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(54) **Blower assembly with impeller for vacuum cleaner**

Staubsaugergebläse mit Laufrad

Soufflante d'aspirateur avec roue de ventilateur

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- **PATENT ABSTRACTS OF JAPAN, unexamined applications, M section, vol. 8, No. 182,August 22, 1984 THE PATENT OFFICE JAPANESE GOVERNMENT page 99 M 319**

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Description

[0001] This invention relates to vacuum cleaner blower assemblies and to vacuum cleaners, having an impeller and a blower motor driving the impeller.

[0002] In the field of household vacuum cleaners, JP-A-59-74396 discloses an impeller for an electric blower in which a shroud plate is defined in the vicinity of the inlet of an impeller by a continuous curve, as viewed in an axial plane, having a large curvature as compared to the inner diameter of the impeller. This design can reduce exhaust noise, but is liable to relatively increase the sound transmitted through walls in the vacuum cleaner, due to vibrations transmitted to the walls.

[0003] In JP-A-59-74396 also, a covering portion of the blower casing is disposed substantially perpendicularly to the shroud plate of the impeller in the vicinity of the inlet of the impeller. Consequently, when the axial direction of the incoming air flow changes to the radial direction in the inlet region of the impeller, the flow breaks away on the side of the shroud, causing a large loss. Since the aerodynamic condition of the flow is bad in the inlet section of the impeller, noise proportional to the product of the number of vanes and the rotational speed of the impeller tends to increase.

[0004] Additionally, since the length of overlap between the impeller inlet and the blower casing is determined by the thickness of the shroud plate of the impeller, the length of a sealing portion is limited to as small as 1 mm; thus, it is difficult to decrease the leakage flow rate between the shroud plate and the casing.

[0005] Furthermore, since the leak flow is substantially perpendicular to the main flow at the inlet of the impeller, break-away of the flow is promoted. Since the shroud plate is curved as viewed in the axial plane, the hub plate opposite the shroud plate and the shroud plate tend to be deformed during the fixing of the shroud plate and the vanes together, creating deviation of the impeller from the desired shape. Further, a gap tends to appear at the end surface of the vane inside the impeller, increasing leakage and loss.

[0006] The object of the present invention is at least partly to avoid the disadvantages described above, and to improve the air flow efficiency through the blower of a vacuum cleaner.

[0007] According to the invention in one aspect there is provided a vacuum cleaner blower assembly as set out in claim 1. In another aspect of the invention there is provided a vacuum cleaner as set out in claim 2, and in yet another aspect there is provided a vacuum cleaner as set out in claim 6.

[0008] Preferably the shroud plate of the impeller is frusto-conical in shape at its region adjacent the impeller vanes.

[0009] Embodiments of the invention will now be described by way of non-limitative example with reference to the accompanying drawings, in which:-

Fig. 1 is a side view, partly in cross section, of an electric blower including motor and blower, embodying the present invention;

Fig. 2 is an axial sectional view of part of the blower of Fig. 1 and illustrates the invention as set out in claims 2 and 6.

Figs. 3 and 4 are diagrams illustrating respectively the air flows in the blower of JP-A-59-74396 and the blower of Fig. 2; and

Fig. 5 is an axial sectional view showing another embodiment of the blower according to the present invention and illustrates the invention as set out in claims 1 and 2.

[0010] Embodiments of impellers and vacuum cleaner blowers of the invention will now be described. They may be fitted in conventional vacuum cleaners. Examples of vacuum cleaners in which they may be mounted are shown in European Patent Applications 91303152.2 and 91303496.3.

[0011] The electric vacuum cleaner blower shown in Fig. 1 and 2 is composed of a blower portion 80 and a motor portion 81. Disposed inside a housing 81a of the motor portion 81 are a rotor 83 secured to a rotating shaft 82 and a stator 85 including coils 84a and 84b. The housing 81 a has a bearing-retaining portion 81b formed at the centre of its end wall, and a bearing 86a for rotatably supporting one end of the rotating shaft 82 is disposed in the bearing-retaining portion 81b. The housing 81a also has exhaust ports 81c in its peripheral surface. The housing 81a has an end bracket 87 at the opposite end, and this end bracket 87 connects the blower portion 80 and the motor 81 together.

