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(54) **Blowing device**

Blasvorrichtung

Dispositif de soufflage

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Description

[0001] The present invention relates to a blowing device for small-sized electronic appliances such as cleaning apparatus, and, in particular, to a blowing device which comprises a centrifugal impeller and a guide vane optimally designed to maximize fan efficiency and heat dissipation of a motor without a diffuser.

[0002] Fig. 1 is a perspective view illustrating a conventional blowing device, and Fig. 2 is a cross-sectional view illustrating a main component of the conventional blowing device.

[0003] The conventional blowing device comprises a housing 4 having an intake port 1 and a discharge port 2, a centrifugal impeller 10 rotatably equipped within the housing 4, and a motor 20 connected to the centrifugal impeller 10 via a shaft 21 to rotate the centrifugal impeller 10.

[0004] The intake port 1 of the housing 4 is located at the center of a front side of the housing 4, and the discharge port 2 of the housing 4 is located at a rear side of the housing 4.

[0005] The centrifugal impeller 10 acts to blow air in a centrifugal direction. The centrifugal impeller 10 comprises a shroud 12 having an inlet 12' communicated with the intake port 1 of the housing 4, a hub 14 separated from the shroud 12 in an axial direction while being coupled to the shaft 21 of the motor 20 to integrally rotate with the shaft 21, and a plurality of blades 16 radially disposed between the shroud 12 and the hub 14.

[0006] As the floor area ratio of the centrifugal impeller 10 to the housing 4 is increased, the centrifugal impeller 10 can have an increased blowing capacity. However, if the floor area ratio of the centrifugal impeller 10 to the housing 4 is excessive, the centrifugal impeller 10 can interfere with the housing 4, and in particular, there occurs an increase in flow resistance of air blown from the centrifugal impeller 10 to the discharge port 2 of the housing 4. Accordingly, the centrifugal impeller 10 is designed to maintain a predetermined distance G from the housing 4.

[0007] Here, the shroud 12, the hub 14, and the blades 16 are typically designed to have an identical outer diameter 10D. For reference, the outer diameter of the blades 16 refers to a diameter of a circle which is defined by connecting distal ends of the plurality of blades 16.

[0008] In the mean time, the housing 4 is provided with a guide vane 30 to guide the air from the centrifugal impeller 10 to the discharge port 2 of the housing 4.

[0009] Operation of the conventional blowing device constructed as described above will be described as follows.

[0010] When the motor 20 is driven, the centrifugal impeller 10 is rotated by rotational force of the motor 20.

[0011] Then, air outside the housing 4 is sucked into the centrifugal impeller 10 through the intake port 1 of the housing 4 and the inlet 12' of the shroud 12. The air sucked into the centrifugal impeller 10 is blown in the centrifugal direction of the centrifugal impeller 10 by the plurality of blades 16, and is discharged from the centrifugal impeller 10. The air discharged from the centrifugal impeller 10 is guided by the guide vane 30, and is discharged from the housing 4 through the discharge port 2 of the housing 4.

[0012] As such, the centrifugal impeller 10 forcibly blows the air to generate blowing force.

[0013] Meanwhile, the air discharged from the housing 4 can be introduced into the motor 20 for heat dissipation of the motor 20.

[0014] As such, since the conventional blowing device constructed as described above does not comprise a diffuser for distribution of air blown from the centrifugal impeller 10 to the guide vane 30, and thus can be designed to have small dimensions, it is appropriate for small-sized electronic appliances such as cleaning apparatuses. However, the conventional blowing device has a problem in that absence of the diffuser causes the air discharged from the centrifugal impeller 10 not to smoothly flow to the guide vane 30, and to leak to the intake port 1 of the housing 4 through a gap between the housing 4 and the shroud 12, lowering fan efficiency.

[0015] Additionally, the conventional blowing device has a problem in that, if the motor 20 is designed to dissipate heat using the air discharged from the housing 4, the fan efficiency is lowered, causing insufficient heat dissipation of the motor 20.

[0016] Additionally, there is a problem in that air flow leaked from the intake port 1 of the housing 4 collides with air flow sucked through the intake port 1 of the housing 4, causing severe flow noise.

[0017] In FR 879.346, a ventilator having a tube shaped cylindrical housing is disclosed.

[0018] The present invention has been made to solve the above problems, and it is an object of the present invention to provide a blowing device which comprises a centrifugal impeller and a guide vane optimally designed to smoothly guide air from the centrifugal impeller to the guide vane, so that the blowing device can be reduced in dimensions and noise, while maximizing fan efficiency and heat dissipation of a motor.

[0019] In accordance with the present invention, the above and other objects can be accomplished by the provision of a blowing device as defined in claim 1, comprising: a housing having an intake port and a discharge port, a shroud rotatably equipped within the housing and having an inlet communicated with the intake port of the housing, a hub separated from the shroud in an axial direction while being connected to the motor, and a plurality of impeller blades radially disposed between the hub and the shroud, wherein the impeller blades have an average diameter in the range of 87 ~ 93 % of a diameter of the housing.

[0020] The shroud has an outer diameter in the range of 103 ~ 106 % of the average diameter of the impeller blades.

[0021] Each impeller blade may have a distal end per-

pendicular to the axial direction or slanted such that an outer diameter of the impeller blade is gradually decreased from the shroud to the hub.

[0022] The hub may have an outer diameter in the range of 95 ~ 98 % of the average diameter of the impeller blades.

[0023] An axial distance between a distal end of the shroud and a distal end of the hub may be in the range of 25 - 50 % of an axial height of the housing.

[0024] The blowing device further comprises: a guide vane

[0025] including a guide vane plate opposite to the hub, and a plurality of guide vane blades radially disposed to the guide vane plate, wherein the guide vane blades have an outer diameter in the range of 103 - 108 % of the average diameter of the impeller blades.

[0026] The guide vane plate may have an outer diameter in the range of 100 - 102 % of the average diameter of the impeller blades.

[0027] The guide vane may have an axial height in the range of 100 - 110 % of the axial distance between the distal end of the shroud and the distal end of the hub.

[0028] A blowing device may further comprise: a housing having an intake port and a discharge port, a shroud rotatably equipped within the housing and having an inlet communicated with the intake port of the housing, a hub separated from the shroud in an axial direction while being connected to the motor, and a plurality of impeller blades radially disposed between the hub and the shroud, wherein the impeller blades have an average diameter in the range of 87 - 93 % of a diameter of the housing, the shroud has an outer diameter in the range of 103 - 106 % of the average diameter of the impeller blades, the hub has an outer diameter in the range of 95 - 98 % of the average diameter of the impeller blades, and an axial distance between a distal end of the shroud and a

[0029] distal end of the hub is in the range of 25 - 50 % of an axial height of the housing.

[0030] The blowing device may further comprise: a guide vane including a guide vane plate opposite to the hub, and a plurality of guide vane blades radially disposed to the guide vane plate, wherein the guide vane plate has an outer diameter in the range of 100 - 102 % of the average diameter of the impeller blades, the guide vane blades have an outer diameter in the range of 103 ~ 108 % of the average diameter of the impeller blades, and the guide vane has an axial height in the range of 100 ~ 110 % of the axial distance between the distal end of the shroud and the distal end of the hub.

[0031] Each impeller blade may have a distal end perpendicular to the axial direction or slanted such that an outer diameter of the impeller blade is gradually decreased from the shroud to the hub.

[0032] A blowing device may still further comprise: a housing having an intake port and a discharge port, a shroud rotatably equipped within the housing and having an inlet communicated with the intake port of the housing, a hub separated from the shroud in an axial direction while being connected to the motor, and a plurality of impeller blades radially disposed between the hub and the shroud, wherein the impeller blades have an average diameter smaller than a diameter of the shroud.

[0033] Here, when outer diameters of the impeller blades refer to diameters of circles defined by connecting distal ends of the plurality of impeller blades, the average diameter of the impeller blades refers to an average of the outer diameters of the impeller blades in an axial direction.

[0034] The hub may have a diameter smaller than the average diameter of the impeller blades.

[0035] One of the advantages of the blowing apparatus constructed as described above is that the centrifugal impeller and the guide vane are optimally designed to allow air to smoothly flow from the centrifugal impeller to the guide vane without a diffuser, so that the blowing device can be reduced in dimensions and noise, while ensuring good fan efficiency and heat dissipation of a motor.

