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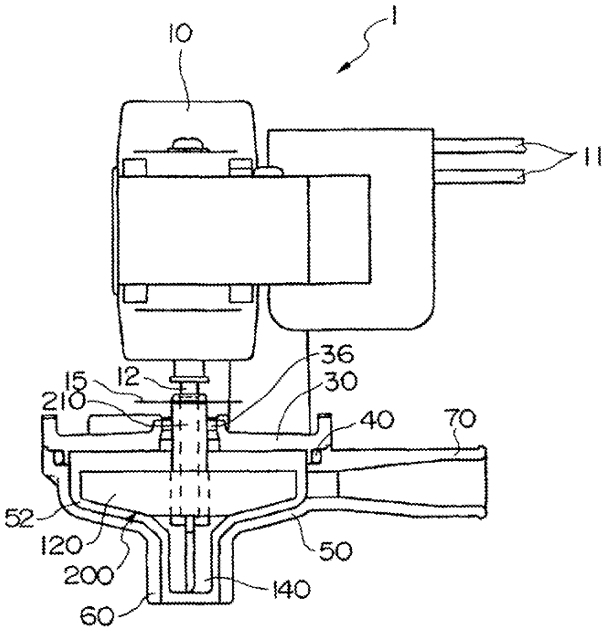
(54) Drainage pump

(57) The invention provides a drainage pump equipped in an air conditioner having high safety by preventing water from coming into contact with a conductive output shaft of an electric motor. The drainage pump has a motor (10), rotating blades (200) coupled to an output shaft (12) of the motor (10), a case main body (50) having a pump chamber for accommodating the rotating blades (200), a lid member (30) covering an opening portion of the pump chamber (52), and a deflector board (15) provided between the lid member (30) and the motor (10). An outer peripheral groove (212) is provided in an end portion of a shaft portion (210) toward the motor (10), and the deflector board (15) is assembled by being fitted to the groove (212) in a tight contact state. Accordingly, drain water does not directly touch the conductive output shaft (12).

FIG. 1



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Description

Technical Field

[0001] The present invention relates to a drainage pump equipped in an air conditioner.

Background art

[0002] In an indoor unit of the air conditioner, a water content in the air is condensed and attached to a heat exchanger at a time of a cooling operation, and drops as drain water into a drain pan provided in a lower side of the heat exchanger. A drainage pump is used for discharging the drain water reserved in the drain pan. The drainage pump is structured such that a suction port is formed in a lower portion, an upper portion is open, rotating blades are rotatably provided within a housing including a pump main body case having a discharge port in a side portion, and the rotating blades are rotated by a motor fixed to an upper portion above an opening of the housing via a cover. A drive shaft of the motor rotatably passes through a through hole formed in the cover so as to be coupled to a shaft portion of the blades, and when the rotating blades are rotated by driving the motor, the drain water reserved within the drain pan is sucked from a lower end of the suction port, is pumped up on the basis of centrifugal force, and is discharged to an external portion from the discharge port.

[0003] Fig. 5 is an explanatory view of a conventional drainage pump as disclosed in Japanese Unexamined Patent Publication No. 9-53591. The drainage pump denoted by reference numeral 1 as a whole has an electric motor 10, and the electric motor 10 is fed with electricity via a lead wire 11. The electric motor 10 is supported by a bracket 20, and a lower end portion of the bracket 20 is coupled to a lid member 30 attached to an upper portion of a case main body 50. A housing of the drainage pump is constructed by the case main body 50 and the lid member 30.

[0004] The case main body 50 is formed by a plastic, and a pump chamber 52 is formed in an inner portion. A suction port 60 and a discharge port 70 which communicate with the pump chamber 52 are integrally formed in the case main body 50.

[0005] A rotating blades 100 are arranged within the pump chamber 52, and an opening portion of the pump chamber 52 is covered by the lid member 30. A seal member 40 is inserted between the case main body 50 and the lid member 30, and the drain water is prevented from leaking out of the pump chamber. The rotating blades 100 have a shaft portion 110, and an output shaft 12 of the electric motor 10 is inserted to a closed-end hole of the shaft portion 110. Plate-like large-diameter blades 120 extending in a radial direction from the shaft portion 110 are provided, and the large-diameter blades 120 are connected to small-diameter blades 140 via coupling portions 130. The drain water from the suction port is fed toward the large-diameter blades 120 via the small-diameter blades 140 and the coupling portions 130.

