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(54) **BLOWER**

(57) [Object]

To obtain a fixing structure of a blower unit that improves the flexibility of the mount directions of a fixing member in the blower unit in which the fixing member is mounted onto a rotating shaft having a circular cross section and the idle running of a multi-blade impeller is prevented by the fixing member.

[Solution]

In a blower unit including a resinous fixing member 10 to which a rotating shaft 1 having a circular cross section has been fitted and a resinous fan 60 having a boss 30 attached to the fixing member 10, the fixing member 10 includes a fixing member through hole 14 to which the rotating shaft 1 is press-fitted, a fixing member first engagement part 15 that is engaged with a boss engagement part 35 provided in the boss 30 in a first mount attitude in which the rotating shaft 1 is press-fitted from one side of the fixing member through hole 14, and a fixing member second engagement part 16 that is engaged with the boss engagement part 35 in a second mount attitude in which the rotating shaft 1 is press-fitted from the other side of the fixing member through hole 14.

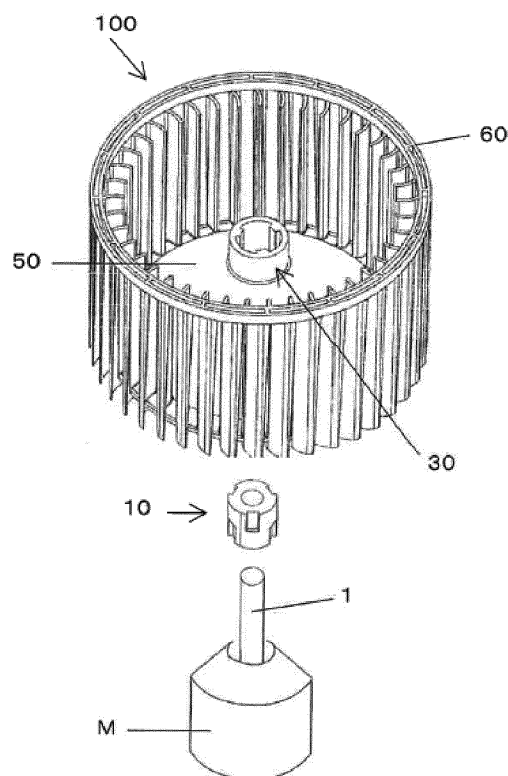


FIG. 1

Description

Technical Field

[0001] The present invention relates to a blower unit having a multi-blade impeller, more particularly to a fixing structure of a blower unit for attaching a resinous fan to a rotating shaft of a motor.

Background Art

[0002] For example, blower units disclosed in JP-A-2004-3449 (PTL 1) and JP-A-2011-163244 (PTL 2) are known as a blower unit having a resinous fan, especially a blower unit for an in-vehicle air conditioner.

[0003] A small size and a large volume of air are needed for this type of blower unit for an in-vehicle air conditioner so that the blower unit can be installed in a vehicle. Accordingly, this type of blower unit rotates a fan having a smaller distance from a rotating shaft to blades at a higher rotation speed than home blower units (electric fans). Since noise is caused by the runout of a fan or imbalance in the structure when the rotation speed is high, good balance is needed.

[0004] In the blower unit described in the PTL 1, the fixing means for fixing a fan to a rotating shaft having a circular cross section is also disclosed. That is, a rotating shaft (shaft 21) having a circular cross section is inserted into a boss part of a fan (10) and then press-fitted to a through hole of a resinous fixing member (cap 30) harder than the fan, and the boss part is fitted to the fixing member along the shaft direction of the rotating shaft. Since the hard fixing member is fixed to the rotating shaft, it is possible to prevent the fan having fitted to the fixing member from idly running with respect to the rotating shaft.

Citation List

Patent Literature

[0005]

PTL 1: JP-A-2004-3449

PTL 2: JP-A-2011-163244

Summary of Invention

Technical Problem

[0006] Since a part to be fitted to the fan is formed on only one side in the shaft direction of the fixing member in the PTL 1, the fixing member needs to be mounted onto the rotating shaft in a certain direction (certain orientation) so as to be correctly fitted to the fan having been inserted.

[0007] Accordingly, it is necessary to determine the mount attitude with respect to the rotating shaft and make adjustment to achieve a regular mount direction in the

production process. Since the adjustment of the mount direction of the fixing member requires a certain decision process, there is room for improvement of production efficiency at this point.

[0008] The invention addresses the above situation with an object of obtaining a fixing structure of a blower unit that improves the flexibility of the mount direction of the fixing member in the fixing structure for preventing the idle running of a multi-blade impeller using this fixing member in a blower unit having the structure for fixing a fan to a rotating shaft having a circular cross section.

Solution to Problem

[0009] The invention of claim 1 is a blower unit 100 including a motor M provided with a rotating shaft 1 having a circular cross section; a resinous fixing member 10 mounted onto the rotating shaft; and a resinous fan 60 having a boss 30 attached to the fixing member, in which the fixing member 10 includes a fixing member through hole 14 to which the rotating shaft 1 is press-fitted, a fixing member first engagement part 15 to be engaged with a boss engagement part 35 provided in the boss 30 in a first mount attitude in which the rotating shaft 1 is press-fitted from one side of the fixing member through hole 14, and a fixing member second engagement part 16 to be engaged with the boss engagement part 35 in a second mount attitude in which the rotating shaft 1 is press-fitted from the other side of the fixing member through hole 14.

[0010] The invention of claim 2 is the blower unit 100 according to claim 1, in which the fixing member through hole 14 has a small-diameter part 14a between the one side and the other side, the fixing member through hole 14 having a diameter smaller than an outer diameter of the rotating shaft 1 at the small-diameter part.

[0011] The invention of claim 3 is the blower unit 100 according to claim 2, in which the fixing member through hole 14 has tapered parts 14b and 14c having diameters tapered gradually from the one side and the other side to the small-diameter part 14a.

[0012] The invention of claim 4 is the blower unit 100 according to any one of claim 1 to 3, in which the fixing member 10 is formed so that the one side is congruous with the other side about a virtual cross section L2 located midway between the end of the one side and the end of the other side.

Advantageous Effects of Invention

[0013] According to the invention of claim 1, when the rotating shaft 1 is press-fitted from one side of the fixing member through hole 14 and the fixing member 10 is fixed to the rotating shaft (first mount attitude) and the boss 30 is attached to the fixing member 10, since the engagement part 35 of the boss 30 is fitted to and engaged with the fixing member first engagement part 15 of the fixing member 10, the fan 60 can be fixed to the

rotating shaft 1 so as not to idly run.

[0014] In addition, when the rotating shaft 1 is press-fitted from the other side of the fixing member through hole 14 and the fixing member 10 is fixed to the rotating shaft (second mount attitude) and the boss 30 is attached to the fixing member 10, since the engagement part 35 of the boss 30 is fitted to and engaged with the fixing member second engagement part 16 of the fixing member 10, also in the second mount attitude, the fan 60 can be fixed to the rotating shaft 1 so as not to idly run as in the first mount attitude.

[0015] According to the invention of claim 2, the fixing member through hole 14 has the small-diameter part 14a between the one side and the other side at which the through hole has a diameter smaller than the outer diameter of the rotating shaft 1, the fixing member 10 can be mounted firmly to the rotating shaft 1 in both the first mount attitude and the second mount attitude of the fixing member 10.

[0016] According to the invention of claim 3, since the fixing member through hole 14 has the tapered parts 14b and 14c having diameters tapered gradually from the one side and the other side to the small-diameter part 14a, the fixing member 10 can be mounted to the rotating shaft 1 relatively easily.

[0017] According to the invention of claim 4, since the fixing member 10 is formed so that the one side is congruous with the other side about the virtual cross section L2 located midway between the end of the one side and the end of the other side, the rotating shaft 1 can be mounted to the fixing member through hole 14 from any side of the fixing member, thereby improving the flexibility of the mount direction of the fixing member and the convenience of assembly.