[0012] The end bracket 87 has a bearing retaining portion 87a at its centre and a flat portion 87b around its circumference. The flat portion 87b is formed with suction ports 88 through which the air from the blower 80 is sent into the motor 81 to cool it. Disposed in the bearing-retaining portion 87a is a bearing 86b for rotatably supporting the other end of the rotating shaft 82. The end bracket 87 carries a diffuser 89, and on the upstream side of the diffuser, a centrifugal impeller 90 is secured to the rotating shaft 82 by means of a nut 91. The centrifugal impeller 90 and the diffuser 89 are covered by a blower casing 92 pressure-fitted to the circumference of the end bracket 87. The blower casing 92 has a suction port 93 formed in its central portion to provide an inlet to the central inlet region of the impeller.

[0013] The diffuser 89 is composed of a plurality of diffuser vanes 94 arranged radially outside the circumference of the centrifugal impeller 90. A plural-ity of return guide vanes 95 are arranged on the back of a wall 89a lying adjacent the impeller 90 and supporting the diffuser vanes 94. The wall 89a has a rounded outer peripheral edge to smooth the air flow from the diffuser vanes 94 to the return guide vanes 95, and in conjunction with the wall 89a and the end bracket 87, the return guide vanes 95 define a return guide passage through

which the air flow is guided to the suction ports 88.

[0014] The general operation of the electric blower in the embodiment will now be described. When the motor 81 is energized so that the impeller 90 is rotated, air flows as indicated by the arrows in the drawing, through the suction port 93 and into the impeller 90. After discharge from the impeller 90, the air passes between the diffuser vanes 94, and after passing through the return guide passage, goes through the suction ports 88 into the housing 81a. The air flow introduced into the housing 81a cools the rotor 83, passes through an air passage defined by the stator 85 and the inner surface of the housing 81a, cools the coils 84a and 84b, and goes through the exhaust ports 81c formed in the periphery of the housing 81a to the outside.

[0015] Fig. 2 shows the configuration of the centrifugal impeller 90 and the diffuser region in more detail. The impeller 90 is composed of a plurality of vanes 96, a shroud plate 97 and hub plate 98. Each vane 96 has on each edge three protrusions which are fitted in holes formed in the shroud plate 97 and the hub plate 98 and then caulked or upset, so that these components are rigidly and tightly secured together at these connection points. The vanes 96 are curved as they extend outwardly, but for convenience this is not indicated in Fig. 2.

[0016] The outer diameter portion of the shroud plate 97 is frusto-conical, i.e. straight as seen in the axial plane, radially outwardly of the innermost point of connection 99 to the vanes 96. Inwardly of the point 99, the shroud plate 97 is shaped as to define a rounded portion 97a ending in an upwardly turned flange 97b whose end portion is at about 20° to the impeller axis. The radius of curvature of the rounded portion 87a is 0,7 times the vane inlet width. The blower casing 92 is shaped to provide an inwardly bent flange 92a, and a leakage gap 100 is left between the flange 92a and the flange 97b of the impeller 90. As seen in Fig. 2, the flanges 92a and 97b overlap axially (see also Figs. 4 and 5), with the flange 92a radially inside.

[0017] By virtue of the pressure difference between the inlet and outlet of the impeller 90, a part of the air flow leaving the impeller 90 passes between the impeller 90 and the blower casing 92 and flows again into the impeller inlet zone. Therefore, the impeller 90 acts on this leak flow too, and if the flow rate of this leakage is large, the performance of the electric blower is considerably degraded; however, since in the illustrated embodiment the length of the gap 100 is larger than the thickness of the shroud plate 97, the friction loss of the leak flow can be increased, thereby decreasing the leak flow rate.

[0018] Since the direction of the leak flow is parallel to the axis and in this region the main flow is also parallel to the axis, the leak flow does not have bad influence on the main flow, and since the radius of curvature of the rounded portion 97a of the shroud plate is large, the main flow breaks away from the shroud plate 97 at most only slightly.

[0019] From simulation experiments performed on the blower shown in Fig. 3 and blowers similar to the embodiment of Figs. 1 and 2 and using water flows chosen to be identical in terms of the Reynolds number, it has been found that in the case of the known structure as shown in Fig. 3, the flow breaks away considerably on the side of the shroud plate of the impeller, whereas in the case of the impeller of the present invention in which the ratio of the radius of the rounded portion 97a to the impeller vane inlet width (in the axial direction) was 0.5, the flow lies well along the shroud plate as illustrated by Fig. 4. Consequently, it is possible to suppress noise arising at a frequency corresponding to the product of the rotational speed and the number of vanes. Moreover, the energy loss of the impeller of Figs. 1 and 2 is low.