[0006] A deflector board 14 is formed in a circular plate shape, has a hole in a center portion, and is pressure fitted to the output shaft 12. The deflector board 14 prevents the drain water (particularly backwater) spouting out of the through hole 36 of the lid member 30 from flying toward the motor 10.

[0007] Reference is made to Japanese Unexamined Patent Publication No. 9-53591.

Disclosure of the Invention

Problem to be Solved by the Invention

[0008] However, in the structure of Fig. 5, since the deflector board 14 is pressure fitted to the output shaft 12, a gap is formed between the deflector board 14 and an end portion 111 of a shaft portion 110 as shown in Fig. 6, and the water comes into contact with the metal output shaft 12. As mentioned above, it is not preferable that the flying water comes into contact with the charged output shaft 12 of the drainage pump because it causes a possibility of an electric leakage and a malfunction of the electric motor 10. In this respect, the output shaft 12, which may be charged by breakage of a basic insulation, is handled as a charged portion in a safety standard, and IEC60335-1 and JIS C 9335-1 provides that "a conductive liquid which can be in contact or may be in contact by a normal use should not directly come into contact with a charged portion". Thus, it is necessary to devise a countermeasure to comply with this standard.

[0009] The present invention is made by taking the problem mentioned above into consideration, and an object of the present invention is to provide a drainage pump in which safety is enhanced by preventing water from directly coming into contact with a metal output shaft of an electric motor, in the drainage pump equipped in an air conditioner.

Means for Solving the Problem

[0010] In order to achieve the object mentioned above, in accordance with the present invention, there is provided a drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
the case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between the lid member and the motor,
wherein a shaft portion coupled to an output shaft of

the motor is integrally formed with the rotating blades in such a manner as to protrude from the lid member, and the deflector board is installed to a motor side end portion of the shaft portion.

[0011] Further, in the drainage pump in accordance with the present invention, the deflector board is installed to an outer peripheral groove formed at a motor side end portion of the shaft portion, and a taper portion for facilitating installation of the deflector board is provided at the motor side end portion of the shaft portion.

[0012] Further, in accordance with the present invention, there is provided a drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
the case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between the lid member and the motor,
wherein a shaft portion coupled to an output shaft of the motor is integrally formed with the rotating blades in such a manner as to protrude from the lid member, and the deflector board is integrally formed with a motor side end portion of the shaft portion.

[0013] In the drainage pump in accordance with the present invention having the structure mentioned above, the lid member is divided into two pieces in a semicircular shape.

[0014] Further, in accordance with the present invention, there is provided a drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
the case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between the lid member and the motor,
wherein a shaft portion coupled to an output shaft of the motor is integrally formed with the rotating blades in such a manner as to protrude from the lid member, and the deflector board is passed through by the output shaft of the motor and is bonded to the motor side end portion of the shaft portion by applying of an adhesive agent around it.

[0015] In this case, the adhesive agent enters in such a manner as to fill a gap between the motor side end portion of the shaft portion and the deflector board.

Effect of the Invention

[0016] In accordance with the drainage pump of the present invention, the water does not come into contact with the metal output shaft of the electric motor, and safety is enhanced.

Brief Description of the Drawings

[0017]

Fig. 1 is an explanatory view of a drainage pump in accordance with Embodiment 1;
Fig. 2 is an enlarged view of a substantial part of the drainage pump in accordance with Embodiment 1;
Fig. 3 is an enlarged view of a substantial part of a drainage pump in accordance with Embodiment 2;
Fig. 4 is an enlarged view of a substantial part of a drainage pump in accordance with Embodiment 3;
Fig. 5 is an explanatory view of a conventional drainage pump; and
Fig. 6 is an explanatory view of a conventional deflector board.

Description of Reference Numerals

[0018]

10	electric motor
12	output shaft
14, 15, 310a	deflector board
30	lid member
50	case main body
100	rotating blades
110, 210, 310	shaft portion
212	groove portion
410	adhesive agent

Best Mode for Carrying Out the Invention

[0019] A description will be given below of a best mode for carrying out the present invention.