[0018] As described above, according to the invention, it is possible to obtain the fixing structure of a blower unit that improves the flexibility of the mount directions of a fixing member in the blower unit having the structure for fixing a fan to a rotating shaft having a circular cross section.

Brief Description of Drawings

[0019]

[Fig. 1] Fig. 1 is an exploded perspective view illustrating the arrangement state of a boss, a cone, a fan, a fixing member, a rotating shaft, and a motor according to an example of the invention, as seen from obliquely upward.

[Fig. 2] Fig. 2 is an external perspective view illustrating the mount state of the rotating shaft, the fixing member, and the boss according to the example of the invention, as seen from upward to downward.

[Fig. 3] Fig. 3 is an enlarged view illustrating the positions of the rotating shaft, the fixing member, and the boss in Fig. 2.

[Fig. 4] Fig. 4 is an external perspective view illus-

trating the mount state of the rotating shaft, the fixing member, and the boss according to the example of the invention, as seen from downward to upward.

[Fig. 5] Fig. 5 is an enlarged view illustrating the positions of the rotating shaft, the fixing member, and the boss in Fig. 4.

[Fig. 6] Fig. 6 is an external perspective view illustrating the boss, the cone, and the fan according to the example of the invention, as seen from upward to downward.

[Fig. 7] Fig. 7 is an enlarged view illustrating the position of the boss in Fig. 6.

[Fig. 8] Fig. 8 is an external perspective view illustrating the boss, the cone, and the fan according to the example of the invention, as seen from downward to upward.

[Fig. 9] Fig. 9 is an enlarged view illustrating the position of the boss in Fig. 8.

[Fig. 10] Fig. 10 is an external perspective view illustrating the fixing member according to the example of the invention as seen from obliquely upward.

[Fig. 11] Fig. 11 is an external perspective view illustrating the fixing member according to the example of the invention as seen from obliquely downward.

[Fig. 12] Fig. 12 is a longitudinal sectional view illustrating, from the top, the boss, the fixing member in the first mount attitude, and the rotating shaft according to the example of the invention in the state in which they are separated from each other.

[Fig. 13] Fig. 13 is a longitudinal sectional view illustrating the boss, the fixing member in the first mount attitude, and the rotating shaft in Fig. 12 in the state in which they are combined with each other.

[Fig. 14] Fig. 14 is a longitudinal sectional view illustrating, from the top, the boss, the fixing member in the second mount attitude, and the rotating shaft according to the example of the invention in the state in which they are separated from each other.

[Fig. 15] Fig. 15 is an exploded perspective view illustrating the arrangement state of a fixing member, a boss, a cone, a fan, a rotating shaft, and a motor according to another example of the invention, as seen from obliquely upward.

[Fig. 16] Fig. 16 is a longitudinal sectional view illustrating, from the top, the fixing member in the first mount attitude, the boss, and the rotating shaft according to the other example of the invention in the state in which they are separated from each other.

[Fig. 17] Fig. 17 is a longitudinal sectional view illustrating the fixing member in a first press-fitting attitude, the boss, and the rotating shaft in Fig. 16 in the state in which they are combined with each other.

[Fig. 18] Fig. 18 is a longitudinal sectional view illustrating, from the top, a fixing member in a second press-fitting attitude, a boss, and a rotating shaft according to another example of the invention in the state in which they are separated from each other.

[Fig. 19] Fig. 19 is a longitudinal sectional view illus-

trating, from the top, a fixing member in the first press-fitting attitude, a boss, and a rotating shaft according to still another example in the state in which they are separated from each other.

Description of Embodiments

[0020] An aspect of the invention will be described below with reference to the attached drawings. The embodiments described below are examples of the invention and the invention is not limited to the following embodiments. It should be noted that components having the same reference numerals are identical to each other in this description and the drawing. In addition, various modifications can be made as long as the working effect of the invention is obtained.

[0021] Fig. 1 to Fig. 14 illustrate components (structural members) of the blower unit according to the first embodiment of the invention. The blower unit 100 according to the embodiment includes the motor M provided with the rotating shaft 1 having a circular cross section, the resinous fixing member 10 mounted onto the rotating shaft 1, and the resinous fan 60 having a boss 30 attached to the fixing member 10, that is, the resinous fan 60 including a cone 50 extending from the boss 30 and many blades extending from the outer circumferential edge part of the cone 50. It should be noted that the fixing member 10 is made of resin having high mechanical strength as in the prior art (for example, the PTL 1 and PTL 2) and that the boss 30 is made of resin having mechanical strength lower than the fixing member 10. Alternatively, the fixing member 10 and the boss 30 may be made of resin having approximately the same mechanical strength. In addition, the fixing member 10 and the fan 60 are formed by a well-known molding method such as injection molding. The material of the resin is, for example, polypropylene or ABS resin.

[0022] The fixing member 10 is a cylindrical member and mounted onto the rotating shaft 1 as described above. The fan 60 is attached to the fixing member 10 via the boss 30 and the rotation of the rotating shaft 1 is transmitted to the fan 60 via the fixing member 10. Accordingly, the fixing member 10 is firmly fixed to the rotating shaft 1 so as not to slip or move in the shaft direction with respect to the rotating shaft 1.

[0023] In addition, as illustrated in Fig. 10 and Fig. 11, the fixing member 10 includes a fixing member first end surface 11 close to the tip of the rotating shaft 1, a fixing member second end surface 12 away from the tip of the rotating shaft, a fixing member outer peripheral surface 13 formed between the fixing member first end surface 11 and the fixing member second end surface 12, the fixing member through hole 14 to which the rotating shaft 1 is press-fitted, the concave or convex fixing member first engagement parts 15 formed on the fixing member outer peripheral surface 13, and the concave or convex fixing member second engagement parts 16 formed in positions different from the positions of the fixing member

first engagement parts on the fixing member outer peripheral surface 15.

[0024] In the fixing member 10 according to the embodiment, the fixing member first engagement parts 15 and the fixing member second engagement parts 16 have concave shapes. In addition, the fixing member first engagement parts 15 and the fixing member second engagement parts 16 are disposed radially at regular angular intervals about a virtual axial line L1 of the rotating shaft 1. In the disposition aspect of these engagement parts, each of the fixing member second engagement parts 16 is located midway between each pair of the fixing member first engagement parts 15 (midway between the plurality of fixing member first engagement parts 15 in the circumferential direction of the fixing member outer peripheral surface 13).

[0025] The boss 30 is a cylindrical member, is a part of the fan 60, is made of resin, and is attached to the fixing member 10. As illustrated in Fig. 7 and Fig. 9, the boss 30 according to the embodiment includes a boss first end surface 31 close to the tip of the rotating shaft 1, a boss second end surface 32 away from the tip of the rotating shaft 1, a boss outer peripheral surface 33 formed between the boss first end surface 31 and the boss second end surface 32, a boss through hole 34 into which the fixing member 10 is inserted, the boss first engagement parts 35 formed on the inner peripheral surface of the boss through hole 34 and engaged with the fixing member first engagement parts 15, and boss second engagement parts 36 formed on the inner peripheral surface of the boss through hole 34 and engaged with the fixing member second engagement parts 16. In the embodiment, the boss first end surface 31 is positioned in the upper side of the drawing and the boss second end surface 32 is positioned in the lower side of the drawing.

[0026] In the boss 30 according to the embodiment, the boss first engagement parts 35 and the boss second engagement parts 36 have convex shapes that correspond to the concave shapes of the fixing member first engagement parts 15 and the fixing member second engagement parts 16. In addition, the boss first engagement parts 35 and the boss second engagement parts 36 are disposed radially at regular angular intervals about the virtual axial line of the rotating shaft 1 so as to correspond to the fixing member first engagement parts 15 and the fixing member second engagement parts 16. As in the fixing member 10, in the disposition aspect of these parts, each of the boss second engagement parts 36 is located midway between each pair of the boss first engagement parts 35 (midway between the plurality of the boss first engagement parts 35 in the circumferential direction of the boss through hole 34).