[0036] The foregoing and other objects and features of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view illustrating a conventional blowing device;

Fig. 2 is a cross-sectional view illustrating a main component of the conventional blowing device;

Fig. 3 is a cross-sectional view illustrating a main component of a blowing device in accordance with a first embodiment of the present invention;

Fig. 4 is a graph depicting fan efficiency according to variation in ratio of an average diameter of impeller blades to a diameter of a housing of the blowing device in accordance with the present invention;

Fig. 5 is a graph depicting the fan efficiency according to variation in ratio of an outer diameter of a shroud to the diameter of the housing of the blowing device in accordance with the present invention;

Fig. 6 is a graph depicting the fan efficiency according to variation in ratio of the outer diameter of the shroud to the average diameter of the impeller blades of the blowing device in accordance with the present invention;

Fig. 7 is a graph depicting the fan efficiency according to variation in ratio of the outer diameter of the hub to the average diameter of the impeller blades of the blowing device in accordance with the present invention;

Fig. 8 is a graph depicting the fan efficiency according to variation in ratio of an outer diameter of guide vane blades to the diameter of the housing of the blowing device in accordance with the present invention;

Fig. 9 is a graph depicting the fan efficiency according to variation in ratio of the outer diameter of the

guide vane blades to the average diameter of the impeller blades of the blowing device in accordance with the present invention;

Fig. 10 is a graph depicting the fan efficiency according to variation in ratio of an outer diameter of a guide vane plate to the diameter of the housing of the blowing device in accordance with the present invention;

Fig. 11 is a graph depicting the fan efficiency according to variation in ratio of the outer diameter of the guide vane plate to the average diameter of the impeller blades of the blowing device in accordance with the present invention;

Fig. 12 is a graph depicting the fan efficiency according to variation in ratio of an axial height of the guide vane to an impeller height of a centrifugal impeller of the blowing device in accordance with the present invention;

Fig. 13 is a graph depicting pressure coefficients of inventive and conventional blowing devices;

Fig. 14 is a graph depicting the fan efficiency of the inventive and conventional blowing devices; and

Fig. 15 is a cross-sectional view illustrating a blowing device in accordance with a second embodiment of the present invention.

[0037] Preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings, in which like reference numerals refer to like components throughout.

[0038] It should be noted that although various embodiments can be realized within the scope of the invention, most preferred embodiments of the invention will be described hereinafter. Meanwhile, since the structure of a blowing device is the same as that of the conventional blowing device as described above, detailed description thereof will be omitted hereinafter.

[0039] Fig. 3 is a cross-sectional view illustrating a main component of a blowing device according to a first embodiment of the invention.

[0040] The blowing device according to the first embodiment of the invention comprises a housing 50 having an intake port 51 and a discharge port 42, a centrifugal impeller 60 rotatably equipped within the housing 50 while being connected to a motor via a shaft 54 to generate blowing force from the intake port 51 to the discharge port 52 of the housing 50, and a guide vane 70 equipped within the housing 50 to guide air blown by the centrifugal impeller 60 to the discharge port 52 of the housing 50.

[0041] The intake port 51 of the housing 50 is located at the center of a front side of the housing 50 so as to allow air to be sucked into the housing 50. The outlet 52 of the housing 50 is located at a rear side of the housing 50. Here, the rear side of the housing 50 can be entirely open.

[0042] The housing 50 may be designed to have an axial height 50H in the range of 20 - 100 % of a diameter 50D of the housing 50. Here, the diameter 50D of the housing 50 refers to a diameter at a portion of the housing 50 where the centrifugal impeller 60 is located.

[0043] The centrifugal impeller 60 comprises a shroud 62 having an inlet 62' communicated with the intake port 51 of the housing 50, a hub 64 separated from a rear side of the shroud 12 while being integrally coupled to the shaft 54 of the motor to rotate with the shaft 54, and a plurality of impeller blades 66 radially disposed between the hub 64 and the shroud 62.

[0044] The shroud 62, the hub 64, and the impeller blades 66 are designed as follows in order to maximize fan efficiency and heat dissipation of the motor. For reference, since the size of the housing 50, and an average diameter of the impeller blades 66 are references for designing the shroud 62, the hub 64, and the impeller blades 66, the impeller blades 66 will be described first, and then the shroud 62 and the hub 64 will be described subsequently.

[0045] The impeller blades 66 must be designed to maximize blowing capacity of the centrifugal impeller 60 while minimizing flow loss due to a narrow space between the housing 50 and the centrifugal impeller 60 under a predetermined condition of dimensions of the housing 50. With regard to this, Fig. 4 shows a graph depicting fan efficiency according to variation in ratio of an average diameter of the impeller blades 66 to the diameter 50D of the housing 50. As can be appreciated from Fig. 4, it is desirable that the impeller blades 66 have an average diameter in the range of 87 - 93 % of the diameter 50D of the housing 50 in order to ensure an appropriate fan efficiency.

[0046] Here, outer diameters of the impeller blades 66 refer to diameters of circles defined by connecting distal ends of the plurality of impeller blades 66, and the average diameter 66D of the impeller blades 66 refers to an average of the outer diameters of the impeller blades 66 in the axial direction. Here, the reason for using the average diameter 66D of the impeller blades 66 is that, as the impeller blades 66 have the outer diameters gradually decreased from the shroud 62 to the hub 64, the distal ends of the impeller blades 66 are slanted in the axial direction of the centrifugal impeller 60.

[0047] In addition, it is desirable that the average diameter 66d of the impeller blades 66 be smaller than a diameter 62D of the shroud 62 in order to prevent air discharged from the centrifugal impeller 60 from being leaked to the intake port 51 of the housing 50 through a gap between the shroud 62 and the housing 50

[0048] Next, it is desirable that the shroud 62 have not only the diameter 62D larger than the average diameter 66D of the impeller blades 66, but also the following structure in consideration of interference with the housing 50.

[0049] With regard to this, Fig. 5 shows a graph depicting the fan efficiency according to variation in ratio of an outer diameter 62D of the shroud 62 to the diameter 50D of the housing 50. As can be appreciated from Fig. 5, it is desirable that the shroud 62 be designed to have an outer diameter 62D greater than or equal to 90% of

the diameter 50D of the housing 50. Additionally, Fig. 6 shows a graph depicting the fan efficiency according to variation in ratio of the outer diameter 62D of the shroud 62 to the average diameter of the impeller blades 66. As can be appreciated from Fig. 6, it is desirable that the shroud 62 be designed to have the outer diameter 62D greater than or equal to 103 % of the average diameter of the impeller blades 66.

[0050] Additionally, in order to ensure that the ratio of the outer diameter 62D of the shroud 62 to the average diameter of the impeller blades 66 is greater than or equal to a predetermined value under the predetermined condition of the size of the housing 50, the ratio of the average diameter of the impeller blades 66 to the diameter 50D of the housing 50 must be decreased. However, as described with reference to Fig. 4, the impeller blades 66 have the average diameter in the range of 87 - 93 % of the diameter 50D of the housing 50. Accordingly, it is desirable that the shroud 62 have the outer diameter 62D in the range of 90 - 95 % of the diameter 50D of the housing 50 while being in the range of 103 - 106 % of the average diameter 66D of the impeller blades 66.

[0051] Next, it is desirable that the hub 64 be smaller than the impeller blades 66 in order to allow the air blown by the centrifugal impeller 60 to smoothly flow to the guide vane 70. With regard to this, Fig. 7 shows a graph depicting the fan efficiency according to variation in ratio of the outer diameter 64D of the hub 64 to the average diameter of the impeller blades 66. As can be appreciated from Fig. 7, it is desirable that the hub 64 have an outer diameter 64D in the range of 95 - 98 % of the average diameter of the impeller blades 66.

[0052] With the structure as described above, the centrifugal impeller 60 has an impeller height 60H in the range of 25 ~ 50 % of an axial height 50H of the housing 50. Here, the impeller height 60H of the centrifugal impeller 60 refers to a distance defined by connecting a distal end of the hub 62 to a distal end of the hub 64 in the axial direction of the impeller 60.

[0053] The guide vane 70 comprises a plurality of guide vane blades 72 radially disposed at a rear side of the centrifugal impeller 60, and a guide vane plate 74 opposite to the hub 64 to connect the plurality of guide vane blades 72.

[0054] The guide vane blades 72 and the guide vane plates 74 are also designed to optimize the fan efficiency and the heat dissipation of the motor, as described below.

[0055] Fig. 8 shows a graph depicting the fan efficiency according to variation in ratio of an outer diameter 72D of the guide vane blades 72 to the diameter 50D of the housing 50. The guide vane blades 72 are designed to have the outer diameter 72D about 90 % or 95 % or more of the diameter 50D of the housing 50. Additionally, Fig. 9 shows a graph depicting the fan efficiency according to variation in ratio of the outer diameter 72D of the guide vane blades 72 to the average diameter of the impeller blades 66. The guide vane blades 72 are designed to have the outer diameter 72D less than 100 % or 103 % or more of the average diameter of the impeller blades 66. Accordingly, in order to satisfy both conditions shown by the graphs of Figs. 8 and 9, the guide vane blades 72 are designed to have the outer diameter 72D in the range of 103 ~ 108 % of the average diameter of the impeller blades 66.

