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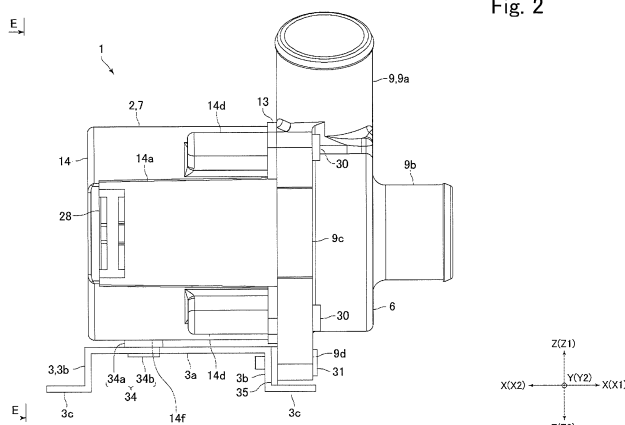
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(54) **PUMP-SECURING STRUCTURE AND PUMP**

(57) The present invention provides a pump-securing structure for securing, to a securing stand, a pump having a pump part and a motor part, wherein the pump-securing structure is able to minimize the transmission of vibration from the motor part to the securing stand even if a part of the pump to be secured to the securing stand changes over time and deforms. In a pump-securing structure (1), a pump (2) is provided with a pump part (6) having an internally disposed impeller, and a motor part (7) for spinning the impeller. The motor part (7) is provided with a resin motor case (14) and is integrated

with a stator; and the external peripheral surface of the motor part (7) describes the form of a substantially truncated conical surface having a draft angle for removing the motor case (14) from a die used when integrally forming the stator and the motor case (14). A securing stand (3) is provided with a motor-supporting part (3a) disposed below the motor part (7) and a part (9d) to which the pump part (6) is secured is secured to the securing stand (3). A buffer member (34) is disposed between the motor part (7) and the motor-supporting part (3a).



Description**[Summary of Invention]****[Field of the Invention]****[Technical Problem]**

[0001] The present invention relates to a pump fixing structure for fixing a pump to a fixing base. Further, the present invention relates to a pump which structures the pump fixing structure.

[Background Art]

[0002] Conventionally, a pump fixing device for fixing a pump to a base has been known (see, for example, Patent Literature 1). In Patent Literature 1, a pump is fixed to a base through an abutting part. Further, the pump includes a pump part having an outlet port and an inlet port for fluid, and a motor part for rotating an impeller which is disposed in an inside of the pump part. An outer peripheral face of the motor part is formed in a cylindrical face shape. The abutting part and the base are formed by bending a metal plate in a predetermined shape. Further, the abutting part is structured of a curved face part in a circular arc shape to which an outer peripheral face of the motor part formed in a cylindrical face shape is fixed, side face parts which are bent to a lower direction from both ends of the curved face part, and bottom face parts extended from lower ends of the side face parts in a horizontal direction. The base is structured of an upper face part to which the bottom face parts of the abutting part are fixed and side face parts which are bent from both ends of the upper face part to a lower direction.

[0003] Further, conventionally, as a pump including a pump part having an outlet port and an inlet port for fluid and a motor part for rotating an impeller which is disposed in an inside of the pump part, a pump has been known which includes a stator structuring a motor part and a mold part made of resin which covers the stator (see, for example, Patent Literature 2). In the pump described in Patent Literature 2, the mold part is integrally formed with the stator and structures an outer peripheral face of the motor part. In a pump having a mold part which is integrally formed with a stator like the pump described in Patent Literature 2, an outer peripheral face of the motor part is commonly formed in a circular truncated cone face shape having a draft angle for drawing out the mold part from a die which is used when the stator and the mold part are integrally molded.

[Patent Literature]**[0004]**

[PTL 1] Examined Utility Model Application Publication Hei 8-7199

[PTL 2] Japanese Patent Laid-Open No. 2008-109848

[0005] In the pump described in Patent Literature 1, a rotor structuring the motor part is rotated and thus vibration is easily occurred in the motor part. On the other hand, in this pump, an outer peripheral face of the motor part is fixed to the curved face part of the abutting part which is formed of a metal plate and the bottom face parts of the abutting part are fixed to the base and thus vibration occurred in the motor part is easily transmitted to the base through the abutting part. Therefore, in order to suppress transmission of vibration from the motor part to the base, it is preferable that a space is provided between an upper face part of the base and the motor part and, for example, the pump part is fixed to a side face part of the base. However, even in this case, when a fixed part of the pump part fixed to the side face part of the base is deformed with a lapse of time, the upper face part of the base and the motor part may be contacted with each other and thus vibration of the motor part may be transmitted to the base.

[0006] In view of the problem described above, an objective of the present invention is to provide a pump fixing structure for fixing a pump having a pump part and a motor part to a fixing base, the pump fixing structure being capable of suppressing transmission of vibration from the motor part to the fixing base even when a fixed part of the pump part which is fixed to the fixing base is deformed due to a lapse of time. Further, an objective of the present invention is to provide a pump which structures the pump fixing structure.

[Solution to Problem]

[0007] To achieve the above mentioned objective, the present invention provides a pump fixing structure for fixing a pump to a fixing base. The pump includes a pump part which has an outlet port and an inlet port for fluid and is disposed with an impeller in its inside, and a motor part for rotating the impeller. The motor part includes a stator having a drive coil and a stator core around which the drive coil is wound, and a motor case which is formed of resin and is integrally molded with the stator to structure an outer peripheral face of the motor part. The outer peripheral face of the motor part is formed in a substantially circular truncated cone face shape having a draft angle for drawing the motor case from a die used when the stator and the motor case are integrally molded. The pump part is provided with a fixed part which is fixed to the fixing base, the fixing base is formed by bending a metal plate and is provided with a motor support part disposed on a lower side with respect to the motor part, and a buffer member having elasticity is disposed between the motor part and the motor support part.