[0020] The shroud plate 97 is straight from its outer circumference to the innermost point of connection 99 as viewed in the axial plane, and there is only a small difference in height of the vane 96 between its inlet and outlet. Therefore, although the vane 96 is curved in the circumferential direction in a conventional manner, the force applied in caulking each protrusion of the vane 96 does not vary from one caulking point to another. Accordingly, the deformation of the shroud plate 97 and of the hub plate 98 is minimized even under the force applied to each caulking point. Consequently, hardly any gaps arise between the vanes 96, shroud plate 97 and hub plate 98, and leak flow between the pressure side and suction pressure side of the vane 96 is suppressed. Further, since any face deflection of the shroud plate 97 and of the hub plate 98 is small, unbalance hardly arises; thus, noise based on a frequency corresponding to the rotational speed decreases.

[0021] Another embodiment of the present invention will be described with reference to Fig. 5 showing a blower in partial sectional view. The shroud plate 97 is straight in its outer diameter portion, as viewed in the axial plane, and has a rounded portion 97a inwardly from the innermost point of connection 99, as in Fig. 2. The shroud plate 97 in this case is provided with a cylindrical portion 97b extending axially from the end of the rounded portion 97a. Furthermore, the blower casing 101 has an inwardly bent flange 101a at its inner diameter region, so that the gap 100 is left between the flange 101 and the cylindrical portion 97b of the impeller 90. Since the length of the gap 100 is much larger than the thickness of the shroud plate 97, the friction loss of the leak flow can be made very large, the leak flow can be reduced remarkably, and the efficiency of the electric blower can be improved.

[0022] A divisional application (94101775.8) has been filed, directed to features of the diffuser 89 of Figs. 1 and 2, such features being disclosed in EP-A-0 467 557.

Claims

1. A vacuum cleaner blower assembly having a blower motor (81), a vaned centrifugal impeller (90) driven by the blower motor (81) to rotate about an axis and an air diffuser (89) radially beyond the periphery of the impeller, the impeller having a shroud plate (97) at one axial side of the vanes (96) of the impeller, and the blower assembly having a casing providing an air inlet passage (93) for flow of air to an inlet region of said impeller, said air inlet passage (93) being provided by an inward annular wall (92) which extends inwardly towards the interior of the casing so as to surround the air inlet passage, wherein, to improve air flow efficiency at the impeller inlet (i) as seen in axial section the shroud plate (97) extends from the inlet ends of the vanes (96) to an inner edge which is spaced axially from the inlet ends of the vanes, (ii) between the inlet ends of the vanes (96) and said inner edge the shroud plate forms a flange (97a,97b) which curves with a convex face facing the regions of air flow to the vanes (96) and (iii) said inward annular wall (92a) axially overlaps said flange (97a,97b) of said shroud plate so as to lie at the radially inner side thereof, **characterised in that** the overlapping portions of said flange (97a, 97b) and said inward annular wall. (92a) are parallel to the axis of rotation of said impeller, and as seen in axial cross-section said inner edge is spaced towards the axis from the inlet ends of the vanes.

2. A vacuum cleaner having an impeller (90), a blower motor (81) drivingly coupled to said impeller (90) and a casing (92) covering said impeller, the casing (92) having an air inlet passage (93) for flow of air to an inlet region of said impeller, said air inlet passage being provided by an inward annular wall (92a) of said casing which extends inwardly towards the interior of the casing so as to surround the air inlet passage, said impeller having a central air inlet region around its axis of rotation, a plurality of vanes (96) extending outwardly from said inlet region and a shroud plate (97) covering said vanes (96) at one axial side thereof and attached to said vanes, in which said shroud plate (97) extends substantially straight, as seen in axial cross section, from an innermost point of connection (99) to each said vane to the outer peripheral ends of the vanes, and radially inwardly from said innermost point of connection said shroud plate (97) is curved as seen in axial section to provide a flange (97a,97b) surrounding said inlet region and directed away from said vanes, **characterised in that** said inward annular wall (92a) of said casing, as seen in axial cross-section, axially overlaps said flange (97a, 97b) so as to lie at the radially inner side thereof, and the extremity of said flange (97a,97b) of said shroud plate is parallel to or at an angle of not more than 30° to the axis, as seen in axial cross-section.

3. A vacuum cleaner according to claim 2 where said shroud plate (97) is frustoconical in shape at its region contiguous to said vanes (96).

4. A vacuum cleaner according to claim 2 or claim 3 wherein the overlapping portion of said flange (97a, 97b) and said inward annular wall (92a) are parallel to the axis of rotation of said impeller.

5. A vacuum cleaner according to any one of claims 2 to 4 wherein the ratio of (a) the radius of curvature of the r shroud plate (97) at its region (97a) of curvature into said flange, to (b) the vane inlet width in the axial direction is in the range 0.5 to 1.0.