[0056] Here, the outer diameter 72D of the guide vane blades 72 refers to a diameter of a circle defined by connecting distal ends of the guide vane blades 72.

[0057] Fig. 10 shows a graph depicting the fan efficiency according to variation in ratio of an outer diameter 74D of the guide vane plate 74 to the diameter 50D of the housing 50. The guide vane plate 74 is designed to have the outer diameter 74D about 90 % of the diameter 50D of the housing 50. Additionally, Fig. 11 shows a graph depicting the fan efficiency according to variation in ratio of the outer diameter 74D of the guide vane plate 74 to the average diameter of the impeller blades 66. The guide vane plate 74 is designed to have the outer diameter 74D substantially the same as the average diameter of the impeller blades 66. Accordingly, in order to satisfy both conditions shown by the graphs of Figs. 10 and 11, the guide vane plate 74 is also designed to have the outer diameter 74D in the range of 100 ~ 102 % of the average diameter of the impeller blades 66.

[0058] As shown in Fig. 12, an axial height 70H of the guide vane 70 also influences the fan efficiency of the blowing device. Fig. 12 shows a graph depicting the fan efficiency according to variation in ratio of the axial height 70H of the guide vane 70 to the impeller height 60H of the centrifugal impeller 60. The guide vane 70 is designed to have the axial height 70H in the range of 100 - 110 % of the impeller height 60H of the centrifugal impeller 60.

[0059] Operation of the blowing device constructed as described above will be described as follows.

[0060] When the motor is driven, the shroud 62, the hub 64, and the impeller blades 66 are integrally rotated to generate blowing force. Then, air outside the housing 50 is sucked into the centrifugal impeller 60 through the intake port 51 of the housing 50, and the inlet 62' of the shroud 62. The air sucked into the centrifugal impeller 60 is discharged from the centrifugal impeller 60 in the centrifugal direction. The air discharged from the centrifugal impeller 60 is guided by the guide vane 30, and is then discharged from the housing 50 to the outside through the discharge port 52 of the housing 50.

[0061] As shown in Figs. 3 to 12, the blowing device of the invention constructed as described above has the optimally designed centrifugal impeller 60 and guide vane 70, so that the fan efficiency of the invention is enhanced in comparison to the conventional blowing device shown in Figs. 1 and 2.

[0062] With regard to this, Fig. 13 shows a graph depicting relationship between pressure coefficient and flow coefficient of an inventive blowing device A and a conventional blowing device B, and Fig. 14 shows a graph depicting relationship between the fan efficiency and the flow coefficient of the blowing devices A and B.

As can be appreciated from Figs. 13 and 14, the inventive blowing device A is excellent in pressure efficiency and fan efficiency to the conventional blowing device B.

[0063] Additionally, when air discharged from the housing 50 flows into the motor in order to dissipate heat from the motor, the blowing device of the invention having the enhanced blowing force in comparison to the conventional blowing device can enhance the heat dissipation of the motor.

[0064] Another embodiment of the invention will be described with reference to Figs. 13 and 14, in which like elements will be denoted by like reference numerals, and detailed description thereof will be omitted.

[0065] Fig. 15 is a cross-sectional view illustrating a blowing device according to a second embodiment of the invention.

[0066] As shown in Fig. 15, in the blowing device according to the second embodiment, a centrifugal impeller 60 comprises a shroud 62, a hub 64, and a plurality of impeller blades 66, which are optimally designed to ensure fan efficiency and heat dissipation of a motor.

[0067] In particular, the impeller blades 66 are designed to have an average diameter in the range of 87 - 93 % of a diameter 50D of the housing 50, and to have distal ends perpendicular to the axial direction of the centrifugal impeller 60.

[0068] Here, since the impeller blades 66 have the distal ends perpendicular to the axial direction of the centrifugal impeller 60, the impeller blades 66 have an identical outer diameter 66D in the axial direction, and thus the average diameter of the impeller blades 66 is the outer diameter of the impeller blades 66.

[0069] As with the blowing device according to the first embodiment of the invention described with reference to Figs. 3 to 14, the blowing device according to the second embodiment of the invention constructed as described above can maximize the fan efficiency and heat dissipation of the motor.

[0070] It should be understood that the embodiments and the accompanying drawings have been described for illustrative purposes and the present invention is limited by the following claims. Further, those skilled in the art will appreciate that various modifications, additions and substitutions are allowed without departing from the scope of the invention as set forth in the accompanying claims.

Claims

1. A blowing device, comprising: a housing (50) having an intake port (51) and a discharge port (52), a shroud (62) rotatably equipped within the housing (50) and having an inlet (62') communicated with the intake port (51) of the housing (50), a hub (64) separated from the shroud (62) in an axial direction while being connected to a motor, a plurality of impeller blades (66) radially disposed between the hub (64) and the shroud (62), a guide vane (70) including a guide vane plate (74) opposite to the hub (64) being disposed downstream from the impeller blades (66), and a plurality of guide vane blades (72) radially disposed to the guide vane plate (74),
characterized in that the impeller blades (66) have the average diameter (66D) in the range of 87 - 93 % of a diameter (50D) of the housing (50), the guide vane blades (72) have the outer diameter (72D) in the range of 103 - 108 % of the average diameter (66D) of the impeller blades (66), and the shroud (62) has an outer diameter (62D) in the range of 103 - 106 % of the average diameter (66D) of the impeller blades (66), wherein the outer diameters of the impeller blades (66) refer to diameters of circles defined by connecting distal ends of the plurality of impeller blades (66), and an average diameter (66D) of the impeller blades (66) refers to an average of the outer diameters of the impeller blades (66) in the axial direction, and the outer diameter (72D) of the guide vane blades (72) refers to a diameter of a circle defined by connecting distal ends of the guide vane blades (72).

2. The blowing device as set forth in claim 1, wherein each impeller blade (66) has a distal end slanted such that the outer diameter of the impeller blade (66) is gradually decreased from the shroud (62) to the hub (64).

3. The blowing device as set forth in claim 1 or 2, wherein the hub (64) has an outer diameter (64D) in the range of 95 - 98 % of the average diameter (66D) of the impeller blades (66).

4. The blowing device as set forth in any one of claims 1 to 3, wherein an axial distance (60H) between a distal end of the shroud (62) and a distal end of the hub (64) is in the range of 25 - 50 % of an axial height (50H) of the housing (50).

5. The blowing device as set forth in any of claims 1 to 4, wherein the guide vane plate (74) has an outer diameter (74D) in the range of 100 - 102 % of the average diameter (66D) of the impeller blades (66).

6. The blowing device as set forth in any of claims 1 to 5, wherein the guide vane (70) has an axial height (70H) in the range of 100 ~ 110 % of the axial distance between the distal end of the shroud (62) and the distal end of the hub (64).

7. The blowing device as set forth in any of claims 1 to 6, wherein each of the impeller blades (66) has a distal end parallel to the axial direction and has an outer diameter smaller than a diameter (62D) of the shroud (62), and the hub (64) has a diameter (64D) smaller than the outer diameter of the impeller blades

(66).

Patentansprüche

1. Blasvorrichtung mit: einem Gehäuse (50), das eine Einlassöffnung (51) und eine Auslassöffnung (52) aufweist, einem Kragen (62), der drehbar im Gehäuse (50) vorgesehen ist und einen Einlass (62') aufweist, der mit der Einlassöffnung (51) des Gehäuses (50) in Verbindung steht, einer Nabe (64), die vom Kragen (62) in einer axialen Richtung getrennt ist, während sie mit einem Motor verbunden ist, mehreren Laufradflügeln (66), die radial zwischen der Nabe (64) und dem Kragen (62) angeordnet sind, einer Leitschaufel (70), die gegenüber der Nabe (64) eine Leitschaufelplatte (74) aufweist, die stromabwärts von den Laufradflügeln (66) angeordnet ist, und mehreren Leitschaufelflügeln (72), die radial zur Leitschaufelplatte (74) angeordnet sind,
dadurch gekennzeichnet, dass die Laufradflügel (66) den durchschnittlichen Durchmesser (66D) im Bereich von 87 - 93% eines Durchmessers (50D) des Gehäuses (50) aufweisen, die Leitschaufelflügel (72) den Außendurchmesser (72D) im Bereich von 103 - 108% des durchschnittlichen Durchmessers (66D) der Laufradflügel (66) aufweisen, und der Kragen (62) einen Außendurchmesser (62D) im Bereich von 103 - 106% des durchschnittlichen Durchmessers (66D) der Laufradflügel (66) aufweist, wobei sich die Außendurchmesser der Laufradflügel (66) auf Durchmesser von Kreisen beziehen, die durch Verbinden von distalen Enden der mehreren Laufradflügel (66) definiert werden, und sich ein durchschnittlicher Durchmesser (66D) der Laufradflügel (66) auf einen Durchschnitt der Außendurchmesser der Laufradflügel (66) in die axiale Richtung bezieht, und sich der Außendurchmesser (72D) der Leitschaufelflügel (72) auf einen Durchmesser eines Kreises bezieht, der durch Verbinden von distalen Enden der Leitschaufelflügel (72) definiert wird.