[0008] In the pump fixing structure in accordance with the present invention, a buffer member having elasticity

is disposed between the motor support part disposed on a lower side with respect to the motor part and the motor part. Therefore, according to the present invention, even when the fixed part of the pump part which is fixed to the fixing base is deformed with a lapse of time, the motor part is prevented from contacting with the motor support part of the fixing base. Therefore, in the present invention, even when the fixed part of the pump part which is fixed to the fixing base is deformed with a lapse of time, transmission of vibration from the motor part to the fixing base is suppressed.

[0009] Further, in the pump fixing structure in accordance with the present invention, a buffer member is disposed between the motor support part disposed on a lower side with respect to the motor part and the motor part. Therefore, even when an outer peripheral face of the motor part is formed in a substantially circular truncated cone face shape having a draft angle, the motor part is supported by the buffer member in a stable state.

[0010] In the present invention, for example, the fixing base is formed in a substantially angular groove shape which is provided with the motor support part formed in a substantially rectangular shape and side face parts which are bent in a lower direction from each of a pair of opposite sides of the motor support part formed in the substantially rectangular shape, the fixed part is fixed to one of two side face parts, a space is formed between the motor part and the motor support part, and the motor part and the motor support part are contacted with the buffer member. In this case, it is preferable that a second buffer member having elasticity is disposed between the side face part and the fixed part. According to this structure, vibration of the motor part is suppressed from being transmitted to the fixing base through the pump part by the second buffer member.

[0011] In the present invention, it is preferable that the motor support part is formed with an engaging hole with which a part of the buffer member is engaged, and the buffer member is formed with an engaging projection which is engaged with the engaging hole. According to this structure, positional displacement of the buffer member with respect to the motor support part is prevented.

[0012] In a pump which structures the pump fixing structure in accordance with the present invention, it is preferable that the motor part includes a connector for supplying an electric current to the drive coil, the connector is integrated with the motor case so as to protrude from the outer peripheral face of the motor case when the stator and the motor case are integrally molded and, when viewed in an axial direction of the motor part, a gate mark which is a mark of a gate of the die is formed on the motor case on an opposite side to the connector so as to interpose an axial center of the motor part therebetween. In this case, a shape of the motor case when viewed in an axial direction of the motor part can be set to be line symmetric with respect to a line connecting the center of the connector and the gate mark. Therefore, when the stator and the motor case are to be integrally

molded, resin is easily flowed uniformly from the gate toward a portion where the connector is disposed.

[0013] In the present invention, it is preferable that the motor case is formed with a gate mark formed part where the gate mark is formed on its surface so as to protrude to an outer side in a radial direction of the motor part. According to this structure, a wall thickness of the gate mark formed part can be made larger than other portions and thus, when the stator and the motor case are to be integrally molded, resin is easily flowed from the gate into an inside of the die.

[0014] In a pump which structures the pump fixing structure in accordance with the present invention, it is preferable that the motor case is formed of BMC (Bulk Molding Compound). In this case, heat radiation property and vibration absorption property of the motor case are enhanced.

[0015] In a pump which structures the pump fixing structure in accordance with the present invention, the motor part includes a rotor which is disposed on an inner peripheral side with respect to the stator, the stator core is provided with an outer peripheral core part in a substantially cylindrical shape which is disposed on an outer peripheral side with respect to the drive coil, and at least a part of a gate mark which is a mark of a gate of the die and at least a part of the outer peripheral core part are overlapped with each other in a radial direction of the motor part. In this case, when the stator and the motor case are to be integrally molded, injection pressure of the resin is hard to be directly applied to the drive coil and the like. Therefore, when the stator 12 and the motor case 14 are to be integrally molded, damage of the drive coils 22 and the like can be prevented.

[Effects of the Invention]

[0016] As described above, in the pump fixing structure in accordance with the present invention, even when the fixed part of the pump part which is fixed to the fixing base is deformed with a lapse of time, transmission of vibration from the motor part to the fixing base is suppressed. Further, in the pump in accordance with the present invention, effects can be attained such that, when the stator and the motor case are to be integrally molded, resin is easily flowed uniformly from the gate toward a portion where the connector is disposed.

[Brief Description of the Drawings]

[0017]

[Fig. 1]

Fig. 1 is a perspective view showing a pump fixing structure in accordance with an embodiment of the present invention.

[Fig. 2]

Fig. 2 is a side view showing the pump fixing structure in Fig. 1 which is viewed in another direction.

[Fig. 3]

Fig. 3 is a rear view showing the pump fixing structure which is viewed in the "E-E" direction in Fig. 2.

[Fig. 4]

Fig. 4 is a cross-sectional view showing the "F-F" cross section in Fig. 3.

[Fig. 5]

Fig. 5 is a perspective view showing a state that a stator shown in Fig. 4 is taken out from a motor case.

[Fig. 6]

Fig. 6 is a side view showing a state that the stator and the motor case shown in Fig. 5 are integrated with each other.

[Description of Embodiments]

[0018] An embodiment of the present invention will be described below with reference to the accompanying drawings.

(Structure of Pump Fixing Structure)

[0019] Fig. 1 is a perspective view showing a pump fixing structure 1 in accordance with an embodiment of the present invention. Fig. 2 is a side view showing the pump fixing structure 1 in Fig. 1 which is viewed in another direction. Fig. 3 is a rear view showing the pump fixing structure 1 which is viewed in the "E-E" direction in Fig. 2. Fig. 4 is a cross-sectional view showing the "F-F" cross section in Fig. 3. Fig. 5 is a perspective view showing a state that a stator 12 shown in Fig. 4 is taken out from a motor case 14. Fig. 6 is a side view showing a state that the stator 12 and the motor case 14 shown in Fig. 5 are integrated with each other.