6. A vacuum cleaner having an impeller (90), a blower motor (81) drivingly coupled to said impeller (90) and a casing (92) covering said impeller, the casing (92) having an air inlet passage (93) for flow of air to an inlet region of said impeller, said air inlet passage being provided by an inward annular wall (92a) of said casing which extends inwardly towards the interior of the casing so as to surround the air inlet passage, said impeller having a central air inlet region around its axis of rotation, a plurality of vanes (96) extending outwardly from said inlet region and a shroud plate (97) covering said vanes (96) at one axial side thereof and attached to said vanes, in which said shroud plate (97) extends substantially straight, as seen in axial cross section, from an innermost point of connection (99) to each said vane to the outer peripheral ends of the vanes, and radially inwardly from said innermost point of connection said shroud plate (97) is curved as seen in axial section to provide a flange (97a,97b) surrounding said inlet region and directed away from said vanes, **characterised in that** said inward annular wall (92a) of said casing, as seen in axial cross-section, axially overlaps said flange so as to lie at the radially inner side thereof, and (iv) the ratio of (a) the radius of curvature of the shroud plate (97) at its region (97a) of curvature into said flange, to (b) the vane inlet width in the axial direction is in the range 0.5 to 1.0.

Patentansprüche

1. Gebläseanordnung für einen Staubsauger mit einem Gebläsemotor (81), einem mit Schaufeln versehenen Zentrifugallaufrad (90), das vom Gebläsemotor (81) so angetrieben wird, daß es sich um eine Achse dreht, und einem Luftumlenker (89) radial jenseits des Umfangs des Laufrads, das an einer axialen Seite der Schaufeln (96) des Laufrads eine Verkleidungsplatte (97) aufweist, und wobei die Ge-

bläseanordnung ein Gehäuse aufweist, das einen Lufteinlaßdurchtritt (93) zum Strömen von Luft zu einem Einlaßbereich des Laufrads vorsieht, wobei der Lufteinlaßdurchtritt (93) mittels einer einwärts gerichteten ringförmigen Wand (92) zur Verfügung gestellt ist, die sich nach innen in Richtung des Inneren des Gehäuses erstreckt, so daß sie den Lufteinlaßdurchtritt umgibt, wobei sich zum Verbessern des Luftströmungswirkungsgrads am Laufradeinlaß, (i) im axialen Schnitt gesehen, die Verkleidungsplatte (97) von den Einlaßenden der Schaufeln (96) zu einer Innenkante erstreckt, die axial von den Einlaßenden der Schaufeln beabstandet ist, (ii) zwischen den Einlaßenden der Schaufeln (96) und der Innenkante der Verkleidungsplatte ein Flansch (97a, 97b) ausgebildet ist, der mit einer konvexen Seite gekrümmt ist, die zu den Bereichen der Luftströmung zu den Schaufeln (96) zeigt, und (iii) die einwärts gerichtete ringförmige Wand (92a) mit dem Flansch (97a, 97b) der Verkleidungsplatte axial überlappt, um so an dessen radial inneren Seite zu liegen, **dadurch gekennzeichnet, daß** die überlappenden Bereiche des Flanschs (97a, 97b) und der einwärts gerichteten ringförmigen Wand (92a) parallel zur Drehachse des Laufrades sind, und im axialen Schnitt gesehen die Innenkante von den Einlaßenden der Schaufeln in Richtung zur Achse hin beabstandet ist.

2. Staubsauger mit einem Laufrad (90), einem antreibend mit dem Laufrad (90) verbundenen Gebläsemotor (81) und einem das Laufrad umgebenden Gehäuse (92), wobei das Gehäuse (92) einen Lufteinlaßdurchtritt (93) zum Strömen von Luft zu einem Einlaßbereich des Laufrads aufweist, wobei der Lufteinlaßdurchtritt durch eine einwärts gerichtete ringförmige Wand (92a) des Gehäuses zur Verfügung gestellt ist, die sich einwärts in Richtung des Inneren des Gehäuses erstreckt, so daß sie den Lufteinlaßdurchtritt umgibt, wobei das Laufrad um seine Drehachse herum einen zentralen Lufteinlaßbereich, eine Vielzahl von sich von dem Einlaßbereich nach außen erstreckender Schaufeln (96) und eine Verkleidungsplatte (97) aufweist, die die Schaufeln (96) an einer ihrer axialen Seiten bedeckt und an den Schaufeln angebracht ist, wobei die Verkleidungsplatte (97) im axialen Schnitt gesehen von einem innersten Verbindungspunkt (99) mit jeder Schaufel zu den Außenumfangsenden der Schaufeln im wesentlichen gerade verläuft und radial innerhalb dieses innersten Verbindungspunkts im axialen Schnitt gesehen so gekrümmt ist, daß sie einen den Einlaßbereich umgebenden und von den Schaufeln weggerichteten Flansch (97a, 97b) bildet, **dadurch gekennzeichnet, daß** die einwärts gerichtete ringförmige Wand (92a) des Gehäuses im axialen Schnitt gesehen den Flansch (97a, 97b) axial überlappt, um so an dessen radial inneren Seite zu liegen, und sich das Ende des Flanschs (97a, 97b) der Verkleidungsplatte im axialen Schnitt gesehen parallel zur Achse oder in einem Winkel von nicht mehr als 30° zur Achse befindet.