2. Blasvorrichtung nach Anspruch 1, wobei jeder Laufradflügel (66) ein distales Ende aufweist, das so abgeschrägt ist, dass der Außendurchmesser des Laufradflügels (66) vom Kragen (62) zur Nabe (64) allmählich abnimmt.

3. Blasvorrichtung nach Anspruch 1 oder 2, wobei die Nabe (64) einen Außendurchmesser (64D) im Bereich von 95 - 98% des durchschnittlichen Durchmessers (66D) der Laufradflügel (66) aufweist.

4. Blasvorrichtung nach einem der Ansprüche 1 bis 3, wobei ein axialer Abstand (60H) zwischen einem distalen Ende des Kragens (62) und einem distalen Ende der Nabe (64) im Bereich von 25 - 50% einer axialen Höhe (50H) des Gehäuses (50) liegt.

5. Blasvorrichtung nach einem der Ansprüche 1 bis 4, wobei die Leitschaufelplatte (74) einen Außendurchmesser (74D) im Bereich von 100 - 102% des durchschnittlichen Durchmessers (66D) der Laufradflügel (66) aufweist.

6. Blasvorrichtung nach einem der Ansprüche 1 bis 5, wobei die Leitschaufel (70) eine axiale Höhe (70H) im Bereich von 100 - 110% des axialen Abstands zwischen dem distalen Ende des Kragens (62) und dem distalen Ende der Nabe (64) aufweist.

7. Blasvorrichtung nach einem der Ansprüche 1 bis 6, wobei jeder der Laufradflügel (66) ein distales Ende aufweist, das parallel zur axialen Richtung ist, und einen Außendurchmesser aufweist, der kleiner als ein Durchmesser (62D) des Kragens (62) ist, und die Nabe (64) einen Durchmesser (64D) aufweist, der kleiner als der Außendurchmesser der Laufradflügel (66) ist.

Revendications

1. Dispositif de soufflage, comprenant : un boîtier (50) avec un orifice d'admission (51) et un orifice d'évacuation (52), un capot (62) disposé de manière rotative à l'intérieur du boîtier (50) et présentant une entrée (62') communiquant avec l'orifice d'admission (51) du boîtier (50), un moyeu (64) séparé du capot (62) en direction axiale et étant relié à un moteur, et une pluralité d'aubes de rotor (66) radialement disposées entre le moyeu (64) et le capot (62), un aubage directeur (70) comportant une plaque (74) d'aubage directeur opposée au moyeu (64), disposé en aval des aubes de rotor (66), et une pluralité d'aubes (72) d'aubage directeur radialement disposées par rapport à la plaque (74) d'aubage directeur, **caractérisé en ce que** les aubes de rotor (66) ont un diamètre moyen (66D) compris entre environ 87 et 93 % d'un diamètre (50D) du boîtier (50), les aubes (72) d'aubage directeur ont un diamètre extérieur (72D) compris entre environ 103 et 108 % du diamètre moyen (66D) des aubes de rotor (66), et le capot (62) a un diamètre extérieur (62D) compris entre environ 103 et 106 % du diamètre moyen (66D) des aubes de rotor (66), les diamètres extérieurs des aubes de rotor (66) se référant aux diamètres de cercles définis en reliant les extrémités distales de la pluralité d'aubes de rotor (66), et un diamètre moyen (66D) des aubes de rotor (66) se référant à la moyenne des diamètres extérieurs des aubes de rotor (66) en direction axiale, et le diamètre extérieur (72D) des aubes (72) d'aubage directeur se référant au diamètre d'un cercle défini en reliant les extrémités distales des aubes (72) d'aubage directeur.

2. Dispositif de soufflage selon la revendication 1, où

chaque aube de rotor (66) a une extrémité oblique de manière que le diamètre extérieur de l'aube de rotor (66) diminue graduellement du capot (62) au moyeu (64).

3. Dispositif de soufflage selon la revendication 1 ou la revendication 2, où le moyeu (64) a un diamètre extérieur (64D) compris entre environ 95 et 98 % du diamètre moyen (66D) des aubes de rotor (66).

4. Dispositif de soufflage selon l'une des revendications 1 à 3, où une distance axiale (60H) entre une extrémité distale du capot (62) et une extrémité distale du moyeu (64) est comprise entre environ 25 et 50 % d'une hauteur axiale (50H) du boîtier (50).

5. Dispositif de soufflage selon l'une des revendications 1 à 4, où la plaque (74) d'aubage directeur a un diamètre extérieur (74D) compris entre environ 100 et 102 % du diamètre moyen (66D) des aubes de rotor (66).

6. Dispositif de soufflage selon l'une des revendications 1 à 5, où l'aubage directeur (70) a une hauteur axiale (70H) comprise entre environ 100 et 110 % de la distance axiale entre l'extrémité distale du capot (62) et l'extrémité distale du moyeu (64).

7. Dispositif de soufflage selon l'une des revendications 1 à 6, où chaque aube de rotor (66) a une extrémité distale parallèle à la direction axiale, et a un diamètre extérieur inférieur au diamètre (62D) du capot (62), et où le moyeu (64) a un diamètre (64D) inférieur au diamètre extérieur des aubes de rotor (66).

FIG. 1 (Prior Art)

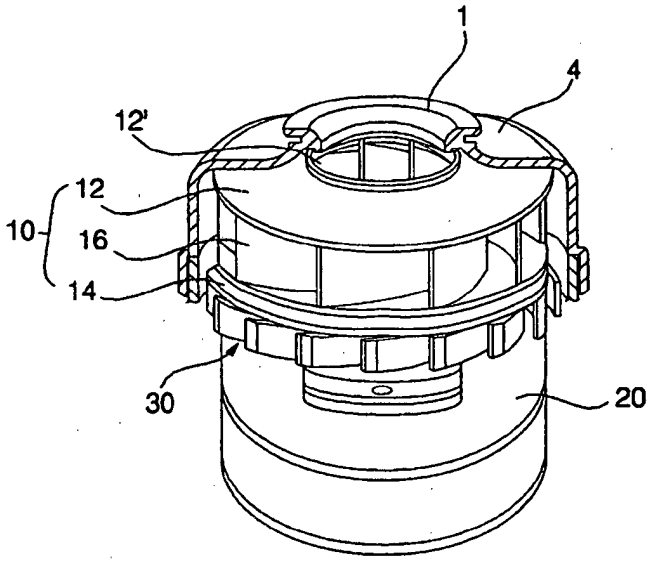


FIG. 2 (Prior Art)