[0020] The pump fixing structure 1 in this embodiment is a structure for fixing a pump 2 to a fixing base 3 and includes the pump 2 and the fixing base 3 to which the pump 2 is fixed. In the following descriptions, as shown in Figs. 2 and 3, in respective three directions perpendicular to each other, an axial line direction of a motor part 7 is referred to as an "X" direction, a direction which is perpendicular to the axial line direction of the motor part 7 and parallel to an upper face part 3a of the fixing base 3 is referred to as a "Y" direction, and a direction which is perpendicular to the axial line direction of the motor part 7 and perpendicular to the upper face part 3a of the fixing base 3 is referred to as a "Z" direction. Further, the "X" direction is referred to as a front and rear direction, the "Y" direction is referred to as a right and left direction, and the "Z" direction is referred to as an upper and lower direction. Further, in Figs. 2 and 3 and the like, the "X1" direction side is referred to as a "front" side, the "X2" direction side is a "rear" (back) side, the "Y1" direction side is a "right" side, the "Y2" direction side is a "left" side, the "Z1" direction side is an "upper" side, and the "Z2" direction side is a "lower" side.

[0021] The pump 2 is a pump which is referred to as a canned pump, which includes a pump part 6 in which an

impeller 5a (see Fig. 4) is disposed in its inside and a motor part 7 for rotating the impeller 5a. The pump part 6 structures a front end side portion of the pump 2 in an axial line direction of the motor part 7, and the motor part 7 structures a rear end side portion of the pump 2 in the axial line direction of the motor part 7. The impeller 5a structures a front end side portion in an axial line direction of an impeller member 5.

[0022] The pump part 6 includes a pump case 9 which is formed with an outlet port 9a and an inlet port 9b for fluid. The outlet port 9a is formed in a cylindrical tube shape which protrudes toward an obliquely left upper direction and the inlet port 9b is formed in a cylindrical tube shape which protrudes toward a front direction. A rear end side of the pump case 9 is formed with a flange part 9c for fixing the motor part 7 to the pump part 6 and for fixing the pump 2 to the fixing base 3. A lower end side of the flange part 9c is formed as a fixed part 9d which is fixed to the fixing base 3. An inside of the pump case 9 is a part of a pump chamber 10 as shown in Fig. 4.

[0023] The motor part 7 includes a rotor 11, a stator 12, a partition member 13 which defines the pump chamber 10 together with the pump case 9, and a motor case 14 which structures an outer peripheral face of the motor part 7. The rotor 11 is disposed on an inner peripheral side with respect to the stator 12. In other words, the motor structuring the motor part 7 is an inner rotor type motor.

[0024] The partition member 13 is formed of resin material. Further, the partition member 13 is formed in a bottomed cylindrical tube shape with a flange and is disposed between the rotor 11 and the stator 12. The flange part 13a of the partition member 13 is abutted with a flange part 9c of the pump case 9, and the pump chamber 10 is formed of an inside of the pump case 9 and an inside of the partition member 13. A seal member ("O"-ring) 15 is disposed between the flange part 9c and the flange part 13a for securing sealability of the pump chamber 10.

[0025] The rotor 11 includes a drive magnet 16 and a cylindrical shaped sleeve 17. A rear end side portion of the impeller member 5 is a holding part 5b formed in a substantially cylindrical shape. The holding part 5b structures a part of the rotor 11, and the drive magnet 16 is fixed to an outer peripheral face of the holding part 5b and the sleeve 17 is fixed to an inner peripheral face of the holding part 5b. The rotor 11 is rotatably supported by a fixed shaft 18 which is fixed to the pump case 9 and the partition member 13 with the front and rear direction as an axial direction. Two thrust bearings 19 are attached to the fixed shaft 18 so as to sandwich the sleeve 17 in the front and rear direction. The rotor 11 is disposed in an inside of the pump chamber 10.

[0026] The stator 12 includes a drive coil 22, a stator core 23 and a bobbin 24, and is formed in a substantially cylindrical tube shape as a whole. The stator core 23 is, for example, a laminated core which is formed by laminating thin magnetic plates made of magnetic material,

and the stator core 23 is provided with an outer peripheral core part 23a in a substantially cylindrical shape which structures an outer peripheral face of the stator core 23 and a plurality of salient pole parts 23b which protrude from the outer peripheral core part 23a to an inner side in a radial direction (see Fig. 5). A width of the outer peripheral core part 23a in a front and rear direction is set to be equal to a width of the salient pole part 23b in the front and rear direction.

[0027] The bobbin 24 is formed in a tube shape with flanges which is provided with flange parts at both ends. The drive coil 22 is wound around an outer peripheral face of the bobbin 24. The bobbin 24 around which the drive coil 22 is wound is fitted to the salient pole part 23b from an inner side in a radial direction, and the drive coil 22 is wound around the salient pole part 23b through the bobbin 24. Further, the bobbins 24 around which the drive coil 22 is wound are disposed on an inner peripheral side with respect to the outer peripheral core part 23a. Both end parts of the drive coil 22 are electrically connected with terminal pins 25 which are fixed to the bobbin 24.

[0028] Circuit boards 26 and 27 provided with a drive circuit and a control circuit are fixed to a rear face side of a bottom part 13b of the partition member 13 and are disposed on a rear end side of the stator 12. The circuit board 26 and the circuit board 27 are electrically connected with each other. The terminal pin 25 is electrically connected with the circuit board 26 by soldering or the like. Various electronic components are mounted on the circuit board 27. Further, a connector 28 for supplying an electric current to the drive coil 22 is mounted on the circuit board 27. In Fig. 6, the circuit boards 26 and 27 and the connector 28 are not shown. Further, an electric current is supplied to the drive coil 22 through the connector 28 and, in addition, exchanges of various signals and the like are performed through the connector 28.