3. Staubsauger nach Anspruch 2, wobei die Verkleidungsplatte (97) in ihrem Bereich benachbart zu den Schaufeln (96) kegelstumpfförmig ist.

4. Staubsauger nach Anspruch 2 oder 3, wobei der überlappende Abschnitt des Flanschs (97a, 97b) und die einwärts gerichtete ringförmige Wand (92a) parallel zur Drehachse des Laufrades sind.

5. Staubsauger nach einem der Ansprüche 2 bis 4, wobei das Verhältnis von (a) dem Krümmungsradius der Verkleidungsplatte (97) in ihrem Krümmungsbereich (97a) in den Flansch zu (b) der Einlaßbreite der Schaufeln in axialer Richtung im Bereich von 0,5 bis 1,0 liegt.

6. Staubsauger mit einem Laufrad (90), einem antreibend mit dem Laufrad (90) verbundenen Gebläsemotor (81) und einem das Laufrad umgebenden Gehäuse (92), wobei das Gehäuse (92) einen Lufteinlaßdurchtritt (93) zum Strömen von Luft zu einem Einlaßbereich des Laufrads aufweist, wobei der Lufteinlaßdurchtritt durch eine einwärts gerichtete ringförmige Wand (92a) des Gehäuses zur Verfügung gestellt ist, die sich einwärts in Richtung des Inneren des Gehäuses erstreckt, so daß sie den Lufteinlaßdurchtritt umgibt, wobei das Laufrad um seine Drehachse herum einen zentralen Lufteinlaßbereich, eine Vielzahl von sich von dem Einlaßbereich nach außen erstreckender Schaufeln (96) und eine Verkleidungsplatte (97) aufweist, die die Schaufeln (96) an einer ihrer axialen Seiten bedeckt und an den Schaufeln angebracht ist, wobei die Verkleidungsplatte (97) im axialen Schnitt gesehen von einem innersten Verbindungspunkt (99) mit jeder Schaufel zu den Außenumfangsenden der Schaufeln im wesentlichen gerade verläuft und radial innerhalb dieses innersten Verbindungspunkts im axialen Schnitt gesehen so gekrümmt ist, daß sie einen den Einlaßbereich umgebenden und von den Schaufeln weggerichteten Flansch (97a, 97b) bildet, **dadurch gekennzeichnet, daß** die einwärts gerichtete ringförmige Wand (92a) des Gehäuses im axialen Schnitt gesehen den Flansch (97a, 97b) axial überlappt, um so an dessen radial inneren Seite zu liegen, und (iv) das Verhältnis von (a) dem Krümmungsradius der Verkleidungsplatte (97) in ihrem Krümmungsbereich (97a) in den Flansch zu (b) der Einlaßbreite der Schaufeln in axialer Richtung im Bereich von 0,5 bis 1,0 liegt.

Revendications

1. Ensemble formant soufflante d'aspirateur présentant un moteur à soufflante (81), une roue de ventilateur centrifuge à ailettes (90) entraînée par le moteur à soufflante (81) pour tourner autour d'un axe et un diffuseur d'air (89) radialement au-delà de la périphérie de la roue de ventilateur, la roue de ventilateur présentant une plaque de protection (97) à un côté axial des ailettes (96) de la roue de ventilateur, et l'ensemble formant soufflante ayant un boîtier réalisant un passage d'entrée d'air (93) pour le flux d'air à une région d'entrée de ladite roue de ventilateur, ledit passage d'entrée d'air (93) étant réalisé par une paroi annulaire interne (92) qui s'étend en dedans, vers l'intérieur du boîtier de façon à entourer le passage d'entrée d'air où, pour améliorer l'efficacité du flux d'air à l'entrée de la roue de ventilateur (i) en regardant suivant la section axiale, la plaque de protection (97) s'étend depuis les extrémités d'entrée des ailettes (96) à un bord interne qui est espacé axialement des extrémités d'entrée des ailettes, (ii) entre les extrémités d'entrée des ailettes (96) et ledit bord interne, la plaque de protection forme un rebord (97a, 97b) qui est courbé avec une face convexe orientée vers les régions du flux d'air vers les ailettes (96) et (iii) ladite paroi annulaire intérieure (92a) recouvrant axialement ledit rebord (97a, 97b) de ladite plaque de protection de façon à se situer au côté radialement interne de celui-ci, **caractérisé en ce que** les portions à recouvrement dudit rebord (97a, 97b) et ladite paroi annulaire intérieure (92a) sont parallèles à l'axe de rotation de ladite roue de ventilateur, et en regardant en section transversale axiale, ledit bord intérieur est espacé vers l'axe depuis les extrémités d'entrée des ailettes.

