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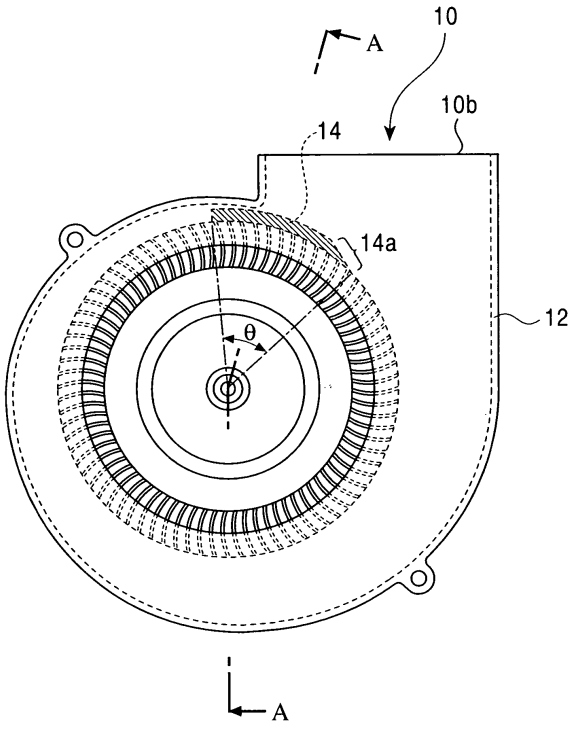
(54) Centrifugal fan

(57) In a centrifugal fan (10) including a casing (12), a rotatable impeller (20) disposed in the casing, a motor (30) for driving the impeller, a control board (40) for controlling the motor, and an ejection port (10b) for cooling air, a dust proof projection (14) is formed to the casing (12) to prevent invasion of dusts from the ejection port (10b) to the motor (30) and the control board (40). With this simple arrangement, invasion of dusts to a coil portion and a control board (40) of the motor can be reduced while suppressing a manufacturing cost. In this case, when the dust proof projection (14) is disposed to a gap between the inner peripheral surface of a side wall of the casing (12) and the outer peripheral surface of the impeller (20) along the outer peripheral surface of the impeller (20) in an arc-shape, a dust proof effect can be more improved.

FIG. 1



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Description

[0001] The present invention relates to a centrifugal fan used to cool, for example, a battery of a hybrid car, and more particularly to a centrifugal fan having a dust proof structure.

[0002] Japanese Patent Application Laid-Open (JP-A) No. 2005-291050 discloses a centrifugal fan that is often used to cool heat generation elements of, for example, OA equipment as an example of a centrifugal fan.

[0003] The conventional centrifugal fan will be explained using FIG. 3.

[0004] FIG. 3 is a longitudinal side elevational view showing an arrangement of the conventional centrifugal fan.

[0005] As shown in FIG. 3, the conventional centrifugal fan 100 is composed of a casing 110, a rotatable impeller 140 disposed in the casing 110, a motor 120 for driving the impeller 140, and a control board 130 of the motor 120.

[0006] Further, the impeller 140 is mainly composed of a blade 142 and a hub 144.

[0007] Further, as shown in FIG. 3, the motor 120 includes a rotor 122, a coil 124, a stator 125, and a rotating shaft 126.

[0008] Incidentally, since a centrifugal fan used to cool a battery has a high flow path resistance due to gas tightness, it is often used at high static pressure, and thus a suction flow (reverse flow) may be caused from a port originally used as an ejection port.

[0009] In particular, in a centrifugal fan used in a dust-containing atmosphere, dusts are deposited on a coil portion and a control board of a motor by suction flows. Consequently, a problem arises in that when the deposited dusts contain moisture, the centrifugal fan may be failed by the deposited dusts.

[0010] FIG. 4 shows how sucked air flows as a result of computer analysis of the suction flow.

[0011] FIG. 4 is a front elevational view showing a result of analysis of wind directions and wind velocities when suction flows between an impeller hub and a casing are caused from an ejection port 100b in the conventional centrifugal fan 100.

[0012] As shown in FIG. 4, it can be understood that the suction flows gather to the vicinity of the rotating shaft 126 of the motor.

[0013] Accordingly, in the centrifugal fan used to cool the battery, it is important to provide the coil portion and the control board of the motor with a dust proof structure against the suction flow.

[0014] Although it is effective to simply narrow a gap between an impeller and a casing as a dust-proofing measure, it is difficult to employ the measure due to a problem of accuracy of parts such as vibration of an impeller surface, and the like.