[0029] The motor case 14 is formed of resin. Specifically, the motor case 14 is formed of BMC (Bulk Molding Compound). Further, the motor case 14 is integrally molded with the stator 12 and the partition member 13 so as to cover an outer peripheral side and a rear face side of the stator 12 and is formed in a substantially bottomed cylindrical tube shape. A die (not shown) which is used for integrally molding the stator 12 and the like with the motor case 14 is structured so as to be divided in the front and rear direction, and an outer peripheral face of the motor case 14 is formed in a substantially circular truncated cone face shape having a draft angle for drawing the motor case 14 from the die. In other words, since the outer peripheral face of the motor case 14 is an outer peripheral face of the motor part 7, the outer peripheral face of the motor part 7 is formed in a substantially circular truncated cone face shape. Specifically, the outer peripheral face of the motor part 7 is formed in a substantially circular truncated cone face shape whose outer diameter gradually becomes smaller toward the rear end side of the motor case 14.

[0030] In this embodiment, when the stator 12 and the

like and the motor case 14 are to be integrally molded, the connector 28 is mounted on the circuit board 27 and the circuit boards 26 and 27 are fixed to the partition member 13. The circuit boards 26 and 27 are integrated with the motor case 14 so as to be covered by the motor case 14 when the stator 12 and the like and the motor case 14 are integrally molded. Further, when the stator 12 and the like and the motor case 14 are integrally molded, the connector 28 is integrated with the motor case 14 so that a part of the connector 28 is protruded from the outer peripheral face of the motor case 14.

[0031] A connector arrangement part 14a where the connector 28 is disposed and a gate mark formed part 14c where a gate mark 14b, i.e., a mark of a gate of a die used when the stator 12 and the like and the motor case 14 are integrally molded is formed are formed on an outer peripheral side of the motor case 14 so as to protrude to an outer side in the radial direction. Further, four protruded parts 14d for screws for fixing the motor part 7 to the pump part 6 are formed on the outer peripheral face of the motor case 14 so as to protrude from the outer peripheral face of the motor part 7 to an outer side in the radial direction.

[0032] The connector arrangement part 14a is protruded from the outer peripheral face of the motor part 7 to the left direction. On the other hand, the gate mark formed part 14c is protruded to the right direction. In other words, when viewed in the front and rear direction which is an axial line direction of the motor part 7, as shown in Fig. 3, the gate mark formed part 14c where the gate mark 14b is formed is formed on an opposite side to the connector arrangement part 14a interposing an axial center of the motor part 7 therebetween. In this embodiment, a shape of the motor case 14 when viewed in the axial direction of the motor part 7 is formed to be line symmetric with respect to a line connecting the center of the connector 28 with the center of the gate mark 14b which is parallel to the right and left direction. The connector arrangement part 14a and the gate mark formed part 14c are formed on almost entire region of the motor case 14 in the front and rear direction. Further, a left side face of the connector arrangement part 14a and a right side face of the gate mark formed part 14c are substantially parallel to the "Z-X" plane which is structured of the "Z" direction and the "X" direction.

[0033] The gate mark 14b is formed so as to slightly protrude to the right direction from the right side face (surface) of the gate mark formed part 14c. Further, the gate mark 14b is formed at a center position in the upper and lower direction of the right side face of the gate mark formed part 14c and is formed in a predetermined range in the front and rear direction of the right side face of the gate mark formed part 14c. As shown in Fig. 6, a part of the gate mark 14b is overlapped with the outer peripheral core part 23a when viewed in the right and left direction. In other words, a part of the gate mark 14b is overlapped with the outer peripheral core part 23a in the radial direction of the motor part 7. Specifically, a part on the front

end side of the gate mark 14b is overlapped with the outer peripheral core part 23a in the radial direction of the motor part 7.

[0034] Four protruded parts 14d for screws are formed so as to respectively protrude from the outer peripheral face of the motor part 7 toward an obliquely right upper direction, an obliquely right lower direction, an obliquely left upper direction and an obliquely left lower direction. The protruded part 14d for a screw is formed with a screw hole 14e with which a screw 30 is engaged. The motor part 7 is fixed to the pump part 6 by four screws 30.

[0035] The fixing base 3 is formed by bending one metal plate made of a steel plate or the like. Further, the fixing base 3 is structured of an upper face part 3a, which is formed in a substantially rectangular shape and is provided with a flat face as a motor support part, side face parts 3b which are disposed on both sides in the front and rear direction and are formed so as to be bent from a pair of opposite sides of the upper face part 3a to a lower direction opposite to the direction that the pump 2 is placed, and bottom face parts 3c forming flanges which are formed so as to be bent from lower ends of the side face parts 3b to an outer direction in the front and rear direction. The fixing base 3 is formed in a substantially rectangular groove shape in which the upper face part 3a is a bottom face and the side face parts 3b are wall faces. The bottom face parts 3c are fixed to a frame or the like of a predetermined device in which the pump 2 is used.