2. Aspirateur comportant une roue de ventilateur (90), un moteur à soufflante (81) accouplé de façon menante à ladite roue de ventilateur (90) et un boîtier (92) couvrant ladite roue de ventilateur, le boîtier (92) possédant un passage d'entrée d'air (93) pour le flux d'air à une région d'entrée de ladite roue de ventilateur, ledit passage d'entrée d'air étant réalisé par une paroi annulaire interne (92a) dudit boîtier qui s'étend en dedans vers l'intérieur du boîtier de manière à entourer le passage d'entrée d'air, ladite roue de ventilateur ayant une région d'entrée d'air centrale autour de son axe de rotation, une pluralité d'ailettes (96) s'étendant vers l'extérieur à partir de ladite région d'entrée et une plaque de protection (97) couvrant lesdites ailettes (96) à un côté axial de celles-ci et attachée auxdites ailettes, où ladite plaque de protection (97) s'étend sensiblement de façon rectiligne, en regardant suivant la section transversale axiale, depuis un point de connexion le plus interne (99) à chacune desdites ailettes aux extrémités périphériques externes des ailettes, et radialement vers l'intérieur depuis ledit point de connexion le plus interne, ladite plaque de protection (97) est courbée en regardant suivant la section axiale, pour réaliser un rebord (97a, 97b) entourant ladite région d'entrée et dirigé au loin desdites ailettes, **caractérisé en ce que** ladite paroi annulaire interne (92a) dudit boîtier, en regardant en section transversale axiale, recouvre axialement ledit rebord (97a, 97b) de manière à se situer à un côté radialement interne de celui-ci, et l'extrémité dudit rebord (97a, 97b) de ladite plaque de protection est parallèle ou à un angle non supérieur à 30° à l'axe, en regardant en section transversale axiale.

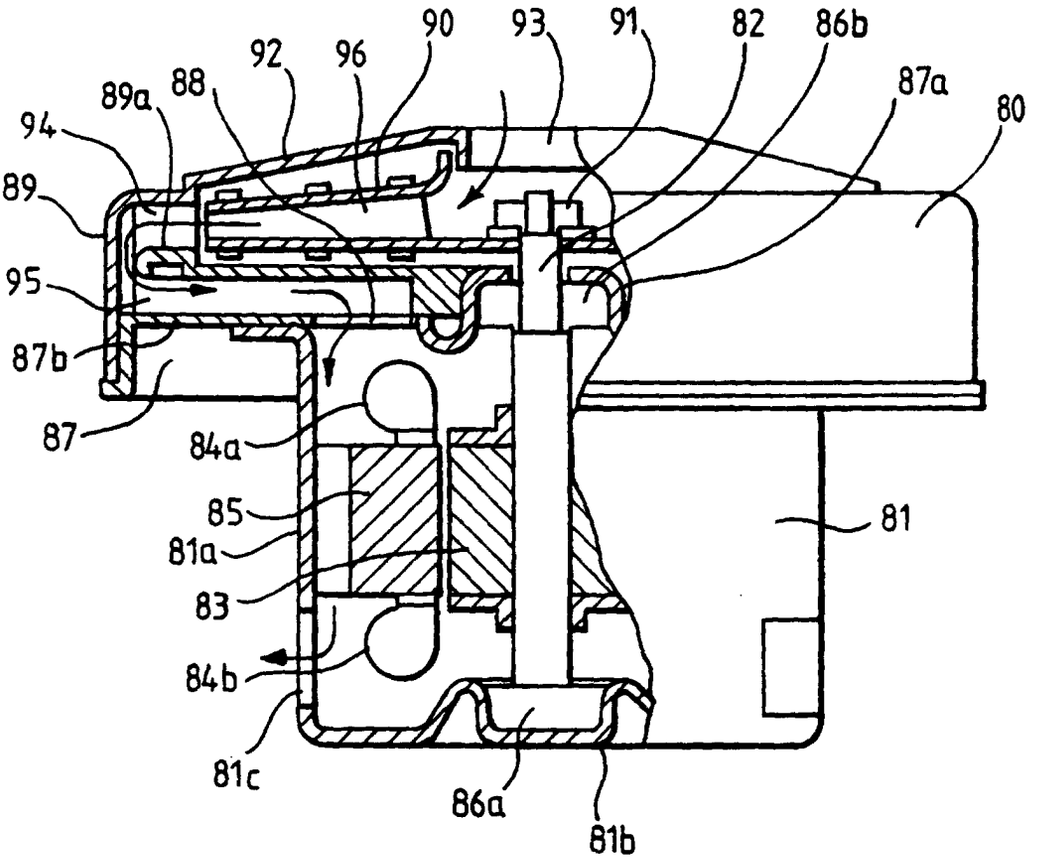
3. Aspirateur selon la revendication 2, où ladite plaque de protection (97) a une forme tronconique à sa région contiguë auxdites ailettes (96).

