine (2) reliant le bord de ce dernier à un trou circulaire (3),
  - un ventilateur (5) enveloppé dans un tube (7), inséré en partie dans ledit trou (3), son sens de rotation étant tel qu'il génère un flux d'air dirigé contre le radiateur (1), le bord du tube entourant le ventilateur (7) qui est distant du radiateur (1) s'étendant jusque dans une partie ne contenant pas de pales,

**caractérisé en ce qu'il** comprend un canal circulaire fixe (8) présentant un bord extérieur positionné à une certaine distance du trou (3) de la gaine (2) afin de créer une ouverture cylindrique (9), au travers de laquelle une partie de l'air acheminé par les pales est aspirée,

ledit bord du tube entourant le ventilateur (7) étant en partie inséré dans la cavité du canal fixe (8). 15 20
2. Système selon la revendication 1, **caractérisé en ce que** ledit radiateur (1), est de forme carrée.
3. Système selon la revendication 1 **caractérisé en ce que** ledit radiateur (1), est de forme rectangulaire.
4. Système selon la revendication 1, **caractérisé en ce que** le canal (8) est de section transversale en C. 25 30 35 40 45 50 55



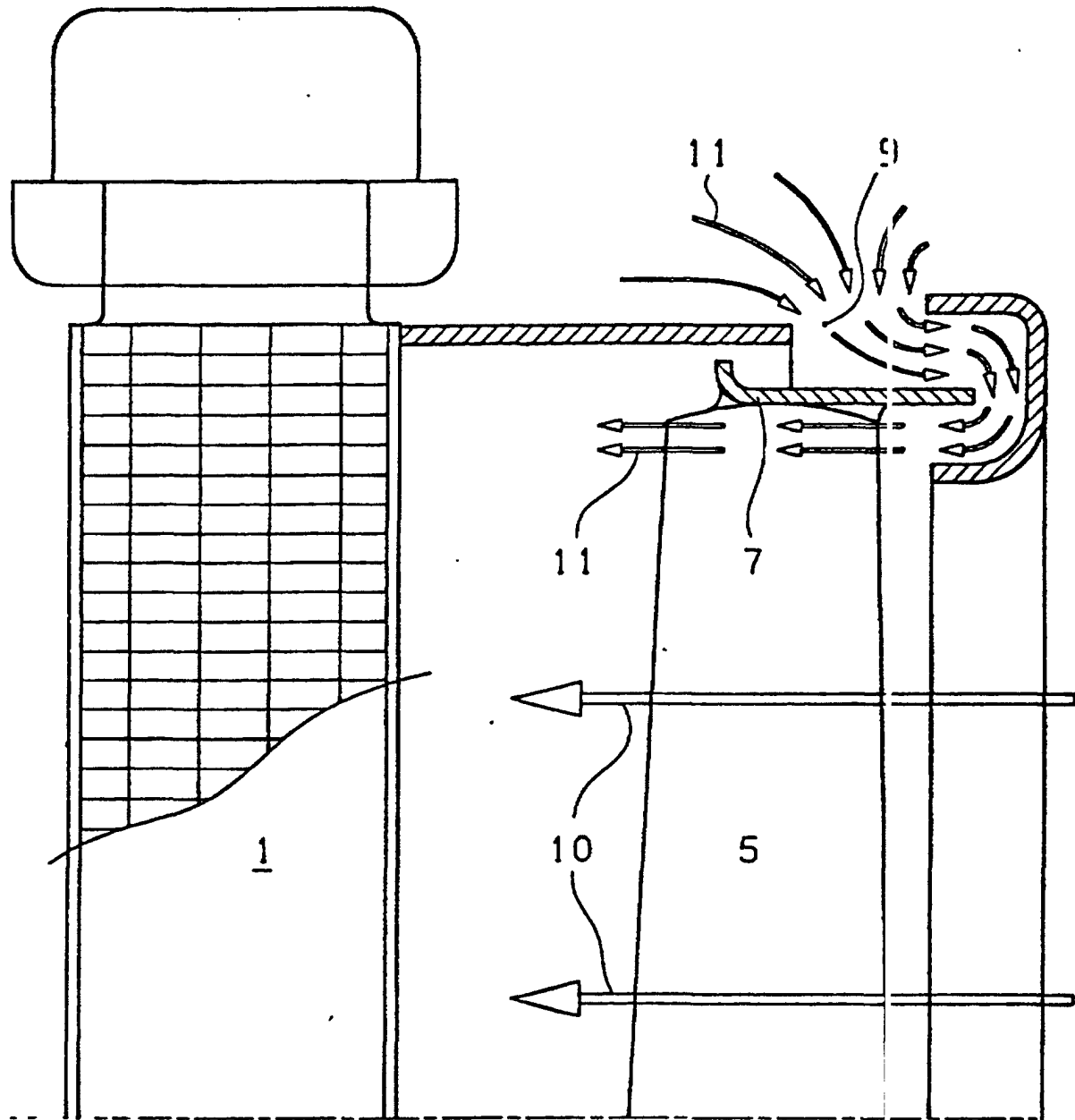


Fig. 2