Embodiment 1

[0020] Fig. 1 is an explanatory view of a drainage pump in accordance with Embodiment 1. Fig. 2 is an enlarged view of a substantial part of the drainage pump in accordance with Embodiment 1. In Embodiment 1, the same reference numerals are attached to the same portions as the conventional drainage pump explained in Figs. 5 and 6, and a description will be given of different portions from the conventional drainage pump explained in Figs. 5 and 6.

[0021] Rotating blades 200 have a shaft portion 210,

and a metal output shaft 12 of an electric motor 10 is inserted to a closed-end hole 213 of the shaft portion 210. A motor side end portion of the shaft portion 210 has an outer peripheral groove 212 around a whole periphery thereof, and an end thereof toward the electric motor 10 has a taper portion 211. On the other hand, a deflector board 15 formed by a nonconductive resin or the like is formed in a circular plate shape and has a hole in a center portion thereof, and the hole is pressure fitted to the outer peripheral groove 212 of the shaft portion 210.

[0022] Next, a description will be given of an assembling method of the deflector board 15. The deflector board 15 is pressure fitted to the shaft portion 210 from an upper portion thereof in a state that the shaft portion 210 passes through at least a through hole 36 of a lid member 30. At this time, the pressure fitting is made easier by the taper portion 211. Thus, the hole provided in the center portion of the deflector board 15 enters into the groove portion 212 in accordance with the pressure fitting, and assembly is achieved. Pressure fitting dimensions are secured even in a state that the deflector board 15 is assembled in the outer peripheral groove 212, and the shaft portion 210 and the deflector board 15 are securely installed in a tight contact state. Thereafter, the output shaft 12 of the electric motor 10 is inserted to the closed-end hole 213 of the shaft portion 210. The case main body 50 may be assembled after insertion of the output shaft 12 to the shaft portion 210, or may be assembled before the insertion.

[0023] Next, a description will be given of an operation of the deflector board 15. As shown by an arrow in Fig. 2, a backwater (a drain water) comes into contact with the deflector board 15 through the through hole 36 of the lid member 30. At this time, the water does not fly toward the electric motor 10 by the deflector board 15. On the other hand, since the deflector board 15 is structured such as to pressure fitted to the outer peripheral groove 212 in the tight contact state, the water does not directly touch the conductive metal output shaft 12, and it is possible to avoid a risk of an electric leakage or the like.

Embodiment 2

[0024] Fig. 3 is an enlarged view of a substantial part of a drainage pump in accordance with Embodiment 2. In Embodiment 2, the same reference numerals are attached to the same portions as the conventional drainage pump explained in Figs. 5 and 6, and a description will be given of different portions from the conventional drainage pump explained in Figs. 5 and 6.

[0025] Rotating blades 300 has a shaft portion 310, and the metal output shaft 12 of the electric motor 10 is inserted to a closed-end hole 313 of the shaft portion 310. A circular deflector board 310a is integrally formed with the shaft portion 310, at an end portion toward the electric motor 10 of the shaft portion 310. They are formed by a nonconductive resin material or the like. Accordingly, they are formed in a state that a gap does not exist between the deflector board 310a and the shaft portion 310. Further, in Embodiment 2, a lid member 30' is structured such as to be divided into two semicircular pieces. Accordingly, the lid member 30' can be attached even to the shaft portion 310 which is integrally formed with the deflector board 310a.

[0026] Next, a description will be given of an operation of the deflector board 310a. The backwater (the drain water) comes into contact with the deflector board 310a through the through hole 36 of the lid member 30. Since the deflector board 310a is integrally formed with the shaft portion 310, the water does not directly touch the metal output shaft 12, and it is possible to avoid a risk of an electric leakage or the like.

Embodiment 3

[0027] Fig. 4 is an enlarged view of a substantial part of a drainage pump in accordance with Embodiment 3. In Embodiment 3, the same reference numerals are attached to the same portions as the conventional drainage pump explained in Figs. 5 and 6, and a description will be given of different portions from the conventional drainage pump explained in Figs. 5 and 6.