4. Aspirateur selon la revendication 2 ou la revendication 3, où la partie à recouvrement dudit rebord (97a, 97b) et ladite paroi annulaire interne (92a) sont parallèles à l'axe de rotation de ladite roue de ventilateur.

5. Aspirateur selon l'une des revendications 2 à 4, où le rapport (a) du rayon de courbure de la plaque de protection (97) à sa région (97a) de courbure dans ledit rebord, à (b) la largeur d'entrée d'ailette dans la direction axiale se situe dans la plage comprise entre 0,5 et 1,0.

6. Aspirateur comportant une roue de ventilateur (90), un moteur à soufflante (81) accouplé de façon menante à ladite roue de ventilateur (90) et un boîtier (92) couvrant ladite roue de ventilateur, le boîtier (92) possédant un passage d'entrée d'air (93) pour le flux d'air à une région d'entrée de ladite roue de ventilateur, ledit passage d'entrée d'air étant réalisé par une paroi annulaire interne (92a) dudit boîtier qui s'étend en dedans, vers l'intérieur du boîtier de façon à entourer le passage d'entrée d'air, ladite roue de ventilateur ayant une région d'entrée d'air centrale autour de son axe de rotation, une pluralité d'ailettes (96) s'étendant vers l'extérieur à partir de ladite région d'entrée et une plaque de protection (97) couvrant lesdites ailettes (96) à un côté axial de celles-ci et attachée auxdites ailettes, où ladite plaque de protection (97) s'étend d'une manière sensiblement rectiligne, en regardant en section transversale axiale, à partir d'un point de connexion le plus interne (99) à chacune desdites ailettes aux extrémités périphériques extérieures des ailettes, et radialement vers l'intérieur à partir dudit point de connexion le plus interne, ladite plaque de protection (97) est courbée, en regardant en section axiale, pour réaliser un rebord (97a, 97b) entourant ladite région d'entrée et dirigé au loin desdites ailet-

tes, **caractérisé en ce que** ladite paroi annulaire interne (92a) dudit boîtier, en regardant en section transversale axiale, recouvre axialement ledit rebord de manière à se situer au côté radialement interne de celui-ci et (iv) le rapport de (a) le rayon de courbure de la plaque de protection (97) à sa région (97a) de courbure dans ledit rebord, à (b) la largeur d'entrée d'ailette dans la direction axiale se situe dans la plage comprise entre 0,5 et 1,0.


90
93
91
82
86b
92
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89a
87a
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81a
83
84b
81c
86a
81b
81

Fig. 1.

