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(54) **A PORTABLE BLOWER/ASPIRATOR DEVICE**

TRAGBARE BLAS-/SAUGVORRICHTUNG

DISPOSITIF PORTABLE SOUFFLEUR/ASPIRATEUR

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Description

TECHNICAL FIELD

[0001] The invention relates to a portable blower/aspirator device.

BACKGROUND ART

[0002] As is known, portable blowers are generally powered by a two-stroke internal combustion engine located internally of a small housing in order to reduce the overall space occupied.

[0003] During use, engines, especially internal combustion engines, reach high temperatures which over time lead to rapid wear of the components thereof, which if they exceed a certain temperature threshold can be irredeemably damaged.

[0004] For this reason, constant engine cooling is required so that it will function correctly for as long as possible.

[0005] The prior art includes engine air-cooling systems which enable use of the cooling air to supply the blower.

[0006] However, the cooling air is at an excessive temperature and the engine group reaches temperatures which disturb the operator.

[0007] For this reason it is necessary to dilute the cooling air.

[0008] DE 19 701 082, which is considered as the closest prior art to the subject-matter of claim 1, discloses the technical features of the preamble of claim 1.

[0009] US 6,116,864 describes a vacuum/blower device that uses a first fan, a venting wheel, keyed on the engine drive shaft, which forces cold air coming from the external atmosphere into a cavity where the motor is housed, in order to cool the engine as the air passes. After having removed a part of the heat from the engine the air is expelled from the cavity by a second fan, a blower wheel, which exhibits two opposite pluralities of vanes positioned on a same circular wall afforded radially about the hub.

[0010] The blower wheel is keyed to the opposite end of the drive shaft.

[0011] The blower wheel exhibits a first plurality of vanes located on one end face and a second plurality of vanes located on the other end face of a wall interposed between the two pluralities of vanes and constituting the blower wheel.

[0012] The first plurality of vanes sucks in axially, through an opening, the hot air coming from the engine housing, while the second plurality of vanes axially sucks in air coming from the outside, which air then mixes with the hot air in the peripheral annular portion of the blower spiral, internally of which the blower wheel is located, before being blown through the blower tube. This cooling system provides a vacuum/blower device which is compact, efficient and which exhibits no drawbacks deriving

from too-high temperatures.

[0013] However, in order to have adequate cooling with the blower wheel described in US 6,116,864, the ratio between the hot-air inlet opening dimensions into the blower wheel and the dimensions of the central wall of the blower wheel has to fall within a predetermined range in order to prevent the flow of air pumped by the second plurality of vanes from obstructing the flow of the cooling air.

[0014] This means operating with design limitations which can in certain cases present problems.

DISCLOSURE OF INVENTION

[0015] It is, therefore, of prime importance to have a portable blower/aspirator device which boasts an efficient engine cooling system operating in the presence of an extremely compact overall structure, in the ambit of a rational constructional solution which is simpler than what the prior art offers. The aim of the present invention is to provide a portable blower/aspirator device having structural and functional characteristics which are such as to satisfy the above-mentioned requirements, while at the same time obviating the drawbacks identified in the prior art.

[0016] This aim is attained by a portable blower/aspirator device according to what is set out in claim 1.

[0017] The dependent claims outline preferred embodiments of the portable blower/aspirator device of the invention which are particularly advantageous.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further characteristics and advantages of the invention will better emerge from a reading of the following description, provided by way of non-limiting example with the aid of the figures of the accompanying drawings, in which:

- figure 1 is a view in section of a portable blower/aspirator device according to the invention;
- figure 2 is a front view of the impeller of the device of figure 1;
- figure 3 is a view in section of the impeller taken along line III-III of figure 2;
- figure 4 is a view from behind of the impeller.

BEST MODE FOR CARRYING OUT THE INVENTION

[0019] With reference to the figures of the drawings, 1 denotes in its entirety a portable blower/aspirator device according to the present invention.

[0020] The blower/aspirator device 1 comprises a housing 2 affording a cavity 2a internally of which a two-stroke internal combustion engine 3 is housed. The engine 3 comprises a piston 4 guided internally of a cylinder 5 which powers, by means of a con rod 6, a crankshaft 7, supported by a pair of bearings 8.