[0028] A different point from the conventional drainage pump explained in Figs. 5 and 6 is that the deflector board 14 and the end portion of the shaft portion 110 are bonded by a nonconductive adhesive agent 410. The deflector board 14 is formed in a circular shape, has a hole in a center portion thereof, and is structured such that the output shaft 12 passes through the hole. The adhesive agent is applied to an outer periphery of the end portion of the shaft portion 110 and the lower surface of the deflector board 14 in a full circle, and bond them.

[0029] More specifically, as shown by an enlarged view at the right side of Fig. 4, a part 411 of the adhesive agent enters into a gap between the deflector board 14 and the end portion 111 of the shaft portion 110, and covers in such a manner as to surround the output shaft 12 to achieve a secure bonding.

[0030] The backwater (the drain water) comes into contact with the deflector board 14 through the through hole 36 of the lid member 30. At this time, the water does not fly toward the electric motor 10, by the deflector board 14. On the other hand, since the deflector board 14 is bonded to the outer periphery of the end portion of the shaft portion 110 over the whole periphery by the adhesive agent 410, the water neither enter into the portion between the deflector board 14 and the end portion 111 of the shaft portion 110, nor directly touch the metal output shaft 12, and it is possible to avoid the risk of the electric leakage or the like. In the structure in accordance with Embodiment 3, there is an advantage that the parts of the deflector board 14 and the rotating blades 100 of the conventional drainage pump explained in Figs. 5 and 6 can be used as they are.

[0031] As shown in Embodiments 1 to 3, since the

structure is made such as to directly install or couple the deflector board to the shaft portion of the rotating blades, the flying water does not touch the output shaft of the motor, and it is possible to avoid the risk of the electric leakage or the like.

Claims

1. A drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
said case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between said lid member and said motor,
wherein a shaft portion coupled to an output shaft of said motor is integrally formed with said rotating blades in such a manner as to protrude from said lid member, and said deflector board is installed to a motor side end portion of said shaft portion.

2. A drainage pump as claimed in claim 1, wherein said deflector board is installed to an outer peripheral groove formed at a motor side end portion of said shaft portion.

3. A drainage pump as claimed in claim 1 or 2, wherein a taper portion for facilitating installation of said deflector board is provided at the motor side end portion of said shaft portion.

4. A drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
said case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between said lid member and said motor,
wherein a shaft portion coupled to an output shaft of said motor is integrally formed with said rotating blades in such a manner as to protrude from said lid member, and the deflector board is integrally formed with a motor side end portion of said shaft portion.

5. A drainage pump as claimed in claim 4, wherein said lid member is divided into two pieces in a semicircular shape.

6. A drainage pump comprising:

a housing constructed by a case main body and a lid member covering an opening portion of the case main body;
rotating blades accommodated in an internal space of the housing; and
a motor for rotationally driving the rotating blades;
said case main body being provided with a drain water suction port in a lower portion thereof and with a drain water discharge port in a side portion thereof; and
a deflector board being arranged between said lid member and said motor,
wherein a shaft portion coupled to an output shaft of said motor is integrally formed with said rotating blades in such a manner as to protrude from said lid member, and said deflector board is passed through by the output shaft of said motor and is bonded to the motor side end portion of said shaft portion by applying of an adhesive agent around it.

7. A drainage pump as claimed in claim 6, wherein said adhesive agent enters in such a manner as to fill a gap between the motor side end portion of said shaft portion and said deflector board.