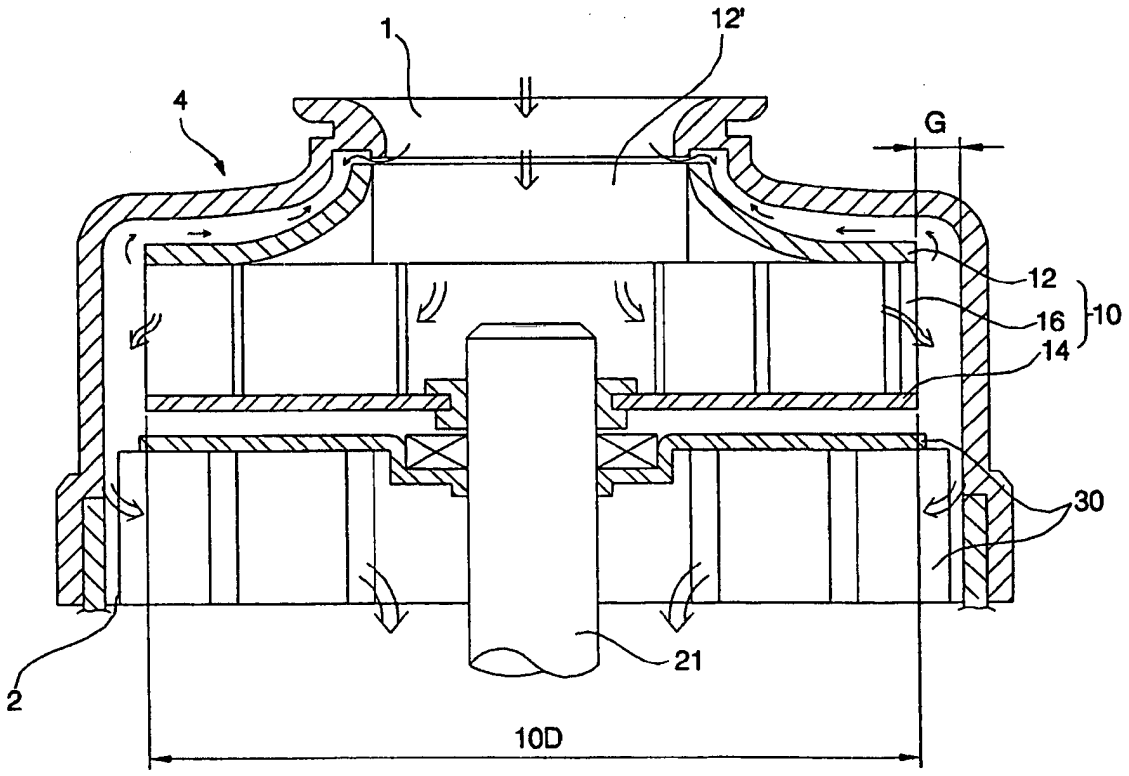


FIG. 3

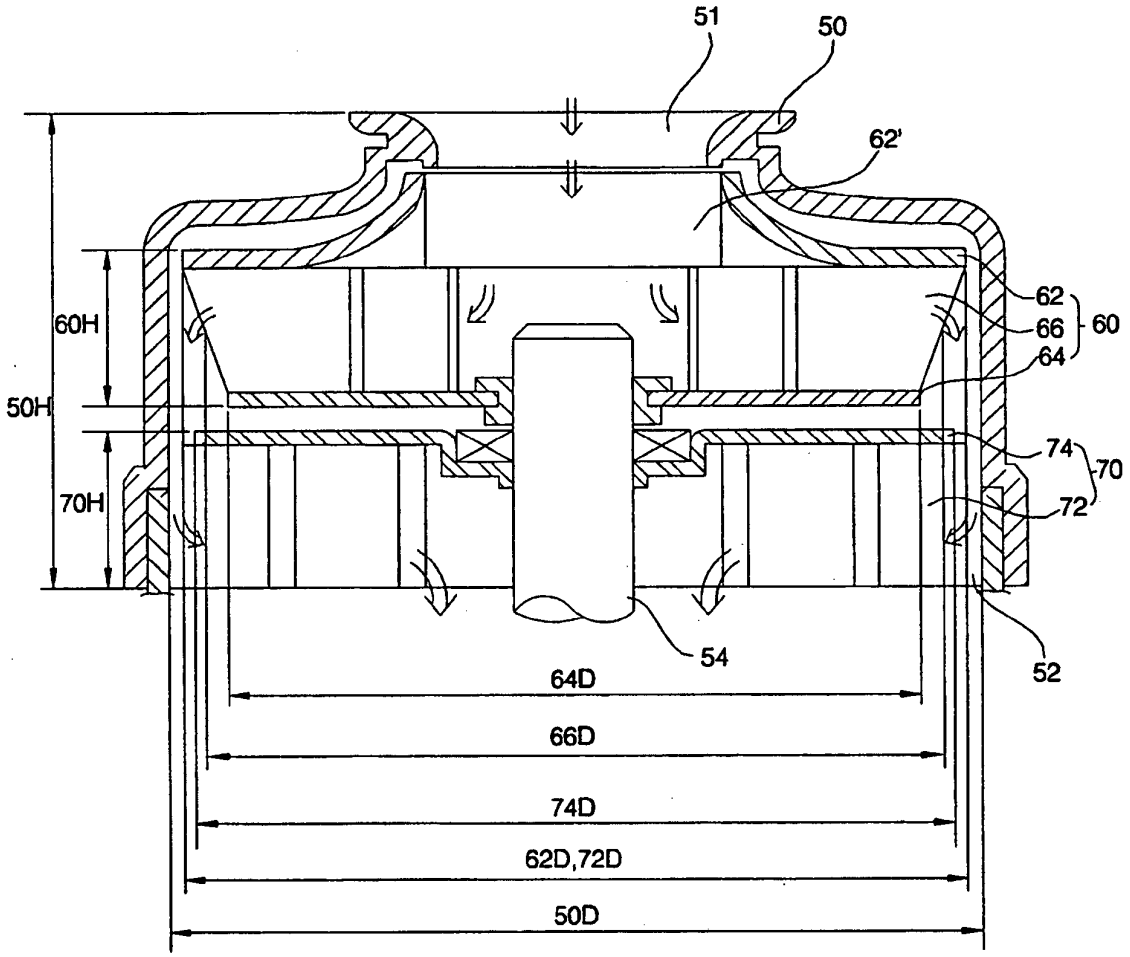

51
50
62'
62
66
64
60
60H
50H
70H
74
70
72
54
52
64D
66D
74D
62D,72D
50D

FIG. 4

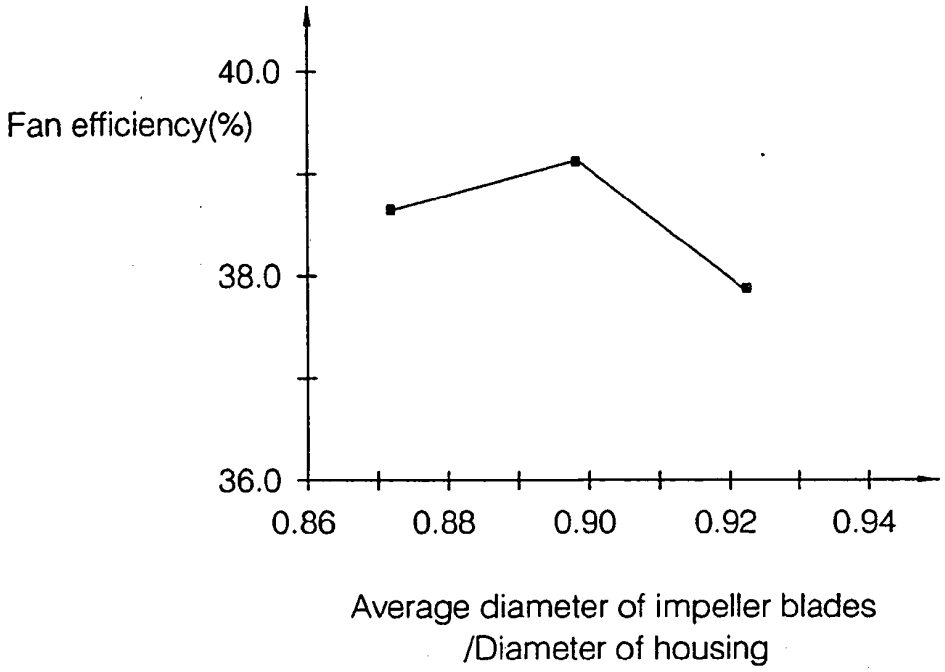

40.0
Fan efficiency(%)
38.0
36.0
0.86
0.88
0.90
0.92
0.94
Average diameter of impeller blades
/Diameter of housing

FIG. 5

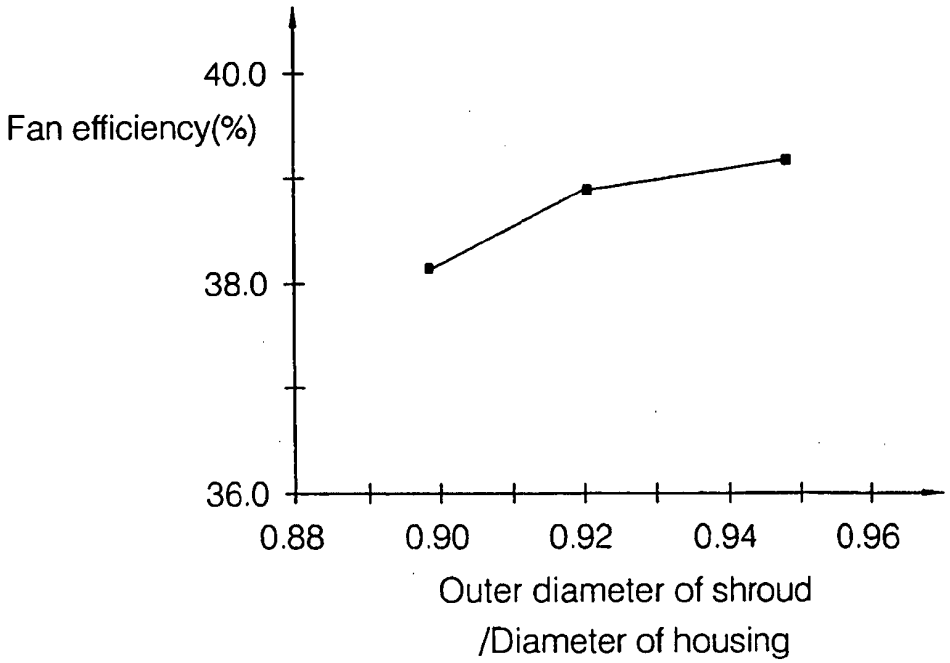

40.0
Fan efficiency(%)
38.0
36.0