[0021] A conical first fan, or cooling fan 9, is keyed to an end 7' of the crankshaft 7. The cooling fan 9 is positioned in such a way as to be able to send fresh air from the outside towards the inside of the housing 2, so that the air can reach the cooling fins of the engine 3.

[0022] A second fan, or blower impeller 20, is fixed at the opposite end 7" of the crankshaft 7, which blower impeller 20 rotates internally of a volute 11 located laterally of the housing 2 and communicating there-with through a circular opening 12.

[0023] In the illustrated embodiment, the opening 12 is afforded in a wall which is shared by the housing 2 and an internal radial face 11 a of the volute 11.

[0024] A further circular opening 13 is afforded on the external radial face 11 b of the volute 11, opposite the internal radial face 11a affording the opening 12; the circular opening 13, at which a grid 14 is mounted, communicates with the external environment.

[0025] In the illustrated embodiment, the radius of the opening 12 facing the cavity 2a of the housing 2 is smaller than the radius of the opening 13 facing the external environment.

[0026] A blower tube (not illustrated) is fixed to the volute 11, which tube exits the volute 11 tangentially, and through which air is blown by the blower impeller 20 when the device 1 is operated as a blower.

[0027] According to the present invention, the blower impeller 20 exhibits a wall 22 located perpendicular to the rotation axis of the crankshaft 7; a vane group constituted by a plurality of identical curved blades 21 is located on the side of the wall 22 facing the opening 13 communicating with the external environment (figure 2).

[0028] In effect, the side of the wall 22 having the vane group faces the opening 13 communicating with the outside, while the opposite side of the wall 22 without the vane group faces towards the opening 12 that communicates with the cavity 2a of the housing 2.

[0029] In particular, the blades 21 develop radially and curvingly from the hub 23, and reach up to the external most circular edge of the wall 22.

[0030] Vents 24 are afforded in a circular arrangement on the wall 22 in proximity of the hub 23, each of which vents 24 is interposed between two blades 21.

[0031] In the illustrated embodiment of the present invention, the vents 24 are fashioned by a quadrangular cut on a portion of wall 22 which has been deformed in proximity of the hub 23 so as to form a capping crown 25 in which the top faces towards the blade side, as is clearly visible in the section view in figure 3.

[0032] More precisely, the vents 24 are cut on the most external circular lateral edge of the crown which rises from the base of the wall 22 and is arranged almost radially.

[0033] The vents 24 place the side of the wall 22 bearing the vane group in communication with the opposite side which bears no vanes, and allow the hot air coming from the cavity 2a of the housing 2, where the engine 3 is housed, to pass into the volute 11, as will be described

in more detail herein below.

[0034] In the illustrated embodiment, the vents 24 are situated at the opening 12 in a position in proximity of the circular edge formed by the opening 12 (figure 1). During operation, when the engine 3 is functioning and therefore when the impeller 20 is rotating internally of the volute 11, the fan 9 sends cool air internally of the cavity 2a of the housing 2 where the engine 3 is housed. In the cavity 2a the air cools the engine 3 and in turn heats up. The air thus heated by the engine 3 is aspirated by the impeller 20 through the opening 12, located axially, thanks to the presence of the vents 24 which enable the air to reach the blades 21 which are present only on the opposite side to the side facing the opening 12 for intake of the hot air. At the same time, the impeller 20, by means of the blades 21, sucks in cool air from the outside through the axially-located opening 13 which is opposite the opening 12. The cool air coming from the outside through the opening 13 and the hot air coming from the housing 2 through the opening 12 and then passed through the vents 24 are mixed together in the space comprised between two adjacent blades 21 thus forming a mixture which is blown radially and expelled through the blower tube.

[0035] In effect the mixture of hot and cool air is formed between the blades 21 of the impeller 20 before the mixture reaches the annular portion of the volute 11; from where it is blown tangentially.

[0036] With the aim of allowing passage of the hot air through the vents 24 in order to form the mixture to be blown out, the difference in pressure at the vents must be sufficient to enable the hot air to pass through the vents.

[0037] For this reason the almost-radial arrangement of the vents 24 on the crown portion of the wall 22 facilitates passage of hot air in order for the hot air to reach the blades 21 arranged on the other side of the wall 22.