[0036] The side face part 3b disposed on the front side of the two side face parts 3b is fixed by screws 31 to the fixed part 9d of the pump case 9 which is located on a lower side relative to the outer peripheral face of the motor part 7. The fixed part 9d is located on a lower side relative to the outer peripheral face of the motor case 14 and, in a state that the fixed part 9d is fixed to the side face part 3b, a space is formed between the upper face part 3a and the outer peripheral face of the motor part 7 facing the upper face part 3a. The upper face part 3a is disposed on a lower side with respect to the motor part 7. A buffer member 34 is disposed between the lower end of the motor part 7 and the upper face of the upper face part 3a. In other words, an abutting part 14f provided on a lower end of the motor part 7, which is provided on a portion except the connector arrangement part 14a, the gate mark 14b, the gate mark formed part 14c and the protruded parts 14d for screws protruded to an outer side in the radial direction from the cylindrical outer peripheral face of the motor part 7, and a flat face of the upper face part 3a are disposed so as to face each other and the buffer member 34 is disposed between the abutting part 14f of the motor part 7 and the upper face part 3a. In a state that the abutting part 14f and the buffer member 34 are abutted with each other, the connector arrangement part 14a, the gate mark 14b, the gate mark formed part 14c and the protruded parts 14d for screws protruded to an outer side in the radial direction from the cylindrical outer peripheral face of the motor part 7 are

provided at positions so as not to contact with the buffer member 34 and the upper face part 3a. As described above, the abutting part 14f formed of a flat outer peripheral face of the motor part 7 and the buffer member 34 are disposed so as to face each other and thus the motor part 7 and the fixing base 3 can be closely disposed and it is suitable to reduce the size of the device. In addition, in this embodiment, the outlet port 9a is provided so as to protrude toward an upper side with respect to the outer peripheral face of the motor part 7 and the abutting part 14f is provided on the outer peripheral face on a lower side of the motor part 7, and the fixed part 9d is provided so as to protrude toward a lower side with respect to the outer peripheral face of the motor part 7. Therefore, a height of the pump 2 fixed to the fixing base 3 can be structured low and thus it is suitable to reduce the size. Further, a buffer member 35 as a second buffer member is disposed between a front face of the side face part 3b disposed on the front side and a rear face of the fixed part 9d.

[0037] The buffer member 34 is formed of elastic material having elasticity. The buffer member 34 in this embodiment is, for example, a rubber bushing formed of rubber. The buffer member 34 is structured of a large diameter part 34a formed in a columnar shape and a small diameter part 34b as an engaging projection which is formed in a columnar shape whose outer diameter is smaller than that of the large diameter part 34a. The buffer member 34 is formed in a stepped columnar shape. The small diameter part 34b is engaged with a circular engaging hole formed in the upper face part 3a of the fixing base 3 and the large diameter part 34a is disposed on the upper face side of the upper face part 3a. As shown in Fig. 2, a space is formed between the motor part 7 and the upper face part 3a. Further, the lower end of the motor part 7 and the upper face of the large diameter part 34a are contacted with each other and the upper face of the upper face part 3a and the under face of the large diameter part 34a are contacted with each other. In this embodiment, the engaging hole formed in the upper face part 3a penetrates through the upper face part 3a and a lower end side of the small diameter part 34b is protruded to a lower side relative to the under face of the upper face part 3a.

[0038] The buffer member 35 is formed of elastic material having elasticity. The buffer member 35 in this embodiment is, for example, a rubber plate formed of rubber and is formed in a flat plate shape. The buffer member 35 is fixed between the fixed part 9d and the side face part 3b by the screw 31 in a state that the buffer member 35 is sandwiched between the fixed part 9d and the side face part 3b.

(Principal Effects in this Embodiment)

[0039] As described above, in this embodiment, the buffer member 34 is disposed between the upper face part 3a of the fixing base 3 and the motor part 7. There-

fore, in this embodiment, vibration transmitted from the motor part 7 to the upper face part 3a can be suppressed by the buffer member 34. Further, in this embodiment, the buffer member 35 is disposed between the side face part 3b of the fixing base 3 and the fixed part 9d of the pump case 9 and thus vibration of the motor part 7 can be suppressed from being transmitted to the side face part 3b through the pump part 6 by the buffer member 35.

[0040] Further, in this embodiment, the buffer member 34 is disposed between the upper face part 3a and the motor part 7 and thus, even when the fixed part 9d of the pump case 9 fixed to the side face part 3b of the fixing base 3 is deformed with a lapse of time, the motor part 7 can be prevented from contacting with the upper face part 3a. Therefore, in this embodiment, even when the fixed part 9d is deformed with a lapse of time, transmission of vibration from the motor part 7 to the fixing base 3 can be suppressed. In addition, in this embodiment, the buffer member 34 is disposed between the upper face part 3a and the motor part 7 and thus, even when the outer peripheral face of the motor part 7 is formed in a substantially circular truncated cone face shape having a draft angle, the motor part 7 can be supported by the buffer member 34 in a stable state.

[0041] In this embodiment, the small diameter part 34b of the buffer member 34 is engaged with the engaging hole formed in the upper face part 3a. Therefore, in this embodiment, positional displacement of the buffer member 34 with respect to the upper face part 3a can be prevented.

[0042] In this embodiment, when viewed in the front and rear direction which is the axial direction of the motor part 7, the gate mark formed part 14c where the gate mark 14b is formed is formed on an opposite side to the connector arrangement part 14a so as to interpose the axial center of the motor part 7 therebetween, and a shape of the motor case 14 when viewed in the axial line direction of the motor part 7 is formed to be line symmetric with respect to a line connecting the center of the connector 28 with the center of the gate mark 14b which is parallel to the right and left direction. Therefore, in this embodiment, when the stator 12 and the like and the motor case 14 are to be integrally molded, resin is easily flowed uniformly from a gate of the die toward a portion where the connector 28 is disposed. Further, in this embodiment, the gate mark formed part 14c is formed so as to protrude to an outer side in the radial direction of the motor part 7 and a wall thickness of the gate mark formed part 14c is set to be thicker than that of the other portion of the motor case 14 except the connector arrangement part 14a and the protruded parts 14d for screws. Therefore, in this embodiment, when the stator 12 and the like and the motor case 14 are to be integrally molded, resin is easily flowed into an inside of the die from the gate.