0.88
0.90
0.92
0.94
0.96
Outer diameter of shroud
/Diameter of housing

FIG. 6

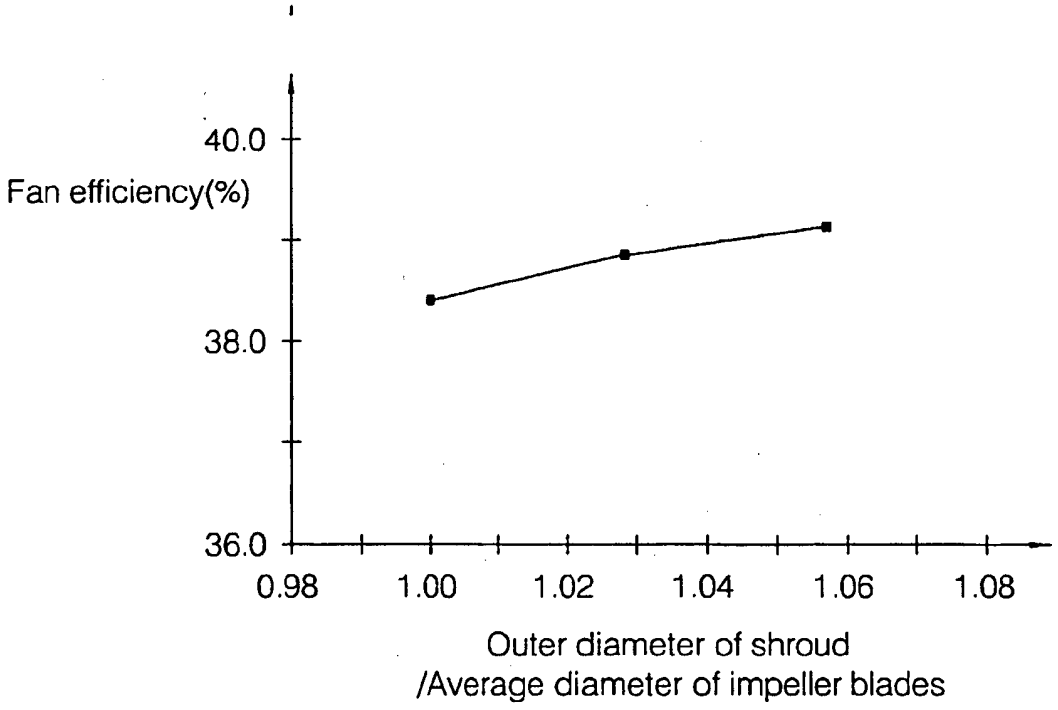

40.0
Fan efficiency(%)
38.0
36.0
0.98
1.00
1.02
1.04
1.06
1.08
Outer diameter of shroud
/Average diameter of impeller blades

FIG. 7

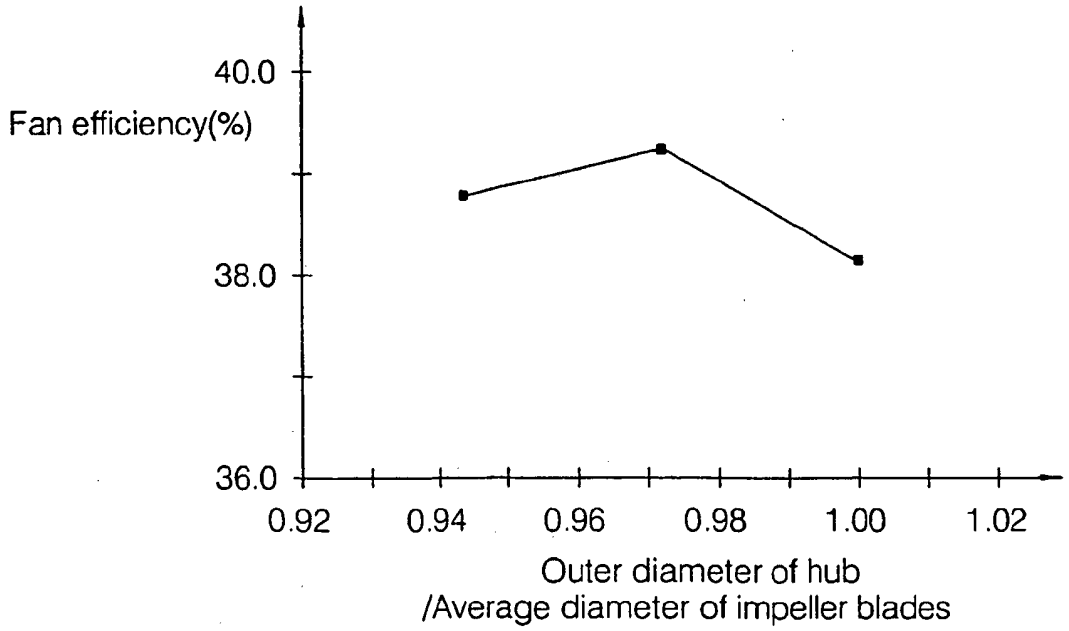

40.0
Fan efficiency(%)
38.0
36.0
0.92
0.94
0.96
0.98
1.00
1.02
Outer diameter of hub
/Average diameter of impeller blades