[0027] In the embodiment, as illustrated in Fig. 10 and Fig. 11 in detail, the fixing member first engagement part 15 extends from the fixing member first end surface 11 along the shaft direction of the rotating shaft 1 and a fixing member first restricting part 17 is provided at an end thereof. In addition, the fixing member second engage-

ment part 16 extends from the fixing member second end surface 12 along the shaft direction of the rotating shaft 1 and a fixing member second restricting part 18 is provided at an end thereof.

[0028] In contrast, the boss first engagement part 35 extends from the boss first end surface 31 along the shaft direction of the rotating shaft 1 and a boss first restricting part 37 is provided at an end thereof. In addition, the boss second engagement part 36 extends from a position away from the boss first end surface 31 along the shaft direction of the rotating shaft 1 and a boss second restricting part 38 is provided at an end close to the boss first end surface 31. It should be noted that the boss second engagement part 36 may extend from the boss second end surface 32 along the shaft direction of the rotating shaft 1 and the boss second restricting part 38 may be provided at an end thereof. Selection is made as appropriate depending on the molding die.

[0029] As described in detail later, the fixing member first restricting part 17 and the boss first restricting part 37 form a first restricting mechanism 70 that restricts the range of movement of the boss 30 along the shaft direction of the rotating shaft 1 (see Fig. 13). Similarly, the fixing member second restricting part 18 and the boss second restricting part 38 form a second restricting mechanism 80 that restricts the range of movement of the boss 30 along the shaft direction of the rotating shaft 1 (see Fig. 13).

[0030] In the embodiment, the cone 50 extends from the boss outer peripheral surface 33 corresponding to the fixing member first engagement part 15 or the fixing member second engagement part 16 in the shaft direction of the rotating shaft 1.

[0031] In the blower unit 100 according to the embodiment, the rotating shaft 1 of the motor is press-fitted and mounted to the fixing member through hole 14 of the fixing member 10 (the rotating shaft 1 is press-fitted and mounted to the fixing member 10), the boss 30 of the fan 60 is attached to the fixing member 10 from the side close to the tip of the rotating shaft 1, that is, the boss 30 is moved from the fixing member first end surface 11, and the engagement parts of the boss 30 are engaged with the engagement parts of the fixing member 10.

[0032] When the boss 30 is moved from the fixing member first end surface 11 of the fixing member 10, positioning is performed so that the boss first engagement parts 35 of the boss 30 correspond to the fixing member first engagement parts 15 and the boss second engagement parts 36 correspond to the fixing member second engagement parts 16 in the shaft direction, and the boss second engagement parts 36 are moved so as to make sliding contact with the fixing member outer peripheral surface 13 while the boss second engagement parts 36 formed in, for example, a well-known hook are pressed. Then, the boss first engagement parts 35 are fitted to and engaged with the fixing member first engagement parts 15 and the boss second engagement parts 36 are fitted to and engaged with the fixing member sec-

ond engagement parts 16.

[0033] Since the boss first engagement parts 35 are recess-projection fitted to and engaged with the fixing member first engagement parts 15 and the boss second engagement parts 36 are recess-projection fitted to and engaged with the fixing member second engagement parts 16 as described above, the fan 60 can be fixed to the rotating shaft 1 without idle running.

[0034] In the blower unit according to the embodiment, the rotational driving force transmitted from the rotating shaft 1 to the fixing member 10 is transmitted radially outward of the rotating shaft from the fixing member 10 to the boss 30 and then transmitted to the cone 50. In addition, since the cone 50 extends radially outward of the rotating shaft 1 from the boss outer peripheral surface 33 corresponding to the fixing member engagement part, the rotational driving force to the cone is also transmitted radially outward of the rotating shaft 1. Since the driving force to the rotating shaft 1, the fixing member 10, the boss 30, and the cone 50 is transmitted radially outward of the rotating shaft 1 and is not transmitted in the direction of the rotating shaft in the blower unit according to the embodiment as described above, the causes of occurrence of runout and imbalance during rotation of the impeller can be eliminated.

[0035] In addition, the above-described first restricting mechanism 70 formed by the fixing member first restricting part 17 and the boss first restricting part 37 according to the embodiment restricts the range of movement of the boss 30 in the direction away from the tip of the rotating shaft 1 and the second restricting mechanism 80 formed by the fixing member second restricting part 18 and the boss second restricting part 38 restricts the range of movement of the boss 30 in the direction toward the tip of the rotating shaft 1.

[0036] Since the first restricting mechanism 70 and the second restricting mechanism 80 are provided as described above, it is possible to prevent the movement of the boss 30 in the shaft direction of the rotating shaft 1 and thereby prevent the movement of the fan 60 in the shaft direction.

[0037] Although the fixing member first engagement parts 15 and the fixing member second engagement parts 16 are formed in concave shapes and the boss first engagement parts 35 and the boss second engagement parts 36 are formed in convex shapes in the embodiment, the fixing member first engagement parts 15 and the fixing member second engagement parts 16 may be formed in convex shapes and the boss first engagement parts 35 and the boss second engagement parts 36 may be formed in concave shapes.

[0038] In addition, the fixing member first restricting parts 17 and the fixing member second restricting parts 18 are preferably present in the same position in the shaft direction of the rotating shaft 1 from the fixing member first end surface 11. In addition, the boss first restricting parts 37 and the boss second restricting parts 38 are also preferably present in the same position in the shaft di-

rection of the rotating shaft 1 from the boss first end surface 31. This makes it easy to provide a parting line in the same position, facilitates the design of a metal mold, and improves the productivity of the fixing member 10 and the fan 60.

[0039] In the first embodiment of the invention described above, the fixing member 10 is formed so that the one side is congruous with the other side about the virtual cross section L2 located midway between the fixing member first end surface 11 and the fixing member second end surface 12. In the example in the first embodiment illustrated in the drawing, the fixing member 10 is mounted onto the rotating shaft 1 with the fixing member first end surface 11 facing upward (in the first mount attitude, see particularly Fig. 12 and Fig. 13) and then the boss 30 is attached thereto.

[0040] In contrast, even when the fixing member 10 is mounted onto the rotating shaft 1 upside down, that is, the fixing member 10 is mounted with the fixing member second end surface 12 facing upward with respect to the rotating shaft 1 (in the second mount attitude) as illustrated in Fig. 14, the boss 30 can be attached similarly to the fixing member 10 described above with no difficulty.

[0041] If the fixing member 10 is formed congruously about the virtual cross section L2 located midway as described above, since the fixing member 10 may be mounted onto the rotating member 1 from any of the end surfaces, convenience of assembly can be improved.

[0042] Since the fixing member 10 is formed congruously about the virtual cross section L2 located midway between the fixing member first end surface 11 and the fixing member second end surface 12 as described above when the invention is practiced, although the lengths in the shaft direction of the fixing member first engagement part 15 and the fixing member second engagement part 16 are preferably identical, the invention is not limited to this and the lengths in the shaft direction of the fixing member first engagement part 15 and the fixing member second engagement part 16 may be different as long as there is not difficulty in the rotation of the fan.

[0043] Next, the second embodiment of the invention will be described.

[0044] Fig. 15 to Fig. 19 illustrate the fixing member 10 and the boss 30 of the blower unit according to the second embodiment of the invention. The blower unit according to the embodiment has the fixing member 10 formed in a cap shape as illustrated in, for example, the PTL 1. That is, the boss 30 of the fan is attached to the rotating shaft 1 and then the fixing member 10 is mounted onto the rotating shaft 1 (the rotating shaft 1 is press-fitted and mounted to the fixing member 10) to fix the boss 30 using the fixing member 10, thereby preventing the fan from rotating with respect to the rotating shaft.

[0045] As in the first embodiment, the blower unit according to the second embodiment of the invention includes the fixing member first engagement parts 15 that are engaged with the boss engagement parts 35 provid-

ed in the boss 30 in the first mount attitude in which the fixing member 10 having the fixing member through hole 14 is mounted onto the rotating shaft 1 from one side of the fixing member through hole 14 and the fixing member second engagement parts 16 that are engaged with the boss engagement parts 35 in the second mount attitude in which the fixing member 10 is mounted onto the rotating shaft 1 from the other side of the fixing member through hole 14.