[0015] Further, since dusts clog the narrowed gap, there is a possibility that centrifugal fan operates defectively in its entirety.

[0016] To cope with the above problem, JP-A-2002-61596 discloses a centrifugal fan. The centrifugal fan has a labyrinth structure formed to a second side wall of a casing and to respective confronting wall portions of an impeller which confront with each other in the axial direction of a blade support member of the impeller. The labyrinth structure is provided to prevent water from invading into a space formed between a cup-shaped member and the second side wall from the outside of a rotating shaft in the radial direction thereof.

[0017] An object of the invention disclosed in JP-A-2002-61596 is to prevent water invasion, and this object is different from the dust-proofing measure of the present invention. However, when the shape disclosed in JP-A-2002-61596 is applied as it is, the following problems may arise:

(1) First, a labyrinth structure must be designed to both the impeller and the casing; and

(2) Next, since the shape of a mold for molding the casing becomes complex, a cost for manufacturing the mold increase.

[0018] Accordingly, an object of the present invention is to overcome the above problems and to provide a centrifugal fan which can decrease dusts invading to a coil portion and a control board of a motor while reducing a cost by a simple arrangement.

[0019] A centrifugal fan according to a first aspect of the invention includes a casing, a rotatable impeller disposed in the casing, a motor for driving the impeller, a control board for controlling the motor, and an ejection port for cooling air, wherein a dust proof projection is formed to the casing to prevent invasion of dusts from the ejection port to the motor and the control board.

[0020] A centrifugal fan according to a second aspect of the invention includes a casing, a rotatable impeller disposed in the casing, a motor for driving the impeller, a control board for controlling the motor, and an ejection port for cooling air, wherein a dust proof projection is attached to the casing to prevent invasion of dusts from the ejection port to the motor and the control board.

[0021] In a centrifugal fan according to a third aspect of the invention, the dust proof projection may be disposed to a gap between the inner peripheral surface of a side wall of the casing and the outer peripheral surface of the impeller along the outer peripheral surface of the impeller in an arc-shape.

[0022] In a centrifugal fan according to a fourth aspect of the invention, the dust proof projection may be disposed in the vicinity of the ejection port of the centrifugal fan as well as a center angle of the arc-shape thereof is 20° to 90° and preferably about 45°.

[0023] In a centrifugal fan according to a fifth aspect of the invention, an extreme end portion of the dust proof projection may be formed in a substantially wedge shape.

[0024] By way of example, the invention will now be described in greater detail with reference to the accom-

panying drawings of which:

FIG. 1 is a front elevational view showing a basic arrangement of a centrifugal fan of an embodiment of the present invention;

FIG. 2 is a longitudinal side elevational view showing the basic arrangement of the centrifugal fan of the embodiment of the invention;

FIG. 3 is a longitudinal side elevational view showing an arrangement of a conventional centrifugal fan; and

FIG. 4 is a front elevational view of the conventional centrifugal fan showing a result of analysis of wind directions and velocity of wind when suction flows are caused from an ejection port.

[0025] Hereinafter, an embodiment a centrifugal fan of the present invention will be explained using FIGS. 1 and 2 and referring to FIG. 3.

[0026] FIG. 1 is a front elevational view showing a basic arrangement of the centrifugal fan of the embodiment of the invention.

[0027] FIG. 2 is a longitudinal side elevational view showing the basic arrangement of the centrifugal fan of the embodiment of the invention.

[0028] First, the basic arrangement of the centrifugal fan of the embodiment will be explained using FIGS. 1 and 2.

[0029] The centrifugal fan 10 of the embodiment is composed of a casing 12, a rotatable impeller 20 disposed in the casing 12, a motor 30 for driving the impeller 20, a control board 40 for controlling the motor 30, and an ejection port 10b for cooling air likewise the conventional centrifugal fan.

[0030] Note that, in FIG. 2, reference numeral 32 denotes a rotor of the motor 30, and 34 denotes a stator thereof.

[0031] As shown in FIGS. 1 and 2, the centrifugal fan 10 of the present invention is characterized in that a dust proof projection 14 is formed to the casing 12 to prevent invasion of dusts from the ejection port 10b to the motor 30 and the control board 40.

[0032] Further, the dust proof projection 14 is disposed to a gap between the inner peripheral surface of a side wall of the casing 12 and the outer peripheral surface of the impeller 20 along the outer peripheral surface of the impeller 20 in an arc-shape.

[0033] More specifically, the dust proof projection 14 is disposed in the vicinity of the ejection port 10b of the centrifugal fan 10 and has the arc shape having a center angle of about 45° and an extreme end portion 14a formed in a substantially wedge shape.