[0038] In substance, the pressure in proximity of the vents 24 on the side facing the opening 12 communicating with the housing 2 must be higher than the pressure in proximity of the vents 24 on the side facing the opening 13 communicating with the outside.

[0039] In other words, the side of the wall 22 bearing the vane group is constantly under a depression with respect to the side facing the opening 12.

[0040] Naturally a slight depression is sufficient in order not to obstruct the flow of engine-cooling air and to enable the hot air to mix with the cool air coming from the outside environment in the volute 11.

[0041] This depression is a function of the diameter of the circle on which the vents 24 lie and the diameter of the openings 12 and 13.

[0042] By way of example, with an opening 12 having a 72mm diameter, the other opening 13 having a 112mm diameter, an impeller 20 having an external diameter of 160mm and bearing 19 blades, the vents 24 having a surface of 68mm² and operating at a velocity of 6000 rpm, the depression measured is about 30mm of water

gauge.

[0043] The size of the impeller 20 and therefore of the blades 21 and the vents 24 must be decided such that they can operate with the side of the wall 22 bearing the blades at a lower pressure than the opposite side, in order to enable aspiration of the hot air coming from the engine 3 housing 2.

[0044] As can be understood from the above description, the portable blower/aspirator device of the invention satisfies the needs and obviates the drawbacks outlined in the introductory part of the present description in reference to the prior art.

[0045] Indeed, the blower/aspirator device of the invention enables the engine to be cooled during its normal operation, as well as providing a blown air flow which is at a conveniently low temperature.

[0046] Obviously an expert in the technical field, in the interest of satisfying contingent and specific needs, might make numerous modifications and variations to the portable blower/aspirator device of the invention, all falling within the ambit of protection of the invention as it is defined in the following claims.

Claims

1. A portable blower/aspirator device 1, comprising:

- a housing (2) affording a cavity (2a);
- an engine (3) housed in the cavity (2a) of the housing (2), the engine (3) being provided with a drive shaft (7);
- a cooling fan (9) keyed to an end (7') of the drive shaft (7) in order to aspirate cooling air from an outside environment and to send the cooling air into the housing (2);
- a blower impeller (20), keyed to an end (7'') of the drive shaft (7) which is opposite the end (7'), and arranged internally of a volute. (11);

the volute (11) communicating on a side thereof with the housing (2) of the engine (3) through a first opening (12), and on an opposite side thereof with an outside environment through a second opening (13),

characterised in that

the blower impeller (20) comprises a wall (22) which faces the first opening (12), a series of radial blades (21) facing the second opening (13) and a circular zone around a hub (23) which circular zone is provided with vents (24) and which circular zone is located in front of the first opening (12).

2. The device (1) of claim 1, wherein the blades (21) exhibit a curved conformation.
3. The device (1) of claim 1, wherein the blades (21) develop starting from the hub (23) and reach an externalmost circular edge of the wall (22).

4. The device (1) of claim 1, wherein the circular zone about the hub (23) is a cap-shaped crown (25), the vents (24) being afforded on the most external lateral edge of the crown-formed zone and being arranged almost radially.

5. The device (1) of claim 1, wherein the vents (24) are formed by a quadrangular cut.

6. The device (1) of claim 4, wherein the first opening (12) and the second opening (13) exhibit a circular conformation, a radius of the first opening (12) being smaller than a radius of the second opening (13).

7. The device (1) of claim 6, wherein the crown zone of the wall (22) has a radius which corresponds to the radius of the first opening (12).

Patentansprüche

1. Ein tragbarer Bläser/Sauger Gerät 1, einschließlich:

- einem Gehäuse (2) mit einem Hohlraum (2a);
- einem Motor (3), der in dem Hohlraum (2a) des Gehäuses (2) eingesetzt ist, wobei der Motor (3) mit einer Antriebswelle (7) ausgestattet ist;
- einem Kühlgebläse (9), das an ein Ende (7') der Antriebswelle (7) gespannt ist, um Kühlluft von außen einzusaugen und die Kühlluft in das Gehäuse (2) zu leiten;
- einem Gebläserad (20), das an das andere Ende (7'') der Antriebswelle (7) gespannt ist, welches dem Ende (7') gegenüberliegt, und das in einem Verdichtergehäuse (11) liegt;