[0046] Also in the blower unit according to the second embodiment, the fixing member 10 is formed congruously about the virtual cross section L2 located midway in the shaft direction of the fixing member 10 as in the first embodiment. In addition, the fixing member 10 may be formed plane-symmetrically with respect to the virtual cross section L2. In the example illustrated in the drawings (Fig. 16 and Fig. 17) in the second embodiment, the fixing member 10 is mounted with the fixing member first engagement parts 15 facing downward and is engaged with the boss 30 (first mount attitude).

[0047] In addition, as the aspect in which numerals 15 and 16 are surrounded by parentheses in Fig. 16 and Fig. 17, the fixing member 10 can be engaged with the boss 30 with the fixing member first engagement parts 16 facing downward with respect to the rotating shaft 1, that is, with the fixing member 10 mounted upside down.

[0048] Fig. 18 illustrates another example of the second embodiment and, in this example, the fixing member through hole 14 is provided with the small-diameter part 14a having a diameter smaller than the outer diameter of the rotating shaft 1 between the one side and the other side.

[0049] Since the small-diameter part 14a is provided, the fixing member 10 can be firmly mounted onto the rotating shaft 1 in both the first mount attitude and the second mount attitude of the fixing member 10.

[0050] Fig. 19 illustrates another example of the second embodiment and, in this example, the fixing member through hole 14 is provided with the tapered parts 14b and 14c having diameters tapered gradually from the one side and the other side to the small-diameter part 14a.

[0051] Since the small-diameter part 14a and the tapered parts 14b and 14c are provided as described above, the work for mounting the fixing member 10 onto the rotating shaft 1 using depression can be performed relatively easily even though the small-diameter part 14a is present.

[0052] In the blower unit according to the second embodiment described above, since the fixing member 10 is formed congruously or plane-symmetrically about the virtual cross section L2 between the end of the one side and the end of the other side as described above, the fixing member 10 can be mounted onto the rotating shaft 1 from any side of the fixing member 10, thereby improving the flexibility of the mount direction of the fixing member and the convenience of assembly.

[0053] As described above, according to the first embodiment and the second embodiment of the invention,

it is possible to obtain the fixing structure of the blower unit for improving the flexibility of the mount direction of the fixing member in the blower unit having the structure in which the fan is fixed to the rotating shaft having a circular cross section.

[0054] Although the blower unit according to the invention has been described above through the first embodiment and the second embodiment, it will be appreciated that the invention is not limited to these two embodiments.

Industrial Applicability

[0055] The blower unit according to the invention can be manufactured industrially and can be preferably used especially for in-vehicle air conditioners.

Reference Signs List

[0056]

M:	motor	
1:	rotating shaft	
10:	fixing member	
11:	fixing member first end surface	
12:	fixing member second end surface	
13:	fixing member outer peripheral surface	
14:	fixing member through hole	
14a:	small-diameter part	
14b:	tapered part	
14c:	tapered part	
15:	fixing member first engagement part	
16:	fixing member second engagement part	
17:	fixing member first restricting part	
18:	fixing member second restricting part	
30:	boss	
31:	boss first end surface	
32:	boss second end surface	
33:	boss outer peripheral surface	
34:	boss through hole	
35:	boss first engagement part	
36:	boss second engagement part	
37:	boss first restricting part	
38:	boss second restricting part	
50:	cone	
60:	fan	
70:	first restricting mechanism	
80:	second restricting mechanism	
100:	blower unit	
L1:	virtual axial line of rotating shaft	
L2:	virtual cross section	

Claims

1. A blower unit 100 comprising:
 - a motor M provided with a rotating shaft 1 having a circular cross section;

a resinous fixing member 10 mounted onto the rotating shaft; and
a resinous fan 60 having a boss 30 attached to the fixing member,

wherein the fixing member 10 includes
a fixing member through hole 14 to which the rotating shaft 1 is press-fitted,
a fixing member first engagement part 15 to be engaged with a boss engagement part 35 provided in the boss 30 in a first mount attitude in which the rotating shaft 1 is press-fitted from one side of the fixing member through hole 14, and
a fixing member second engagement part 16 to be engaged with the boss engagement part 35 in a second mount attitude in which the rotating shaft 1 is press-fitted from the other side of the fixing member through hole 14.

2. The blower unit 100 according to claim 1, wherein the fixing member through hole 14 has a small-diameter part 14a between the one side and the other side, the fixing member through hole 14 having a diameter smaller than an outer diameter of the rotating shaft 1 at the small-diameter part.
3. The blower unit 100 according to claim 2, wherein the fixing member through hole 14 has tapered parts 14b and 14c having diameters tapered gradually from the one side and the other side to the small-diameter part 14a.
4. The blower unit 100 according to any one of claims 1 to 3, wherein the fixing member 10 is formed so that the one side is congruous with the other side about a virtual cross section L2 located midway between the end of the one side and the end of the other side.