FIG. 8

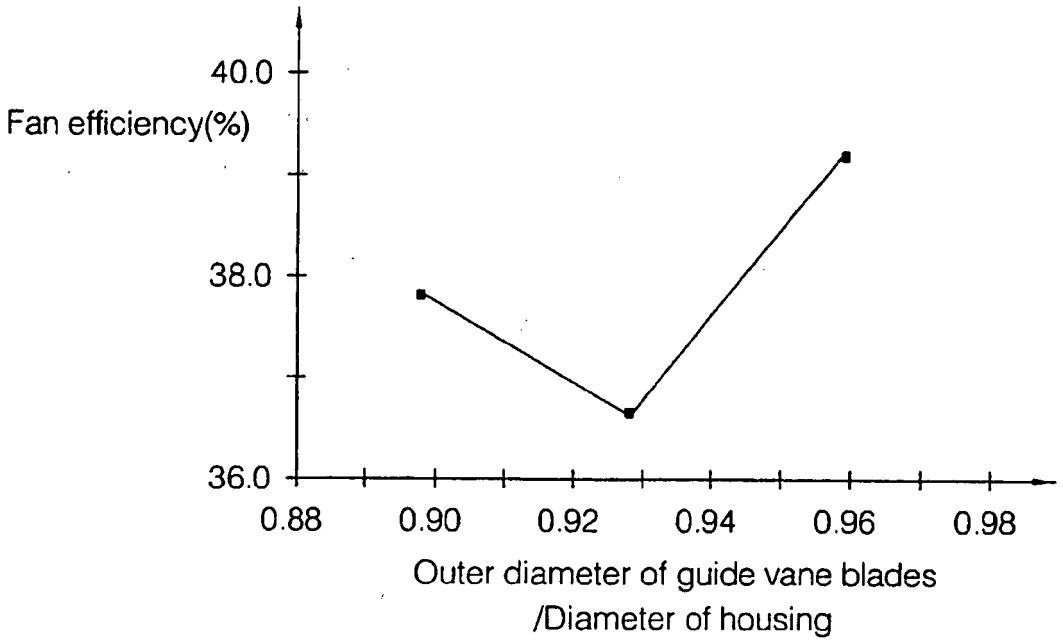

40.0
Fan efficiency(%)
38.0
36.0
0.88
0.90
0.92
0.94
0.96
0.98
Outer diameter of guide vane blades
/Diameter of housing

FIG. 9

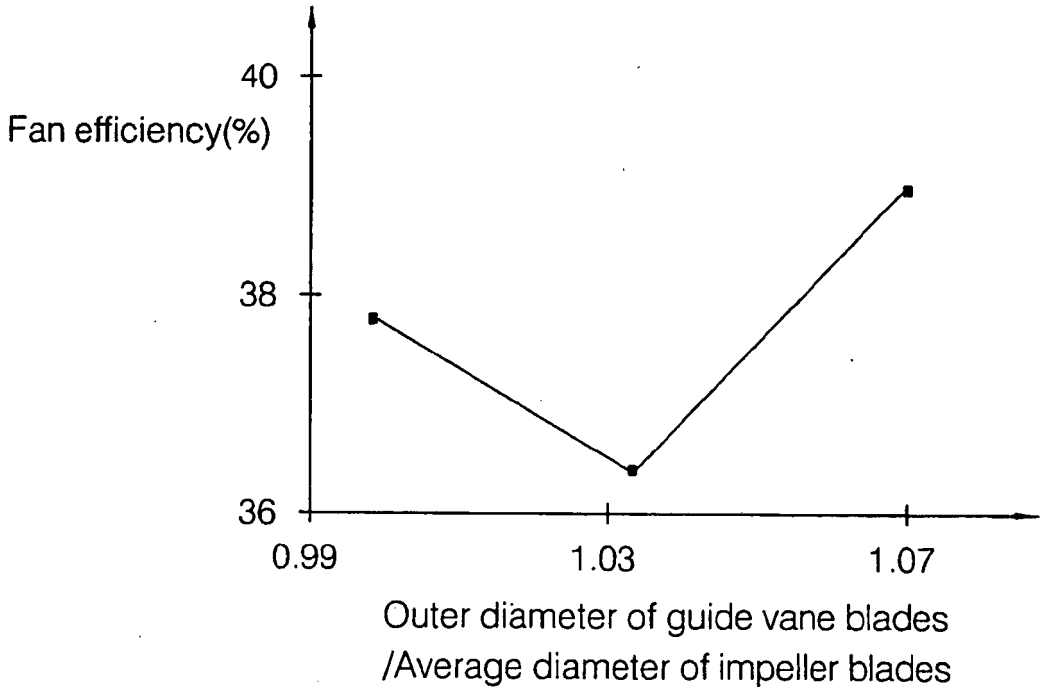

40
Fan efficiency(%)
38
36
0.99
1.03
1.07
Outer diameter of guide vane blades
/Average diameter of impeller blades

FIG. 10

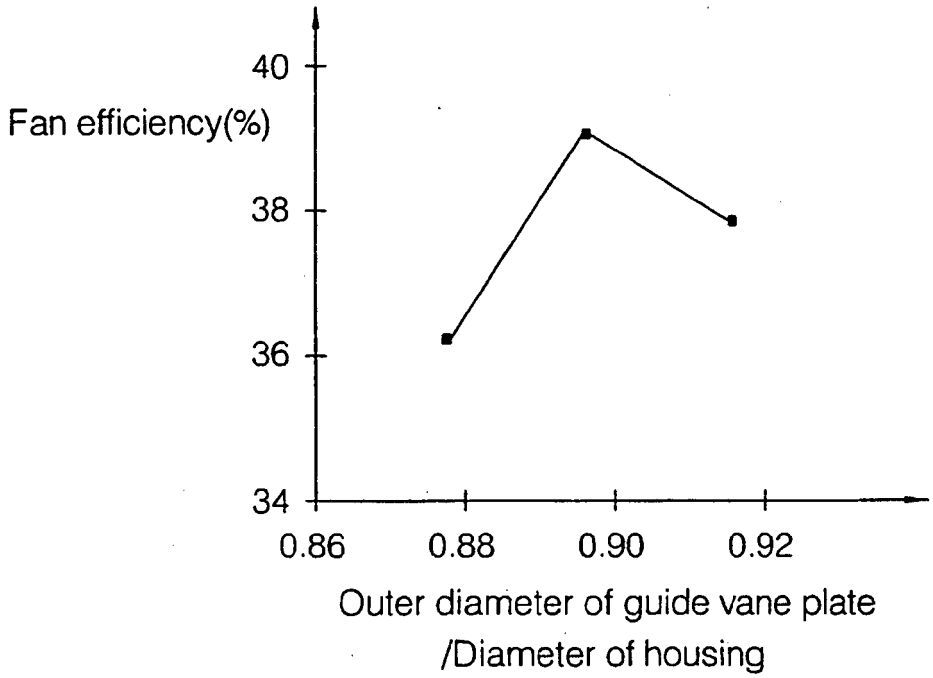

40
38
36
34
Fan efficiency(%)
0.86
0.88
0.90
0.92
Outer diameter of guide vane plate
/Diameter of housing

FIG. 11

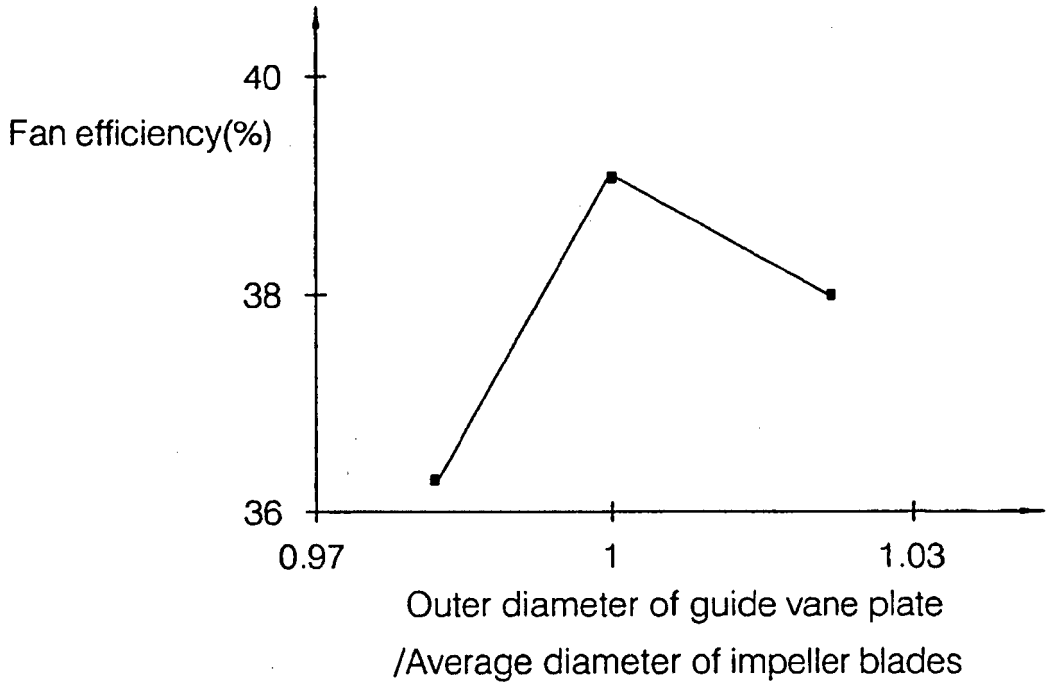

40
Fan efficiency(%)
38
36
0.97
1
1.03
Outer diameter of guide vane plate
/Average diameter of impeller blades

FIG. 12

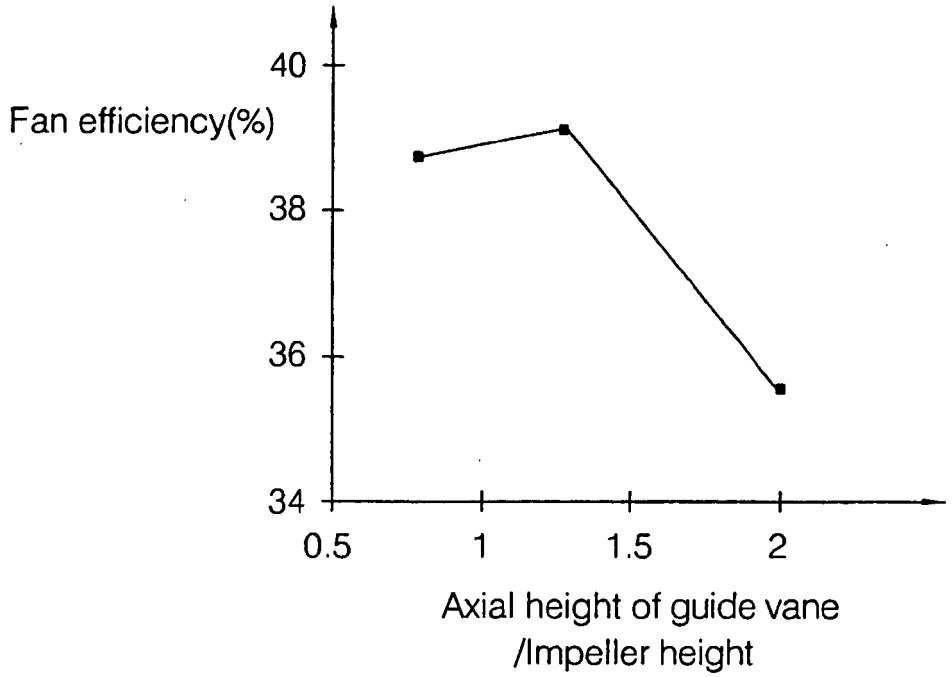

Fan efficiency(%)
40
38
36
34
0.5
1
1.5
2
Axial height of guide vane
/Impeller height