Das Verdichtergehäuse (11) steht dabei auf einer Seite durch eine erste Öffnung (12) mit dem Gehäuse (2) des Motors (3) und auf der gegenüberliegenden Seite durch eine zweite Öffnung (13) mit der Außenumgebung in Verbindung,

dadurch gekennzeichnet, dass

das Gebläserad (20) eine Wand (22) mit einschließt, welche der ersten Öffnung (12) gegenübersteht, sowie eine Reihe an radial angeordneten Klingen (21), welche der zweiten Öffnung (13) gegenüberstehen und einen kreisförmigen Bereich um ein Zentrum (23), wobei der kreisförmige Bereich mit Entlüftungsschlitzen (24) versehen ist und sich vor der ersten Öffnung (12) befindet.

2. Das Gerät (1) nach Patentanspruch 1, bei dem die Klingen (21) eine gewölbte Form aufweisen.

3. Das Gerät (1) nach Patentanspruch 1, bei dem sich die Klingen (21) vom Zentrum aus (23) bewegen und zu dem äußeren, größtenteils kreisrunden Ende der Wand (22) gelangen.

4. Das Gerät (1) nach Patentanspruch 1, bei dem der kreisförmige Bereich um das Zentrum (23) eine dekkelförmige Krone (25) ist. Die Entlüftungsschlitze (24) sind dabei an dem äußersten seitlichen Ende des Kronen-Bereichs und nahezu radial angeordnet. 5
5. Das Gerät (1) nach Patentanspruch 1, bei dem die Entlüftungsschlitze (24) viereckig geschnitten sind.
6. Das Gerät (1) nach Patentanspruch 4, bei dem die erste Öffnung (12) und die zweite Öffnung (13) eine kreisrunde Form aufweisen, wobei der Radius der ersten Öffnung (12) kleiner ist als der Radius der zweiten Öffnung (13). 10
7. Das Gerät (1) nach Patentanspruch 6, bei dem der Kronenbereich der Wand (22) einen Radius aufweist, der dem Radius der ersten Öffnung (12) entspricht. 15
4. L'appareil (1) de la revendication 1, où la zone circulaire autour du moyeu (23) est une couronne en forme de calotte (25), les événements (24) étant prévus sur le bord latéral le plus externe de la zone formée par la couronne et étant disposés presque radialement.
5. L'appareil (1) de la revendication 1, où les événements (24) sont formés par une découpe quadrangulaire.
6. L'appareil (1) de la revendication 4, où la première ouverture (12) et la deuxième ouverture (13) possèdent une conformation circulaire, un rayon de la première ouverture (12) étant plus petit qu'un rayon de la deuxième ouverture (13). 15
7. L'appareil (1) de la revendication 6, où la zone en couronne de la paroi (22) possède un rayon correspondant au rayon de la première ouverture (12). 20

Revendications

1. Un aspirateur souffleur portatif 1, comprenant : 25
- un boîtier (2) prévoyant une cavité (2a) ;
 - un moteur (3) logé dans la cavité (2a) du boîtier (2), le moteur (3) étant doté d'un arbre d'entraînement (7) ;
 - un ventilateur de refroidissement (9) adapté à une extrémité (7') de l'arbre d'entraînement (7) afin d'aspirer l'air de refroidissement depuis un environnement externe et pour envoyer l'air de refroidissement dans le boîtier (2) ; 30
 - une hélice de souffleur (20), adaptée à une extrémité (7'') de l'arbre d'entraînement (7) opposée à l'extrémité (7'), et disposée à l'intérieur d'une volute (11) ; 35
- la volute (11) communiquant sur un de ses côtés avec le boîtier (2) du moteur (3) à travers une première ouverture (12), et sur un de ses côtés opposé avec un environnement extérieur à travers une deuxième ouverture (13), 40
- caractérisé par le fait que** 45
- l'hélice de souffleur (20) comprend une paroi (22) qui fait face à la première ouverture (12), une série de lames radiales (21) qui font face à la deuxième ouverture (13) et une zone circulaire autour d'un moyeu (23) laquelle est dotée d'événements (24) et située face à la première ouverture (12). 50
2. L'appareil (1) de la revendication 1, où les lames (21) possèdent une conformation courbée. 55
3. L'appareil (1) de la revendication 1, où les lames (21) se développent à partir du moyeu (23) et atteignent un bord extérieur presque circulaire de la paroi (22).