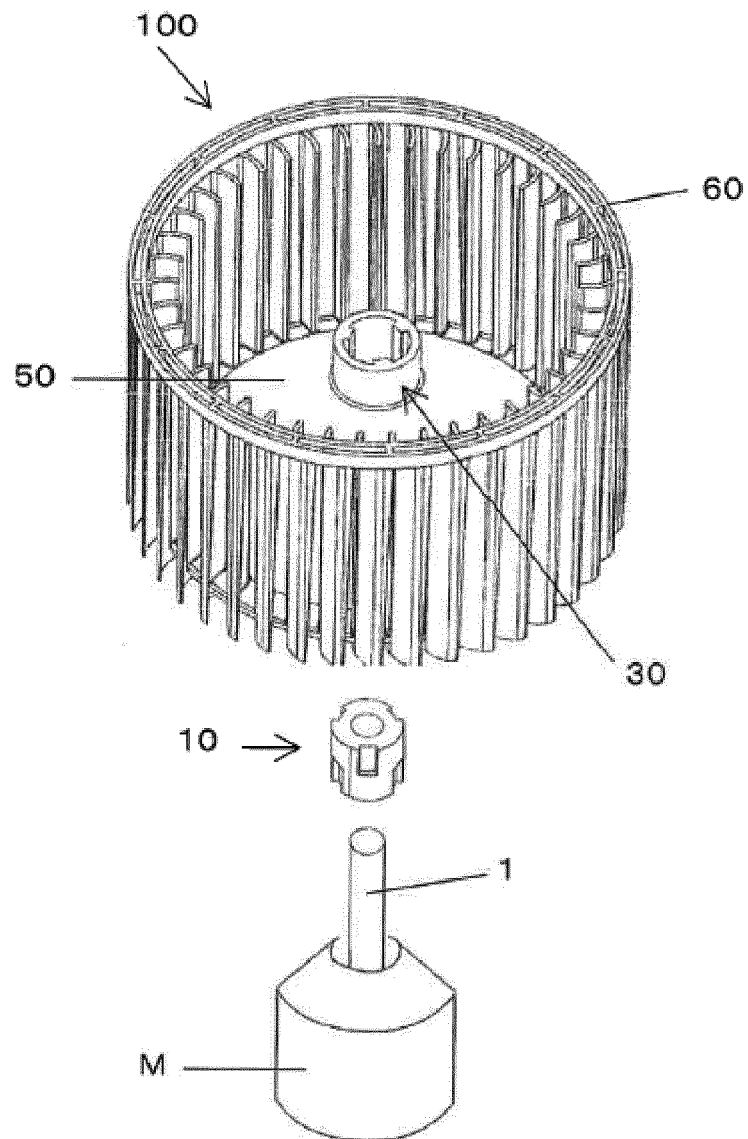


FIG. 1

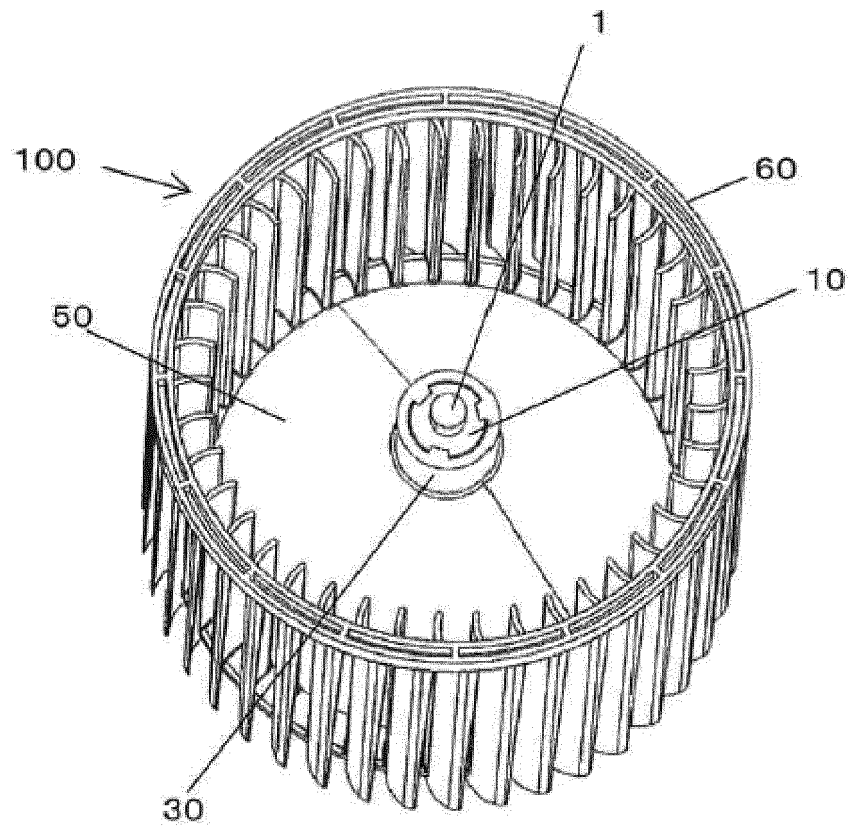


FIG. 2

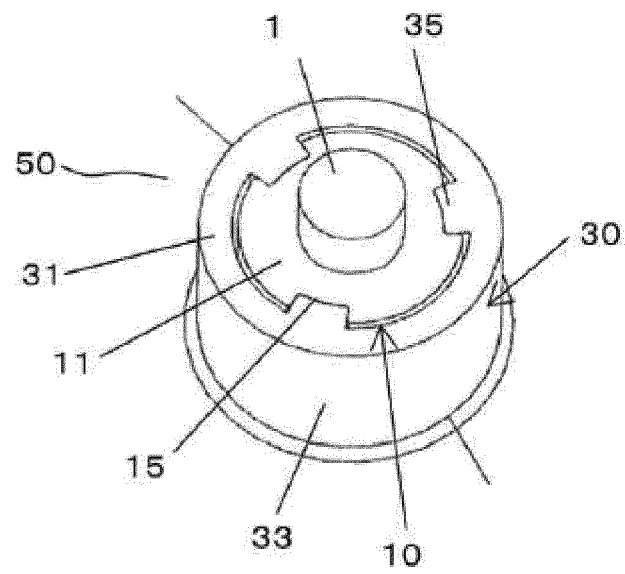


FIG. 3

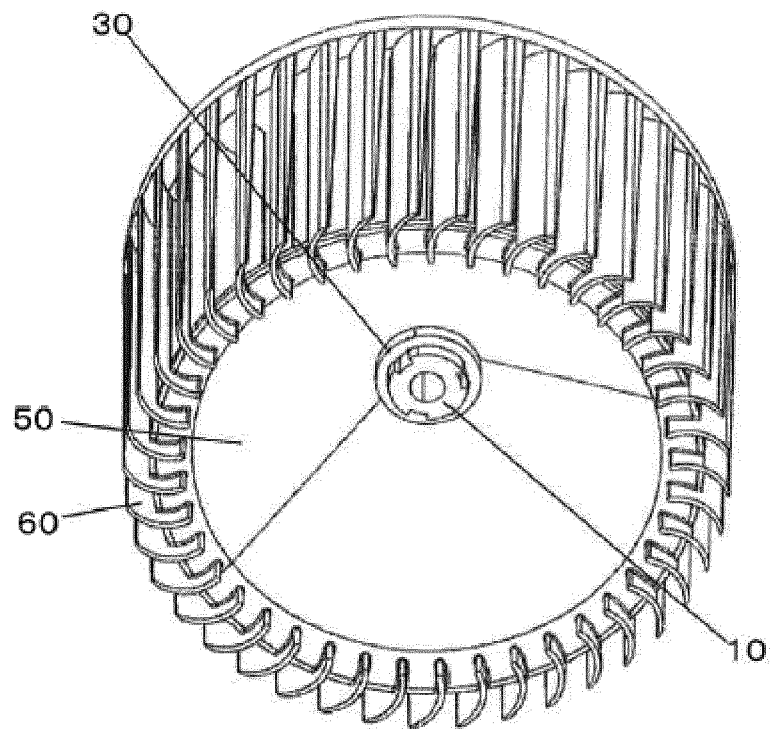


FIG. 4

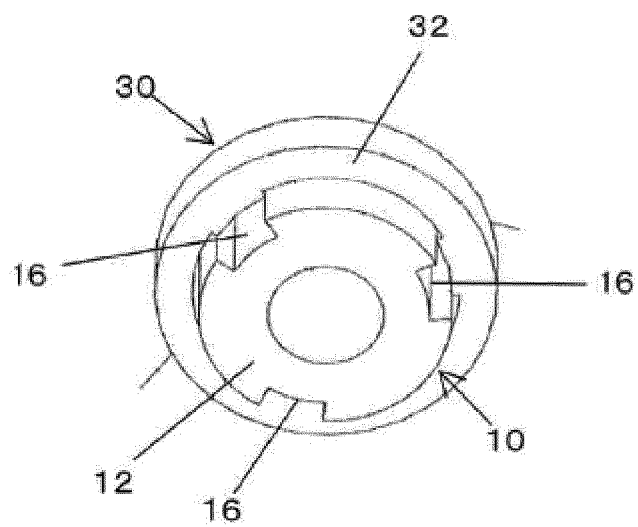


FIG. 5

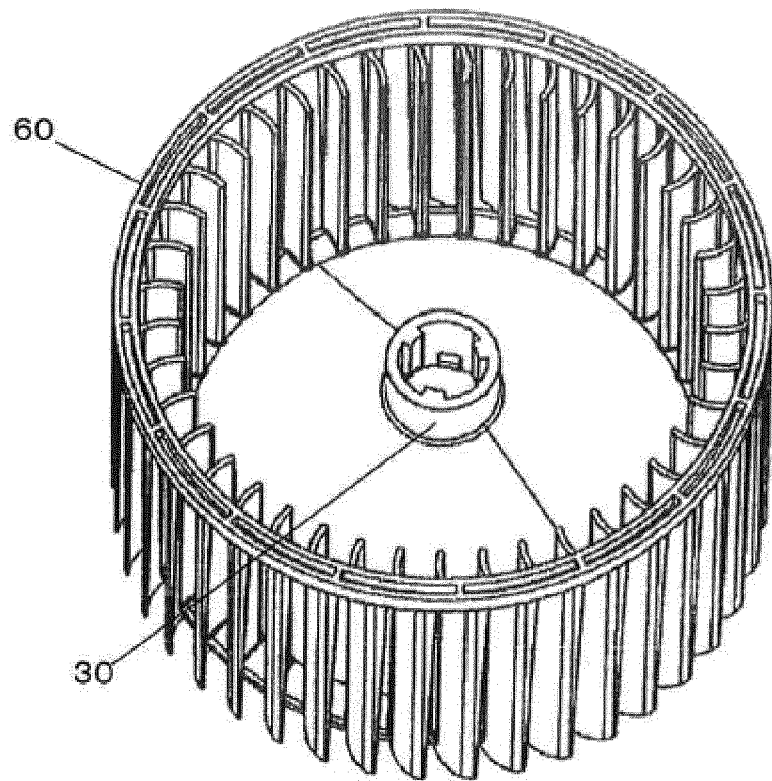


FIG. 6

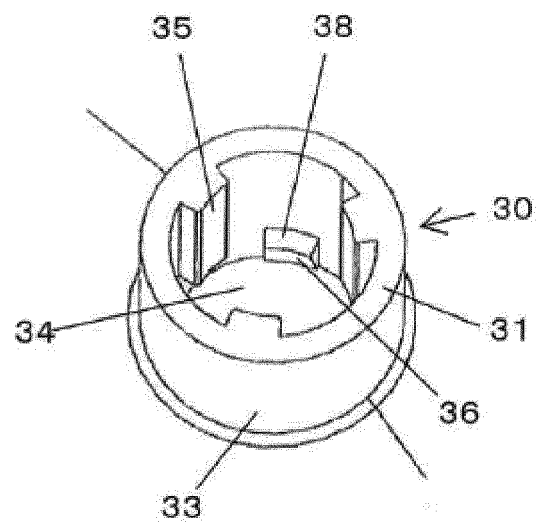


FIG. 7

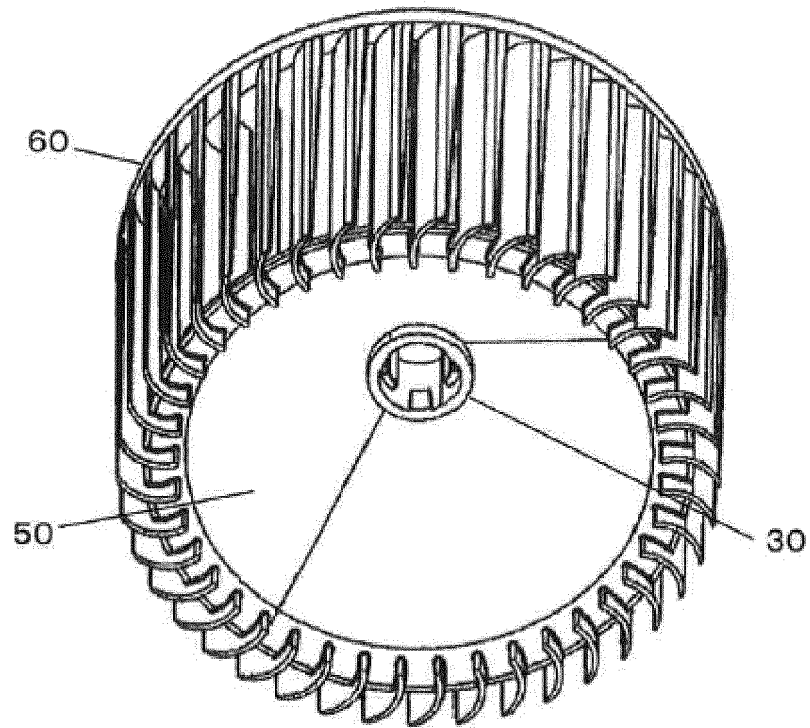


FIG. 8

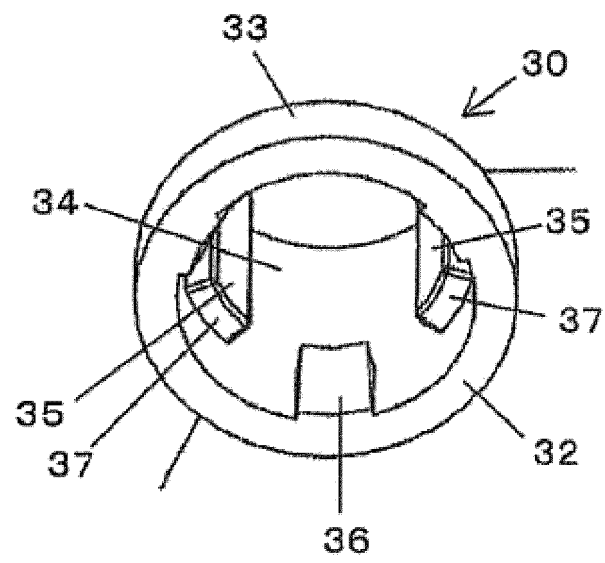


FIG. 9

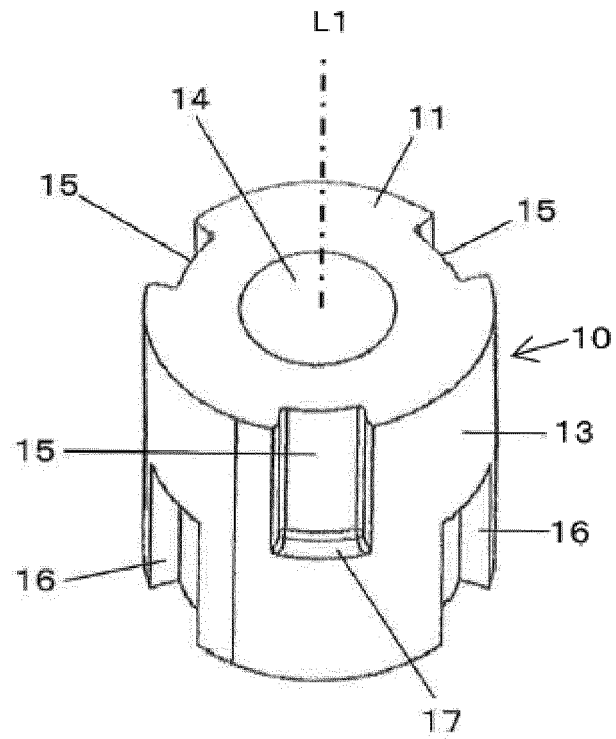


FIG. 10

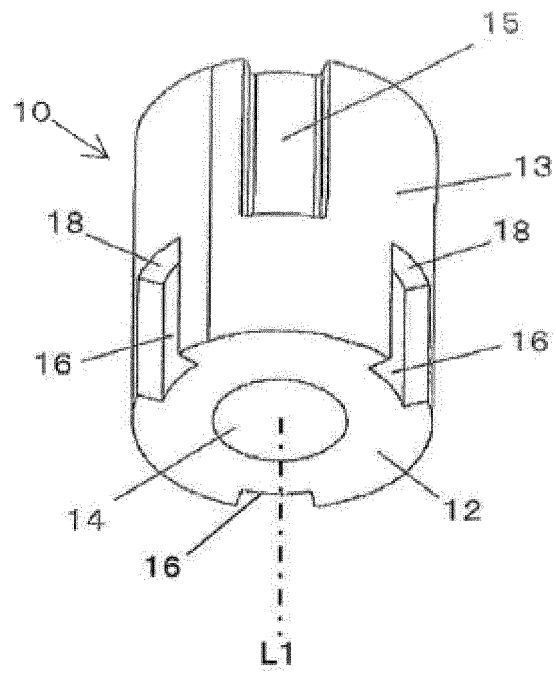


FIG. 11

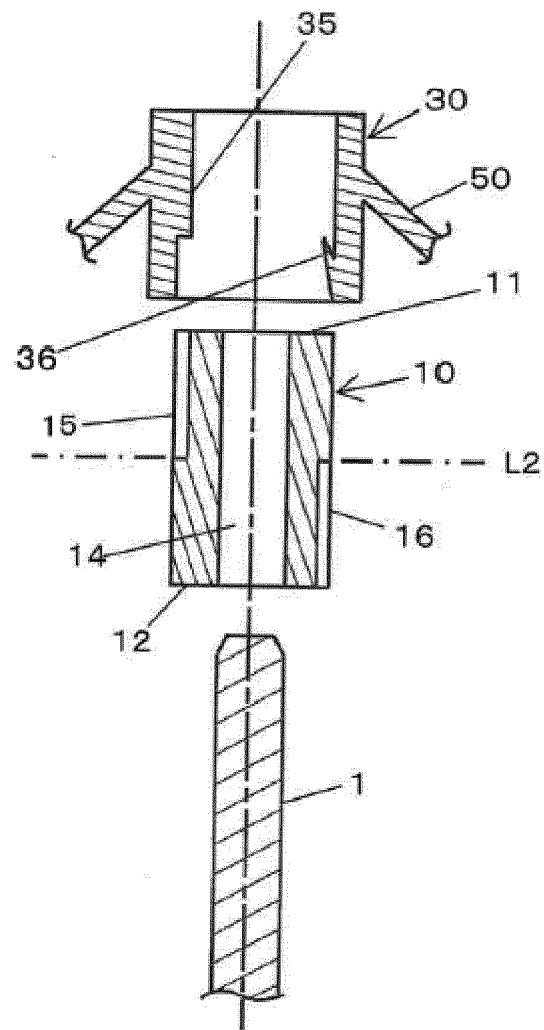


FIG. 12

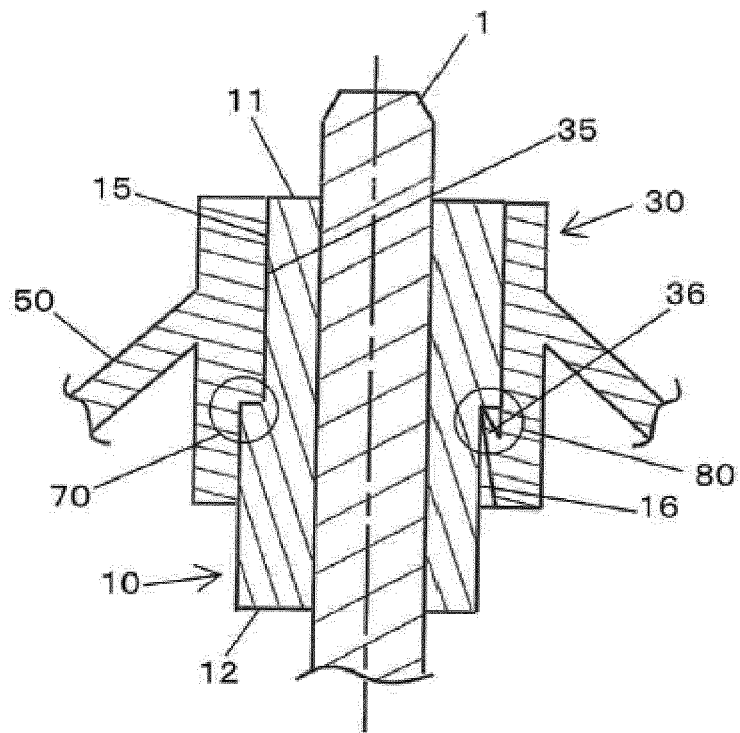