[0034] Next, a basic operation of the centrifugal fan 10 of the embodiment arranged as described above will be explained.

[0035] When, for example, the centrifugal fan 10 is used to cool a battery as described above, suction flows may be caused as shown in FIG. 4.

[0036] Accordingly, it can be easily understood that the dust proof projection 14 prevents invasion of dusts to the motor 30 and the control board 40 by forming the dust proof projection 14 having the above shape to the above portion of the housing 22 as apparent from FIG. 4.

[0037] In particular, the dust proof effect of the dust proof projection 14 can be more increased by disposing the arc-shaped dust proof projection 14 in the vicinity of the ejection port 10b of the centrifugal fan 10 and setting the center angle θ of the arc shape thereof to about 45°.

[0038] Further, a dust collecting property for collecting dusts to the extreme end portion 14a of the dust proof projection 14 can be enhanced by forming the extreme end portion 14a to the substantially wedge shape, which is more effective to dust proof.

[0039] The centrifugal fan of the present invention is by no means limited to the above embodiment and can be variously modified.

[0040] First, although the present invention has been explained as to the example in which the dust proof projection is formed together with the casing, it is needles to say that a case in which the dust proof projection is attached to the casing after the casing is formed is included in the present invention.

[0041] Further, it is needless to say that the shape of the dust proof projection and the position at which the dust proof projection is attached are not limited to those of the above embodiment.

[0042] Since the centrifugal fan of the present embodiment is arranged as described above, it has excellent advantages as described below.

(1) When the centrifugal fan is arranged as disclosed in the first and second aspects of the invention, dusts invading to the coil portion and the control board of the motor can be reduced with a very simple arrangement.

(2) Since the centrifugal fan is arranged very simply, it is not necessary to design a labyrinth structure to both the impeller and the casing.

(3) Further, since it is not almost necessary to modify the shape of a mold for molding the casing, an increase of a manufacturing cost can be minimized.

(4) When the shape of the dust proof projection is formed as disclosed in the third to fifth aspects of the invention, the dust proof effect can be more improved.

Claims

1. A centrifugal fan(10) comprising a casing(12), a rotatable impeller(20) disposed in the casing(12), a motor(30) for driving the impeller(20), a control board (40) for controlling the motor(30), and an ejection port(10b) for cooling air, wherein a dust proof projection(14) is formed to the casing(12) to prevent invasion of dusts from the ejection port(10b) to the

motor(30) and the control board(40).

2. A centrifugal fan(10) comprising a casing(12), a rotatable impeller (20) disposed in the casing(12), a motor(30) for driving the impeller(20), a control board (40) for controlling the motor(30), and an ejection port(10b) for cooling air, wherein a dust proof projection(14) is attached to the casing to prevent invasion of dusts from the ejection port(10b) to the motor (30) and the control board(40).

3. A centrifugal fan(10) according to claim 1 or 2, wherein the dust proof projection(14) is disposed to a gap between the inner peripheral surface of a side wall of the casing(12) and the outer peripheral surface of the impeller(20) along the outer peripheral surface of the impeller(20) in an arc-shape.

4. A centrifugal fan(10) according to claim 3, wherein the dust proof projection(14) is disposed in the vicinity of the ejection port(10b) of the centrifugal fan(10) as well as a center angle of the arc-shape there of is 20° to 90° and preferably about 45°.

5. A centrifugal fan(10) according to claims 1 to 4, wherein an extreme end portion(14a) of the dust proof projection(14) is formed in a substantially wedge shape.