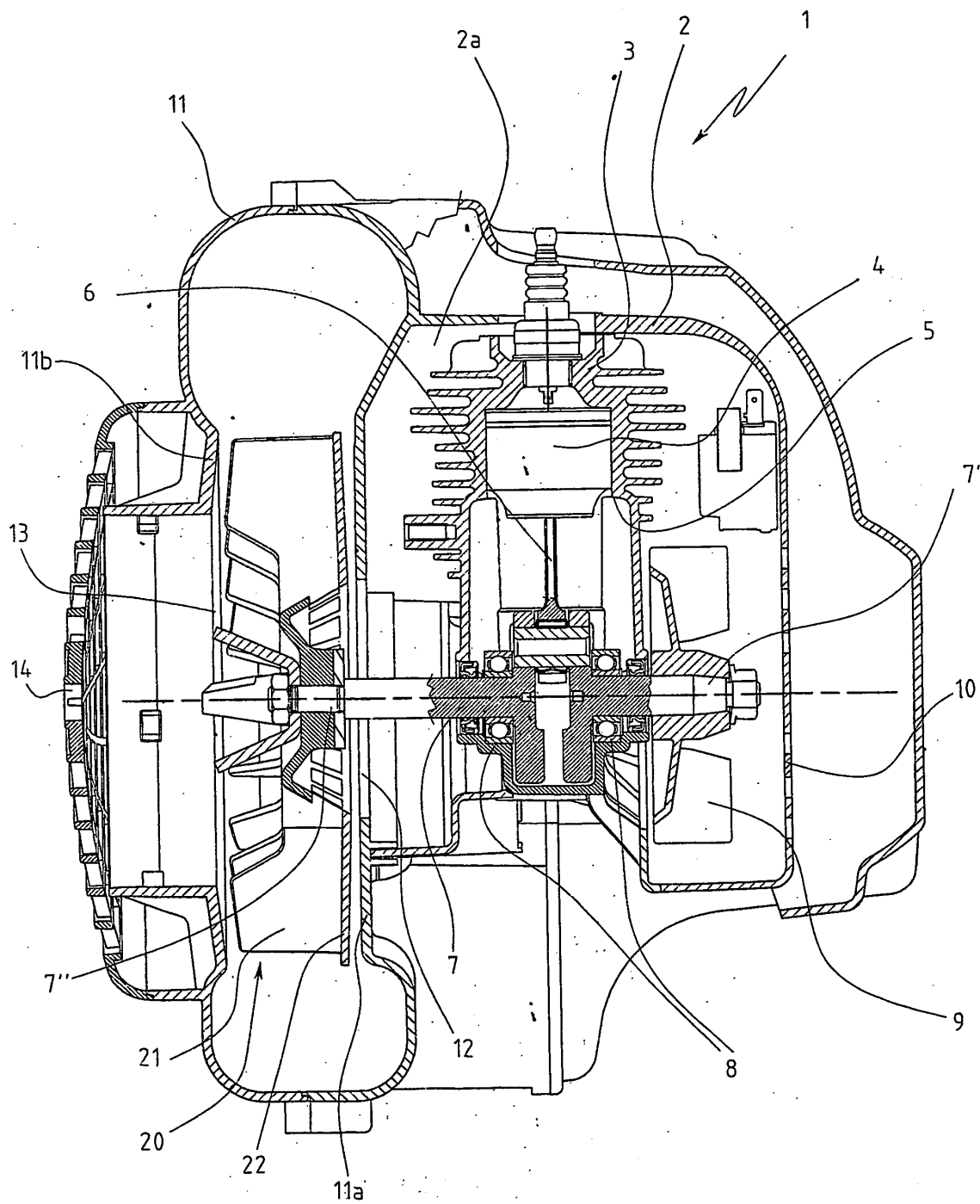


FIG.1

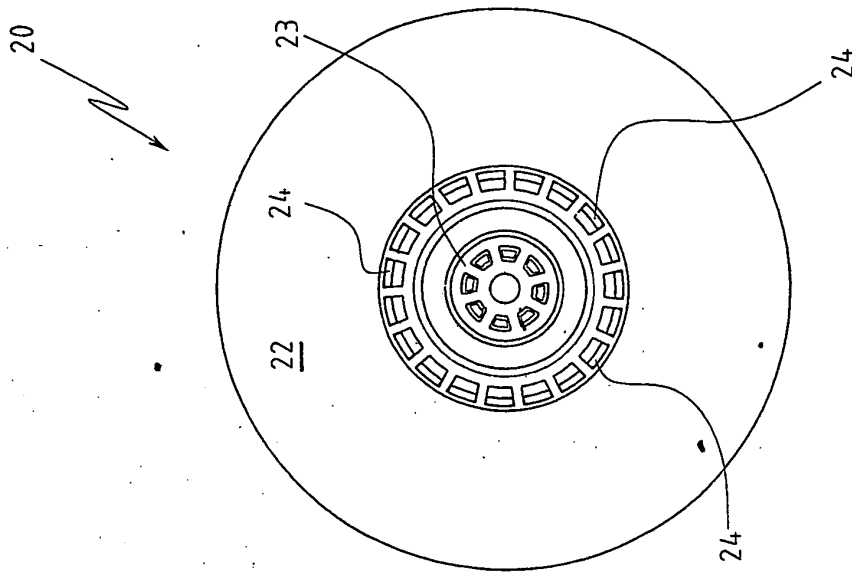


FIG. 4

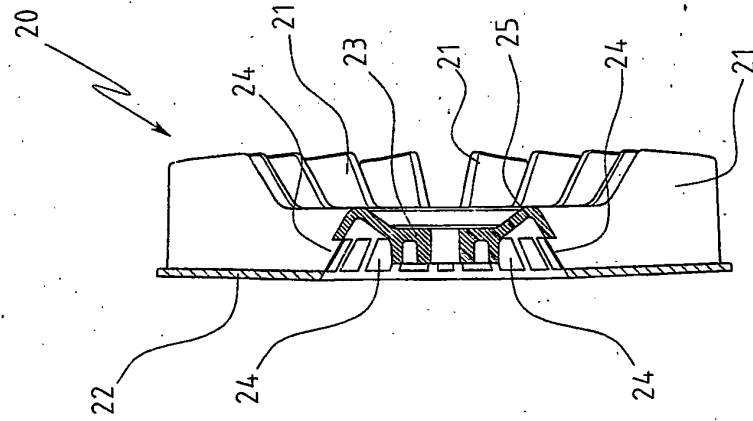


FIG. 3