FIG. 13

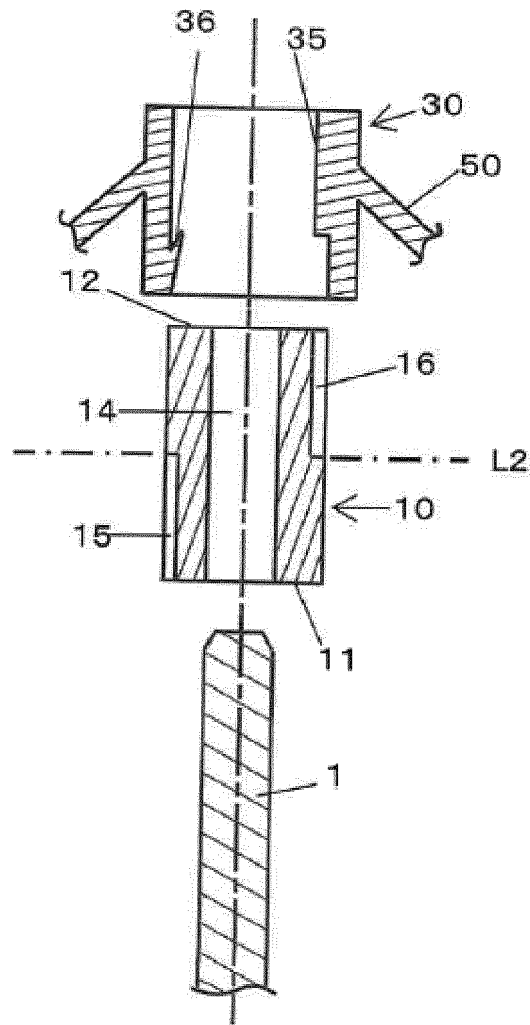


FIG. 14

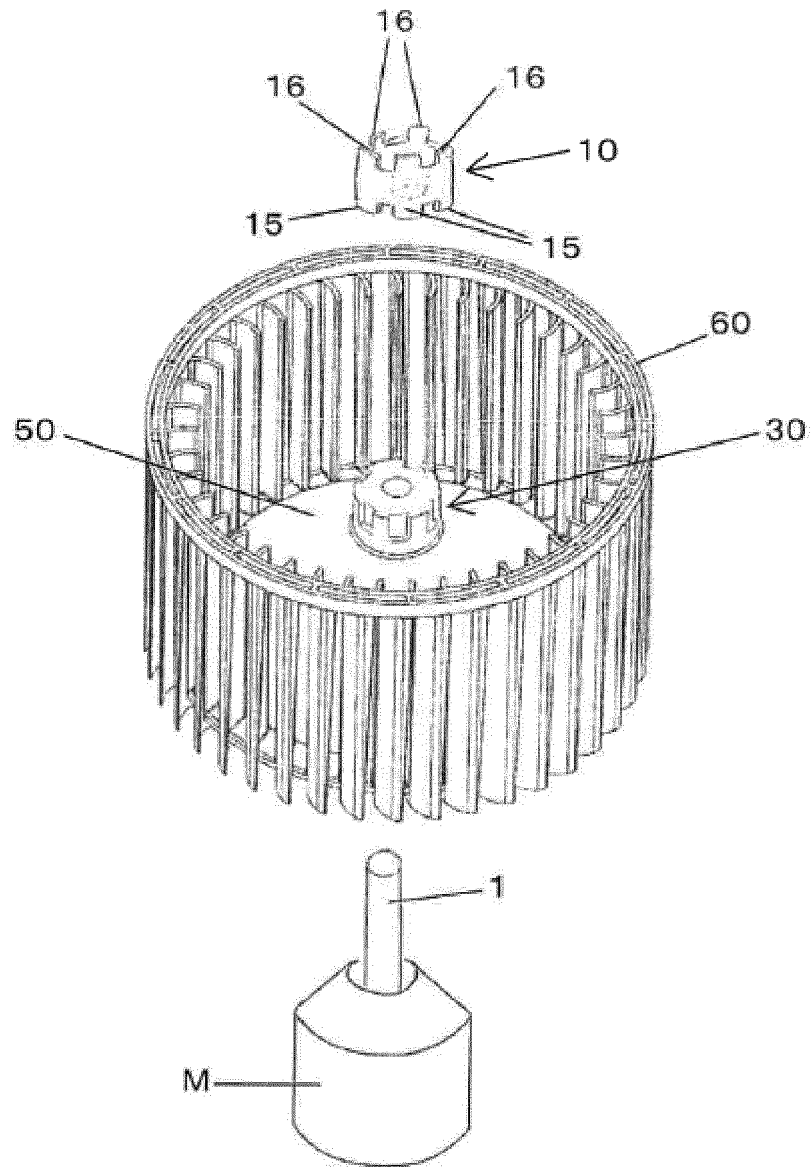


FIG. 15

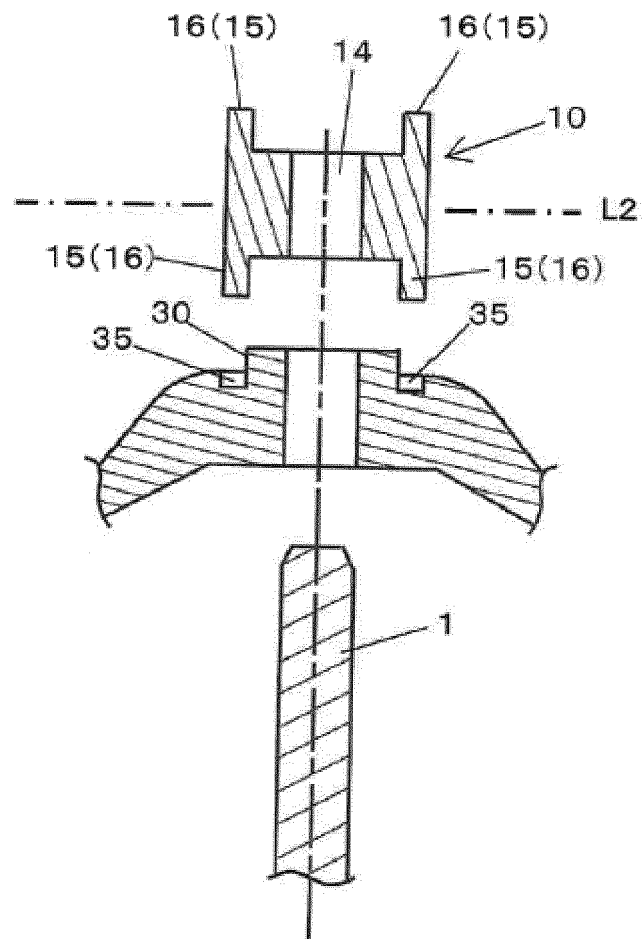


FIG. 16

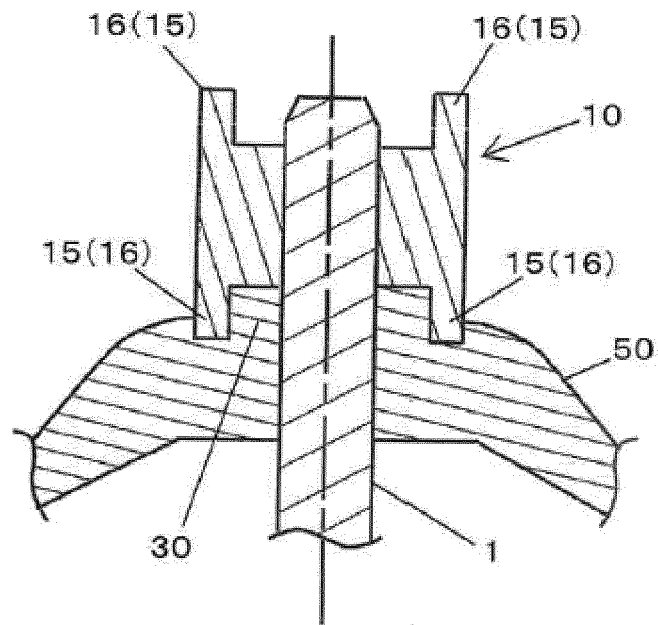


FIG. 17

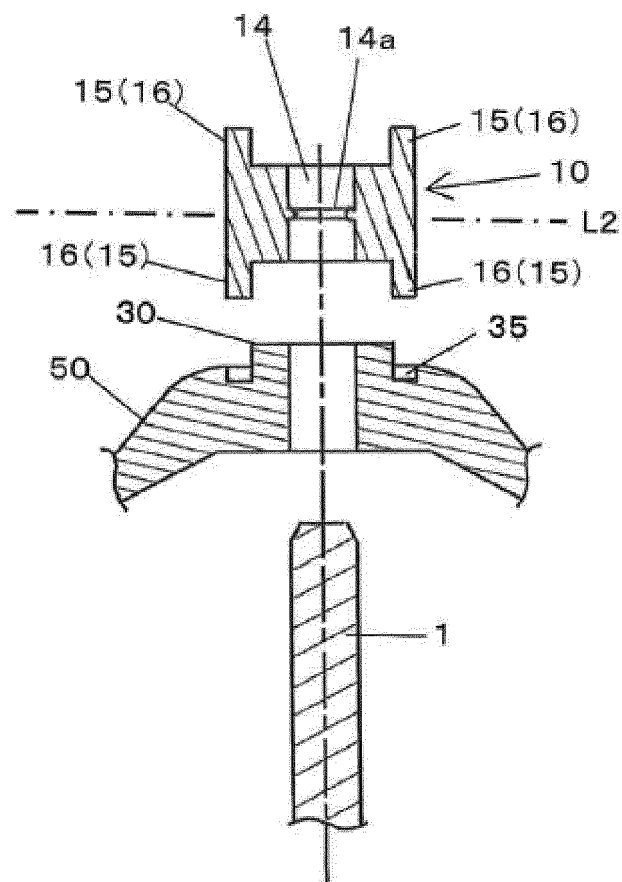


FIG. 18

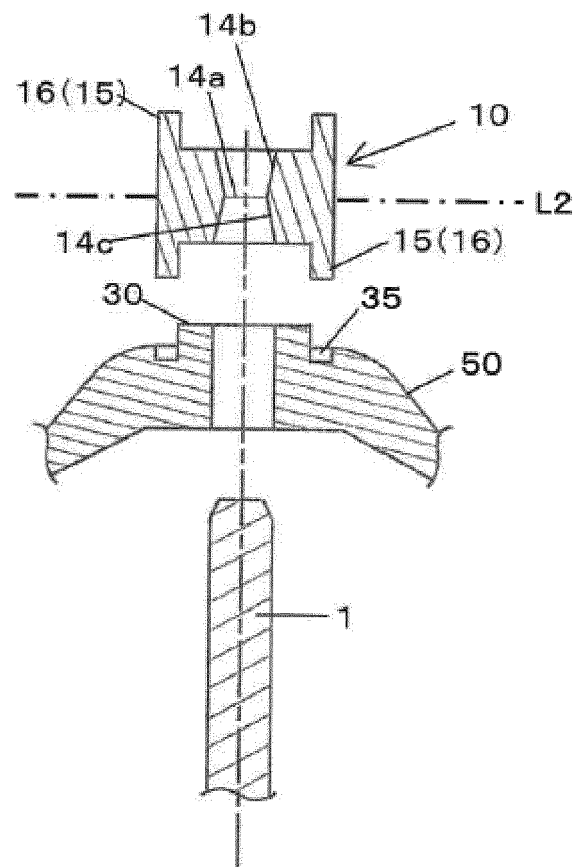


FIG. 19

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/008440

A. CLASSIFICATION OF SUBJECT MATTER

F04D29/28(2006.01)i, F04D29/62(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F04D29/28, F04D29/62

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
 Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 9769/1990 (Laid-open No. 102094/1991) (Uchida Manufacturing Co., Ltd.), 24 October 1991 (24.10.1991), specification, page 3, line 10 to page 9, line 6; fig. 1 to 3 (Family: none)	1-4
Y	JP 2003-314493 A (Denso Corp.), 06 November 2003 (06.11.2003), paragraphs [0014] to [0035]; fig. 1 to 9 (Family: none)	1-4

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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Date of the actual completion of the international search
 19 May 2017 (19.05.17)

Date of mailing of the international search report
 30 May 2017 (30.05.17)

Name and mailing address of the ISA/
 Japan Patent Office
 3-4-3, Kasumigaseki, Chiyoda-ku,
 Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/008440

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-308608 A (Denso Corp.), 04 November 2004 (04.11.2004), paragraphs [0017] to [0041]; fig. 1 to 4 (Family: none)	1-4
A	EP 2960523 A1 (COMPAGNIE INDUSTRIELLE D'APPLICATIONS THERMIQUES), 30 December 2015 (30.12.2015), entire text; all drawings & FR 3022579 A1	1-4
A	DE 102011086379 A1 (ROBERT BOSCH GMBH), 16 May 2013 (16.05.2013), entire text; all drawings (Family: none)	1-4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004003449 A [0002] [0005]
- JP 2011163244 A [0002] [0005]