[0043] In this embodiment, a part of the gate mark 14b is overlapped with the outer peripheral core part 23a in the radial direction of the motor part 7. Therefore, when

the stator 12 and the like and the motor case 14 are to be integrally molded, injection pressure of resin is hard to be directly applied to the drive coils 22 and the like. As a result, according to this embodiment, when the stator 12 and the like and the motor case 14 are to be integrally molded, damage of the drive coils 22 can be prevented.

[0044] In this embodiment, the motor case 14 is formed of BMC. Therefore, according to this embodiment, heat radiation property and vibration absorption property of the motor case 14 can be enhanced.

(Other Embodiments)

[0045] Although the present invention has been shown and described with reference to a specific embodiment, various changes and modifications will be apparent to those skilled in the art from the teachings herein.

[0046] In the embodiment described above, the buffer member 34 is formed in a stepped columnar shape comprised of the large diameter part 34a and the small diameter part 34b. However, the present invention is not limited to this embodiment. For example, the buffer member 34 may be formed in a columnar shape comprised of only the large diameter part 34a or may be formed in a flat plate shape or in a block shape. In this case, for example, the buffer member 34 is fixed to an upper face of the upper face part 3a of the fixing base 3 by an adhesive or the like.

[0047] In the embodiment described above, the buffer member 35 is disposed between the side face part 3b of the fixing base 3 and the fixed part 9d of the pump case 9. However, the present invention is not limited to this embodiment. For example, when vibration of the motor part 7 is hard to be transmitted to the side face part 3b through the pump part 6, no buffer member 35 may be disposed between the side face part 3b and the fixed part 9d.

[0048] In the embodiment described above, the motor case 14 is formed of BMC, but the motor case 14 may be formed of resin other than BMC. Further, in the embodiment described above, when viewed in the front and rear direction which is the axial direction of the motor part 7, the gate mark 14b is formed on the opposite side to the connector arrangement part 14a so as to interpose the axial center of the motor part 7 therebetween, but the gate mark 14b may be formed at another arbitrary position.

[0049] In the embodiment described above, a part of the gate mark 14b is overlapped with the outer peripheral core part 23a in the radial direction of the motor part 7. However, the present invention is not limited to this embodiment. For example, all of the gate mark 14b may be overlapped with the outer peripheral core part 23a in the radial direction of the motor part 7. In this case, when the stator 12 and the like and the motor case 14 are to be integrally molded, damage of the drive coils 22 and the like can be prevented effectively. In accordance with an

embodiment of the present invention, it may be structured that the gate mark 14b and the outer peripheral core part 23a are not overlapped with each other in the radial direction of the motor part 7.

[Reference Signs List]

[0050]

1	pump fixing structure	10
2	pump	
3	fixing base	
5	impeller member	
6	pump part	
7	motor part	15
9	pump case	
"X"	axial direction of motor part	
10	pump chamber	
11	rotor	
12	stator	20
13	partition member	
14	motor case	
16	drive magnet	
17	sleeve	
18	fixed shaft	25
19	thrust bearing	
22	drive coil	
23	stator core	
24	bobbin	
26	circuit board	30
27	circuit board	
28	connector	
34	buffer member	
35	buffer member (second buffer member)	
3a	upper face part (motor support part)	35
3b	side face part	
3c	bottom face part	
5a	impeller	
9a	outlet port	
9b	inlet port	40
9d	fixed part	
13a	flange part	
13b	bottom part	
14b	gate mark	
14c	gate mark formed part	45
14d	protruded part for screw	
23a	outer peripheral core part	
23b	salient pole part	
34a	large diameter part	
34b	small diameter part (engaging projection)	50

Claims

1. A pump fixing structure comprising:
 - a pump comprising a pump part and a motor part; and

a fixing base to which the pump is fixed; wherein the pump part has an outlet port and an inlet port for fluid and comprises an impeller which is disposed in an inside of the pump part; wherein the motor part provided for rotating the impeller comprises:

a stator which comprises a drive coil and a stator core around which the drive coil is wound; and a motor case which is formed of resin and is integrally molded with the stator, the motor case structuring an outer peripheral face of the motor part;

wherein the outer peripheral face of the motor part is formed in a substantially circular truncated cone face shape having a draft angle for drawing the motor case from a die which is used when the stator and the motor case are integrally molded;

wherein the pump part comprises a fixed part which is fixed to the fixing base;

wherein the fixing base is formed by bending a metal plate and is provided with a motor support part disposed on a lower side with respect to the motor part; and

wherein a buffer member having elasticity is disposed between the motor part and the motor support part.

2. The pump fixing structure according to claim 1, wherein the fixing base is formed in a substantially angular groove shape which is provided with the motor support part formed in a substantially rectangular shape and side face parts which are bent in a lower direction from each of a pair of opposite sides of the motor support part formed in the substantially rectangular shape, the fixed part is fixed to one of two side face parts, a space is formed between the motor part and the motor support part, and the motor part and the motor support part are contacted with the buffer member.
3. The pump fixing structure according to claim 2, wherein a second buffer member having elasticity is disposed between the side face part and the fixed part.
4. The pump fixing structure according to claim 3, wherein the motor support part is formed with an engaging hole with which a part of the buffer member is engaged, and the buffer member is formed with an engaging projection which is engaged with the engaging hole.

5. The pump which structures the pump fixing structure as defined in claim 1, wherein the motor part comprises a connector for supplying an electric current to the drive coil, the connector is integrated with the motor case so as to protrude from an outer peripheral face of the motor case when the stator and the motor case are integrally molded, and when viewed in an axial direction of the motor part, a gate mark which is a mark of a gate of the die is formed on the motor case on an opposite side to the connector so as to interpose an axial center of the motor part therebetween.

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6. The pump according to claim 5, wherein the motor case is formed with a gate mark formed part where the gate mark is formed on its surface so as to protrude to an outer side in a radial direction of the motor part.