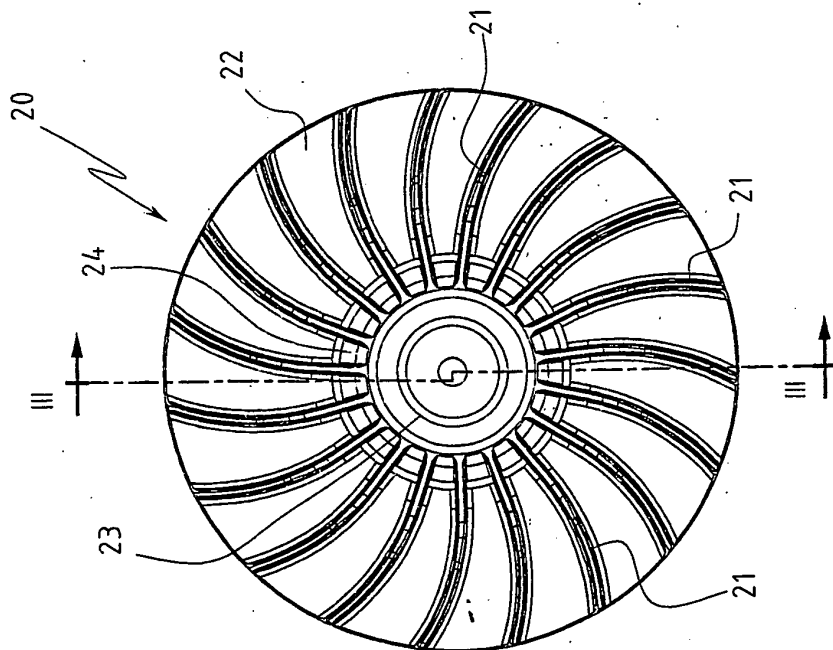


FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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