FIG. 1

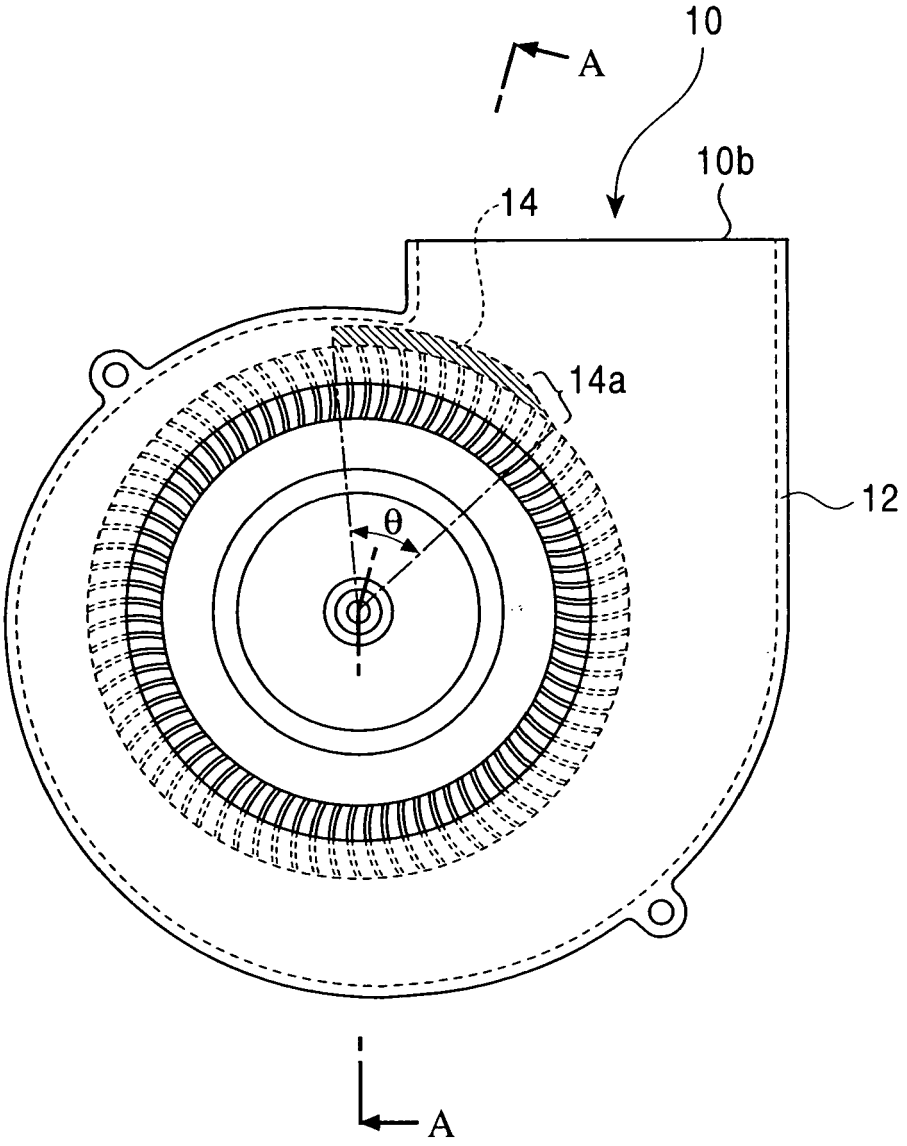


FIG. 2

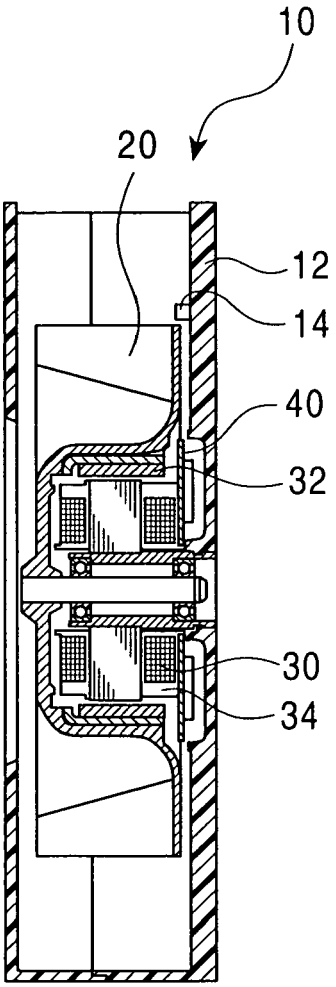


FIG. 3
PRIOR ART

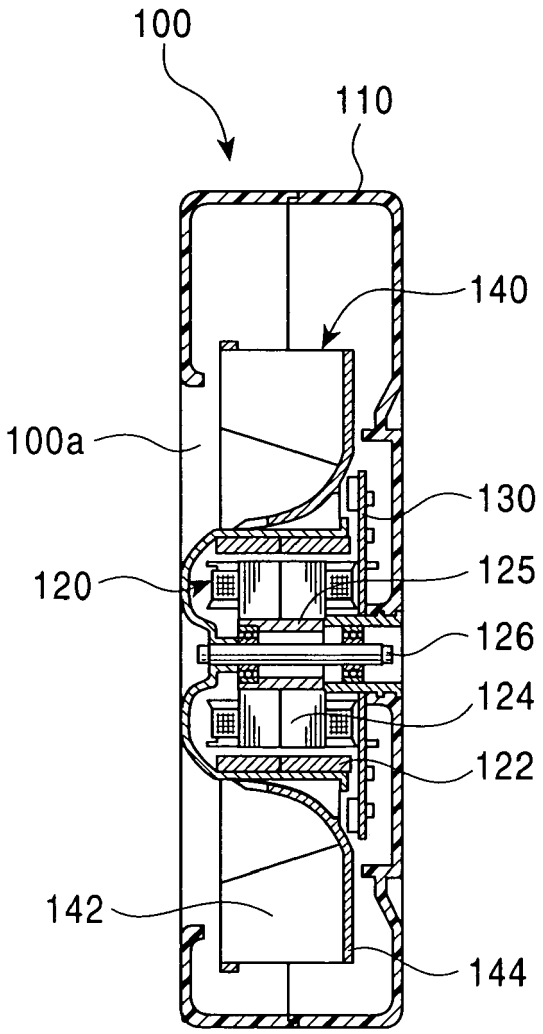
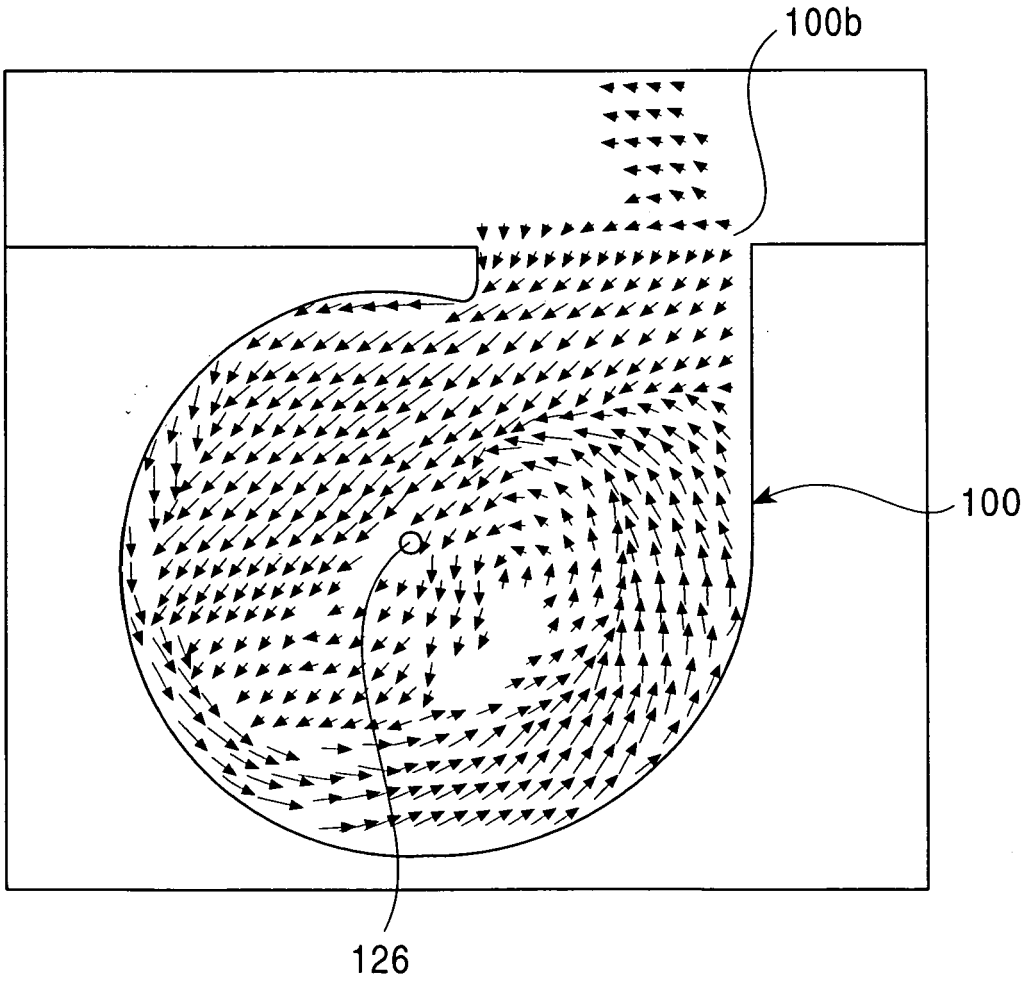


FIG. 4
PRIOR ART



REFERENCES CITED IN THE DESCRIPTION

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- JP 2005291050 A **[0002]**
- JP 2002061596 A **[0016] [0017] [0017]**