FIG. 1

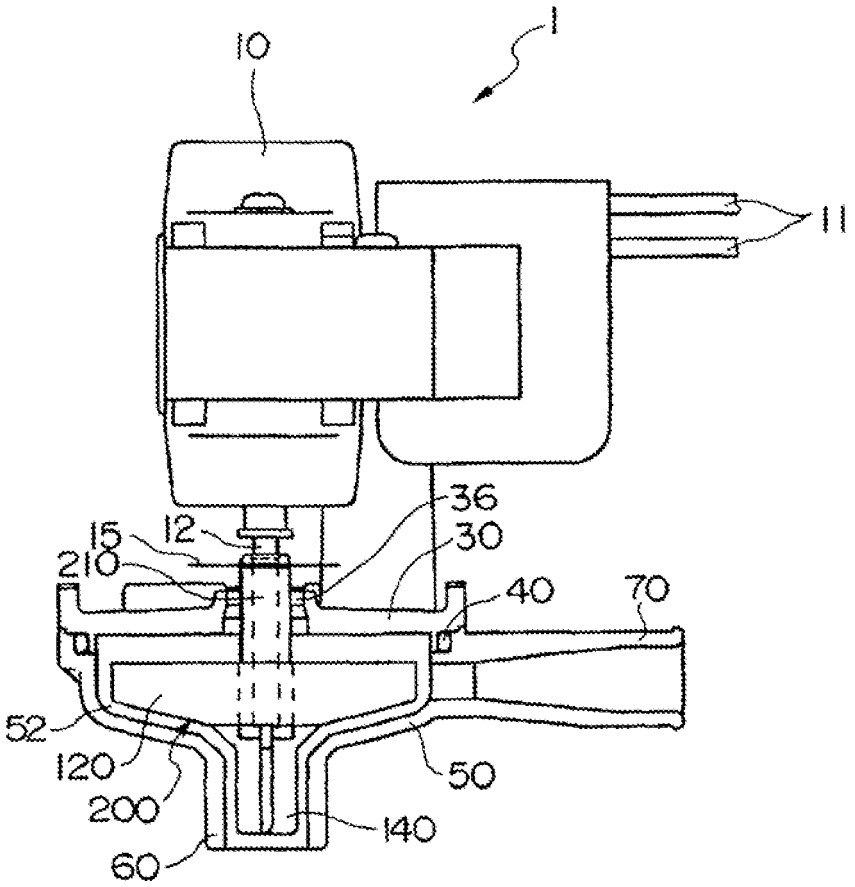


FIG. 2

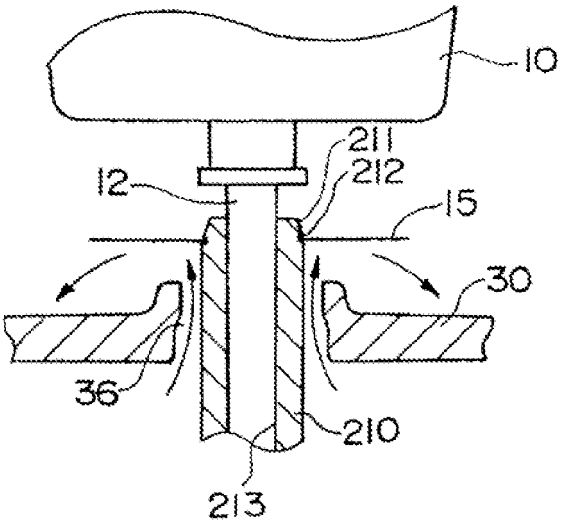


FIG. 3

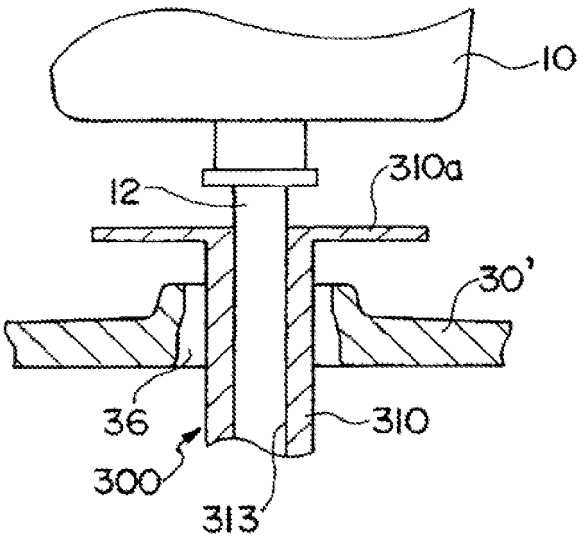
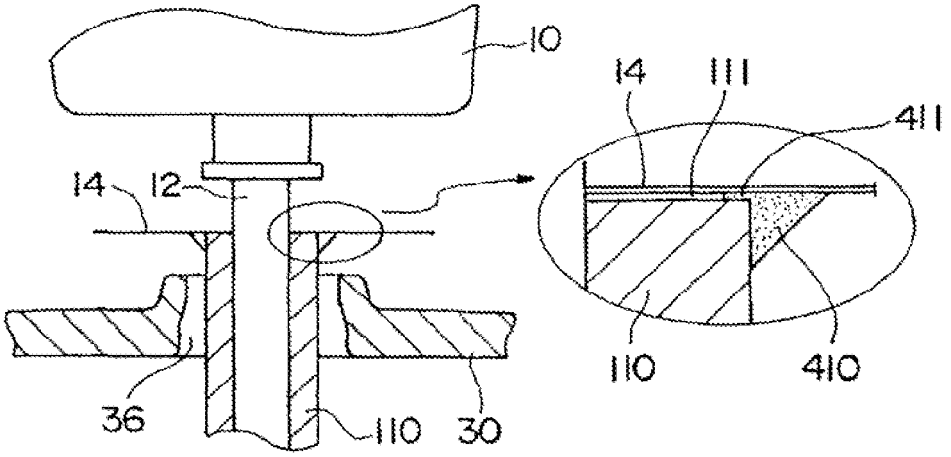