FIG. 13

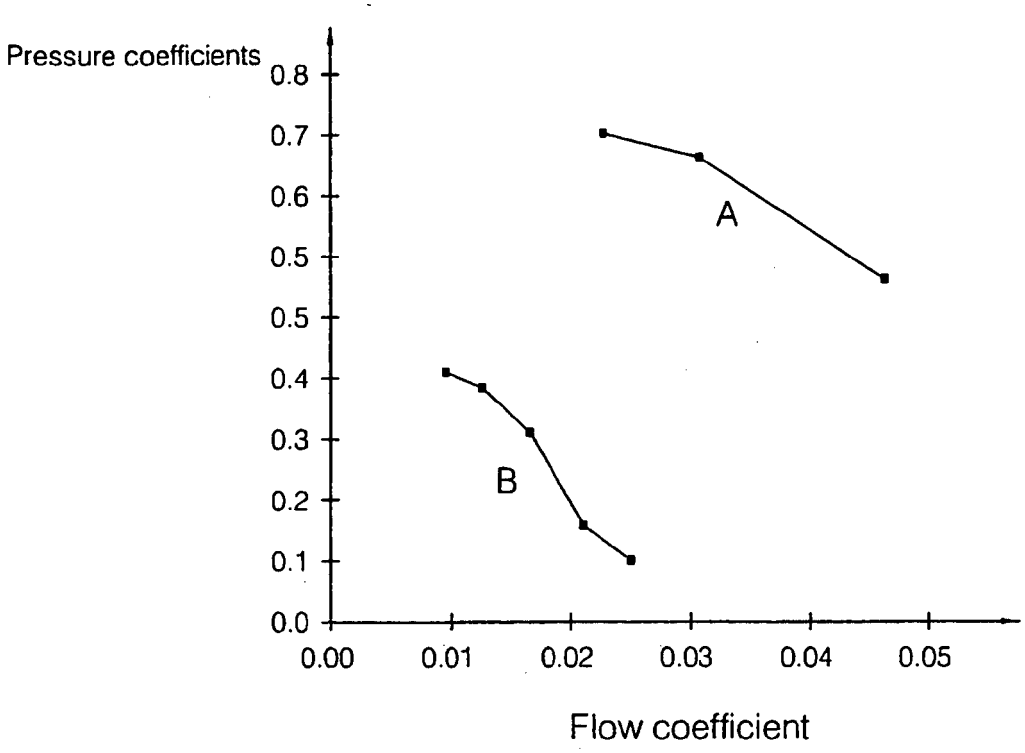

Pressure coefficients
0.8
0.7
0.6
0.5
0.5
0.4
0.3
0.2
0.1
0.0
A
B
0.00
0.01
0.02
0.03
0.04
0.05
Flow coefficient

FIG. 14

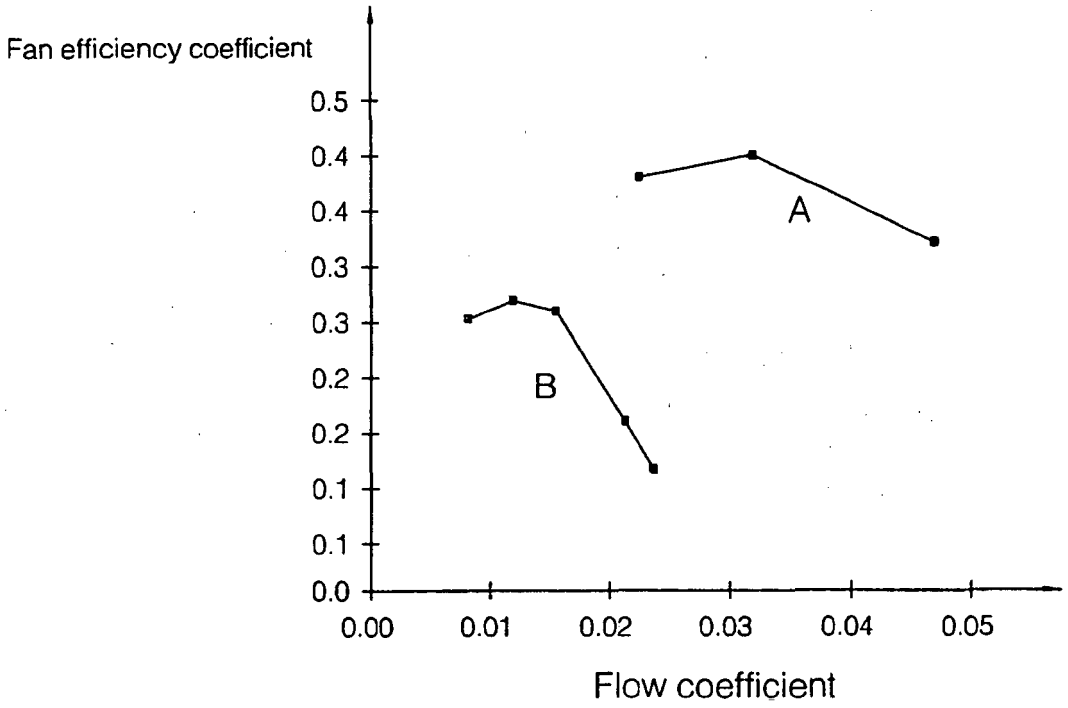
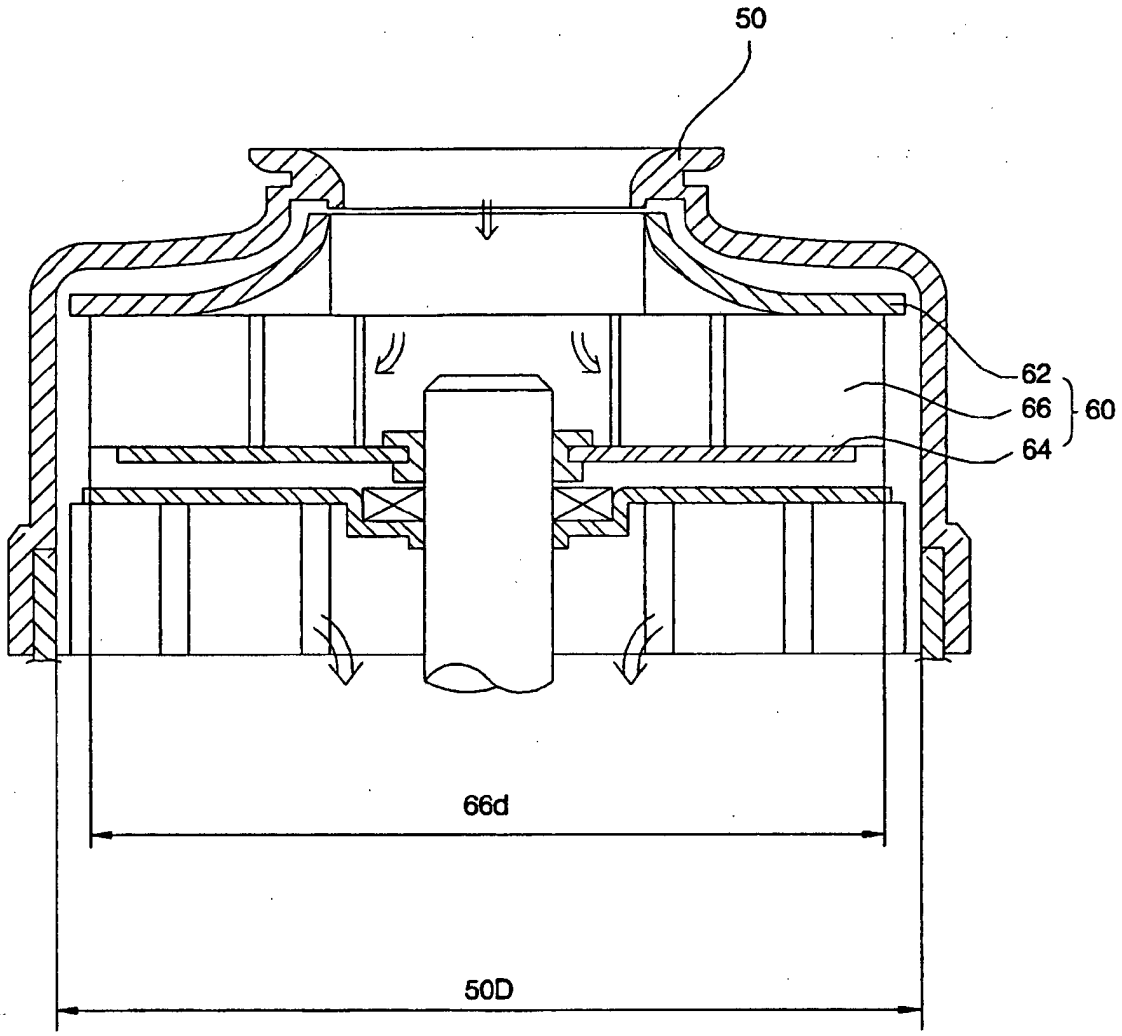

Fan efficiency coefficient
0.5
0.4
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
0.00
0.01
0.02
0.03
0.04
0.05
Flow coefficient
A
B

FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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