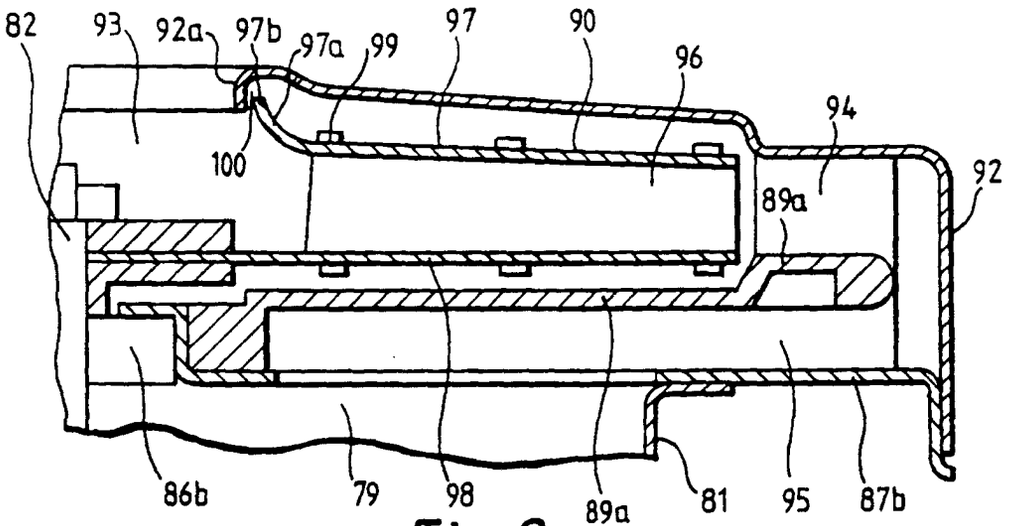


Fig.2.

Fig.3.

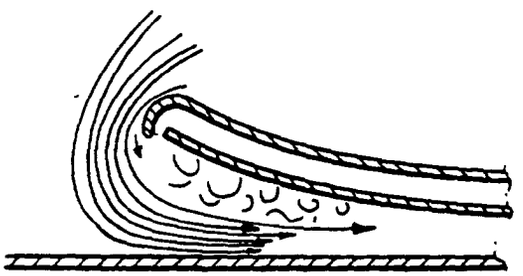
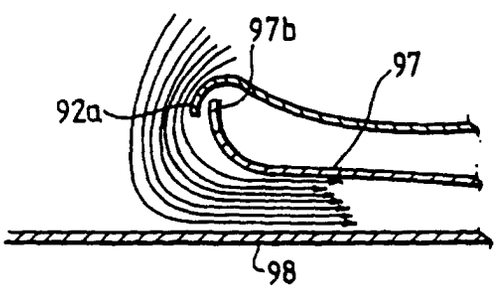


Fig.4.



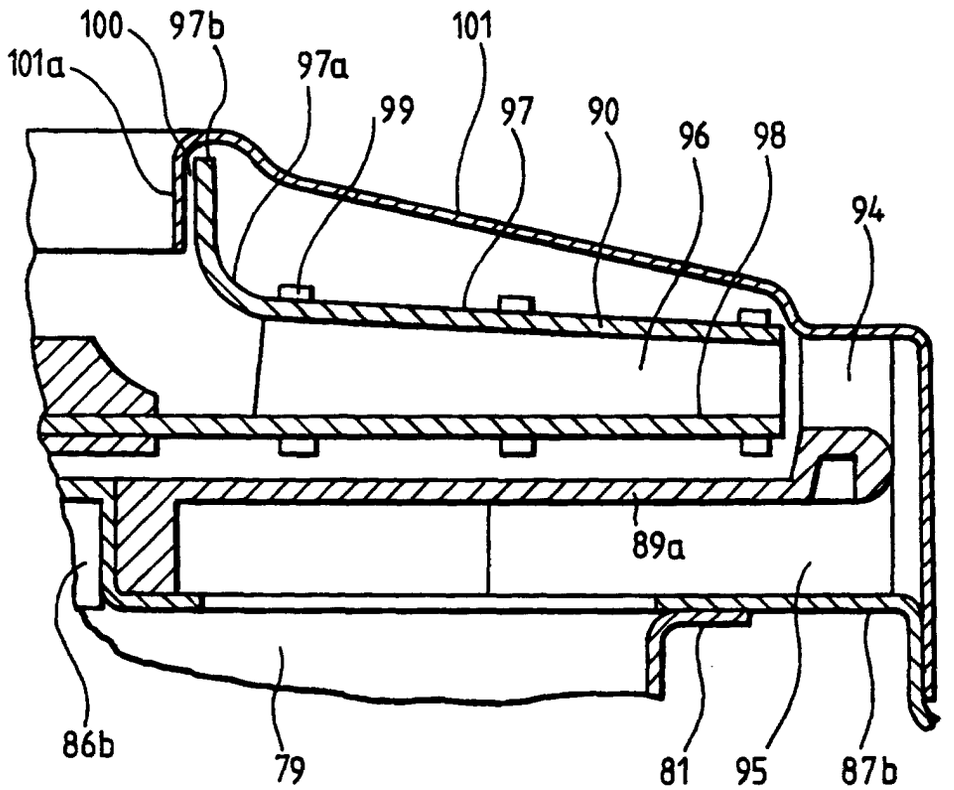


Fig.5.