FIG. 4


10
14
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411
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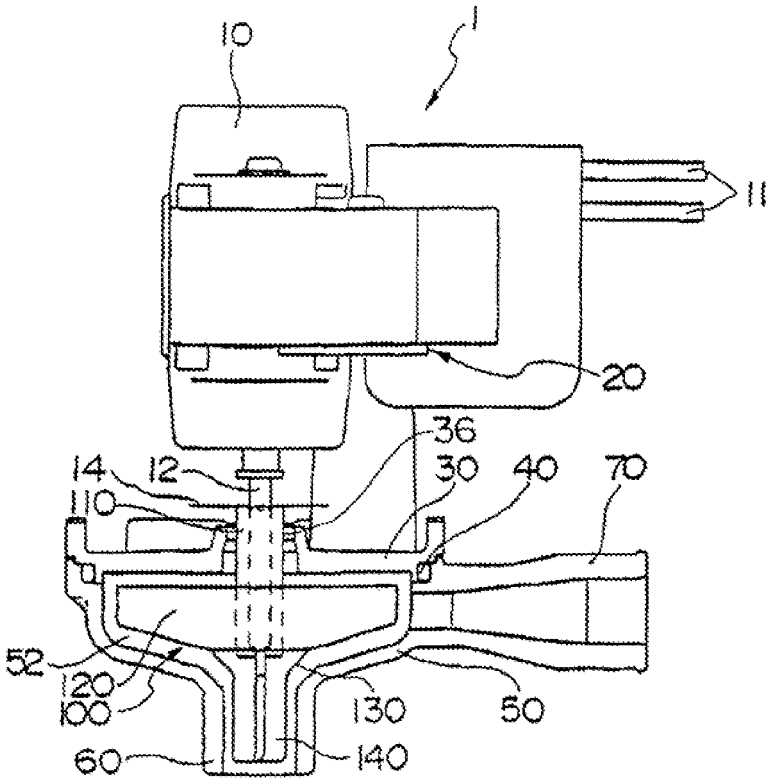
410

FIG. 5


10
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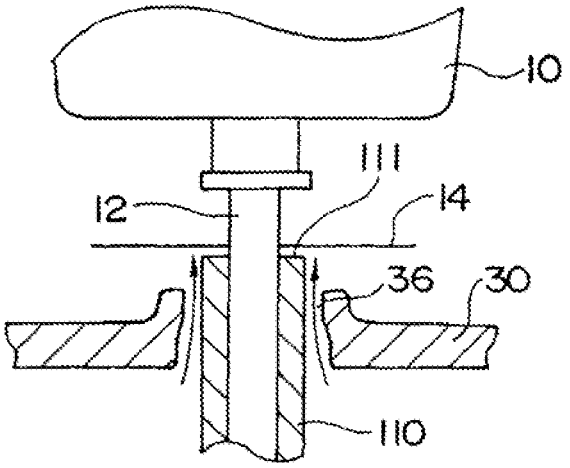
140

FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 9053591 A **[0003] [0007]**