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7. The pump which structures the pump fixing structure as defined in claim 1, wherein the motor case is formed of BMC (Bulk Molding Compound).

8. The pump which structures the pump fixing structure as defined in claim 3, wherein the motor part comprises a rotor which is disposed on an inner peripheral side with respect to the stator, the stator core comprises an outer peripheral core part in a substantially cylindrical shape which is disposed on an outer peripheral side with respect to the drive coil, and at least a part of a gate mark which is a mark of a gate of the die and at least a part of the outer peripheral core part are overlapped with each other in a radial direction of the motor part.

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Fig. 1

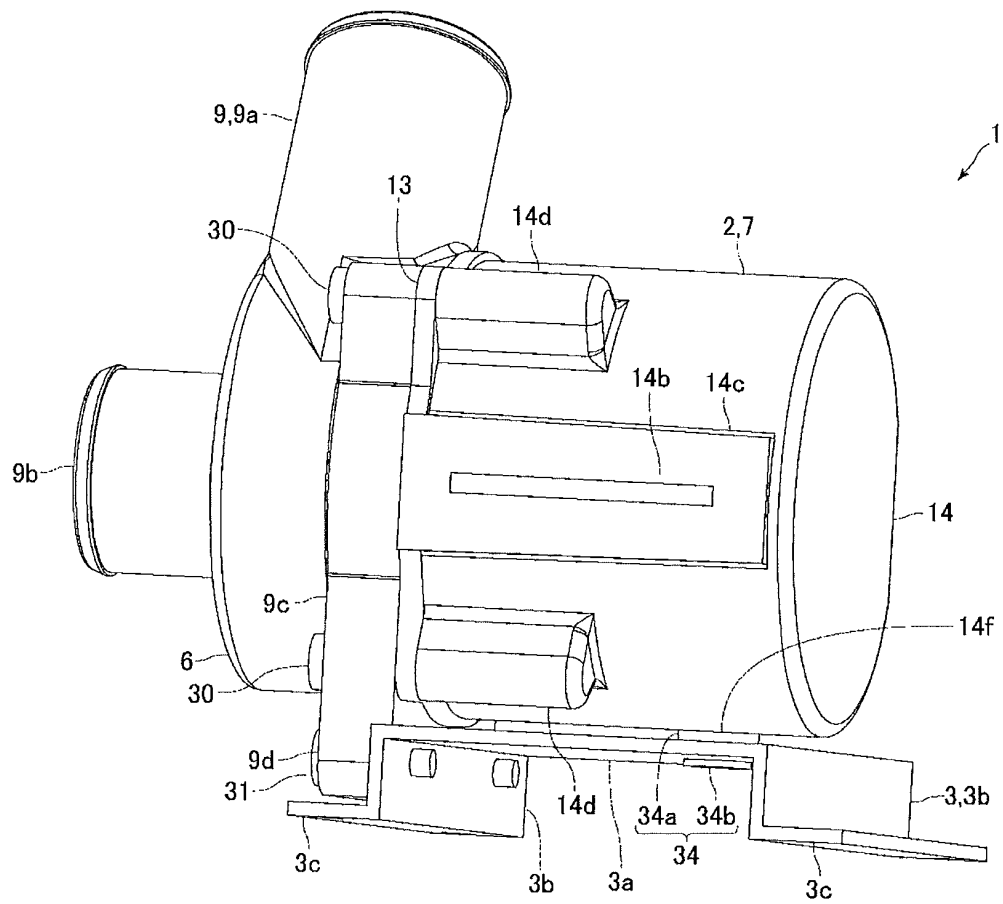


Fig. 2

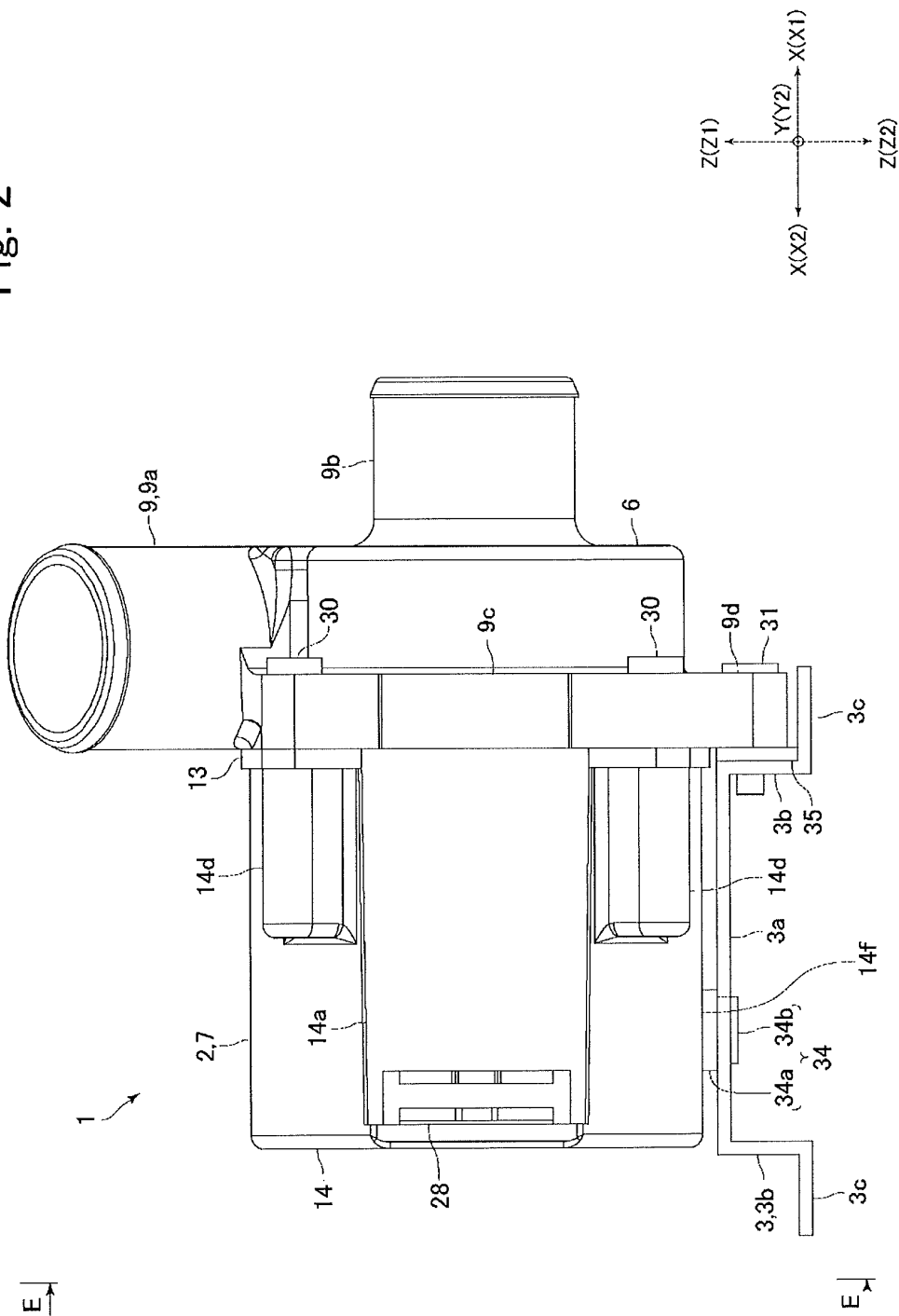


Fig. 3

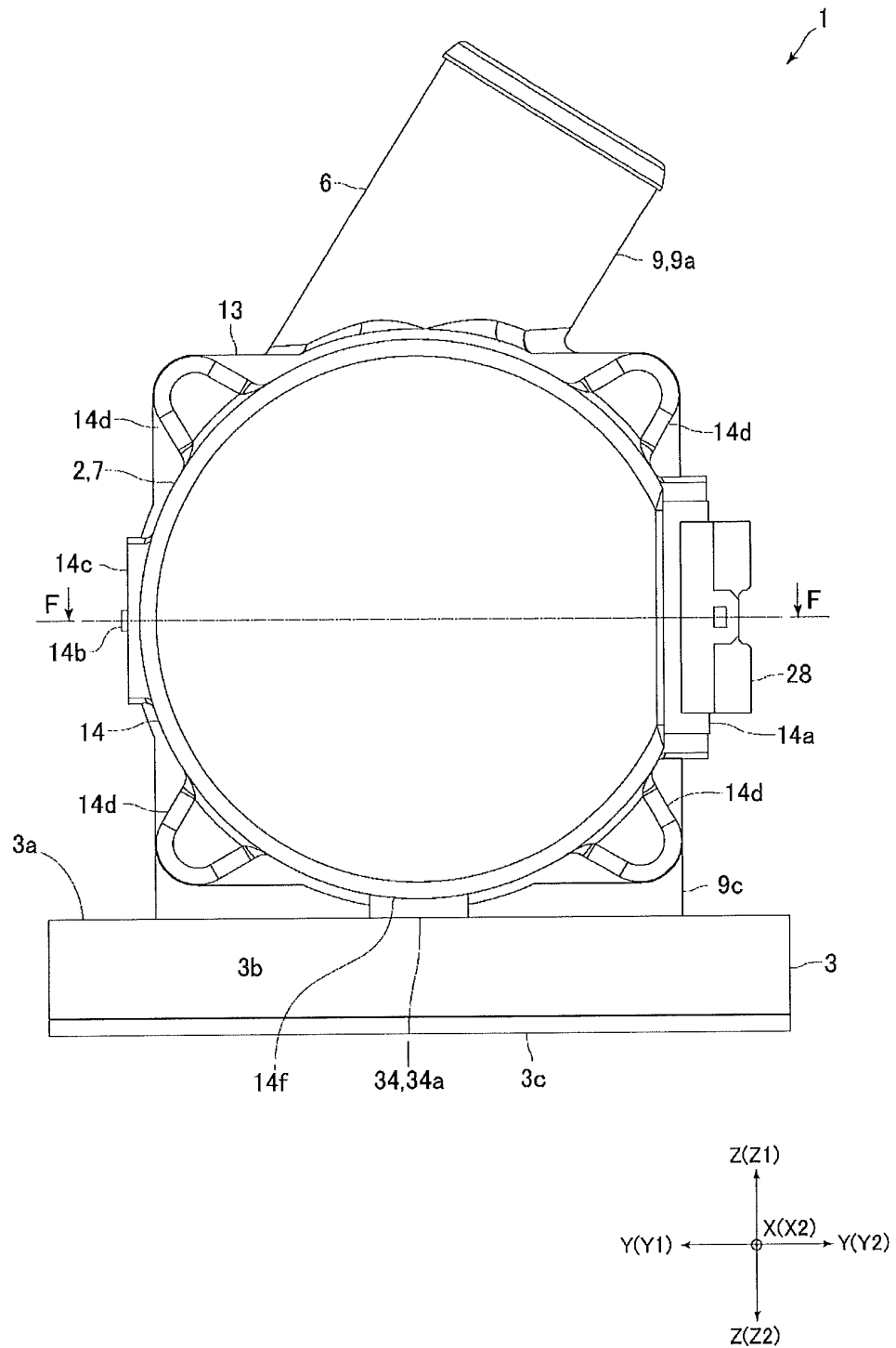


Fig. 4

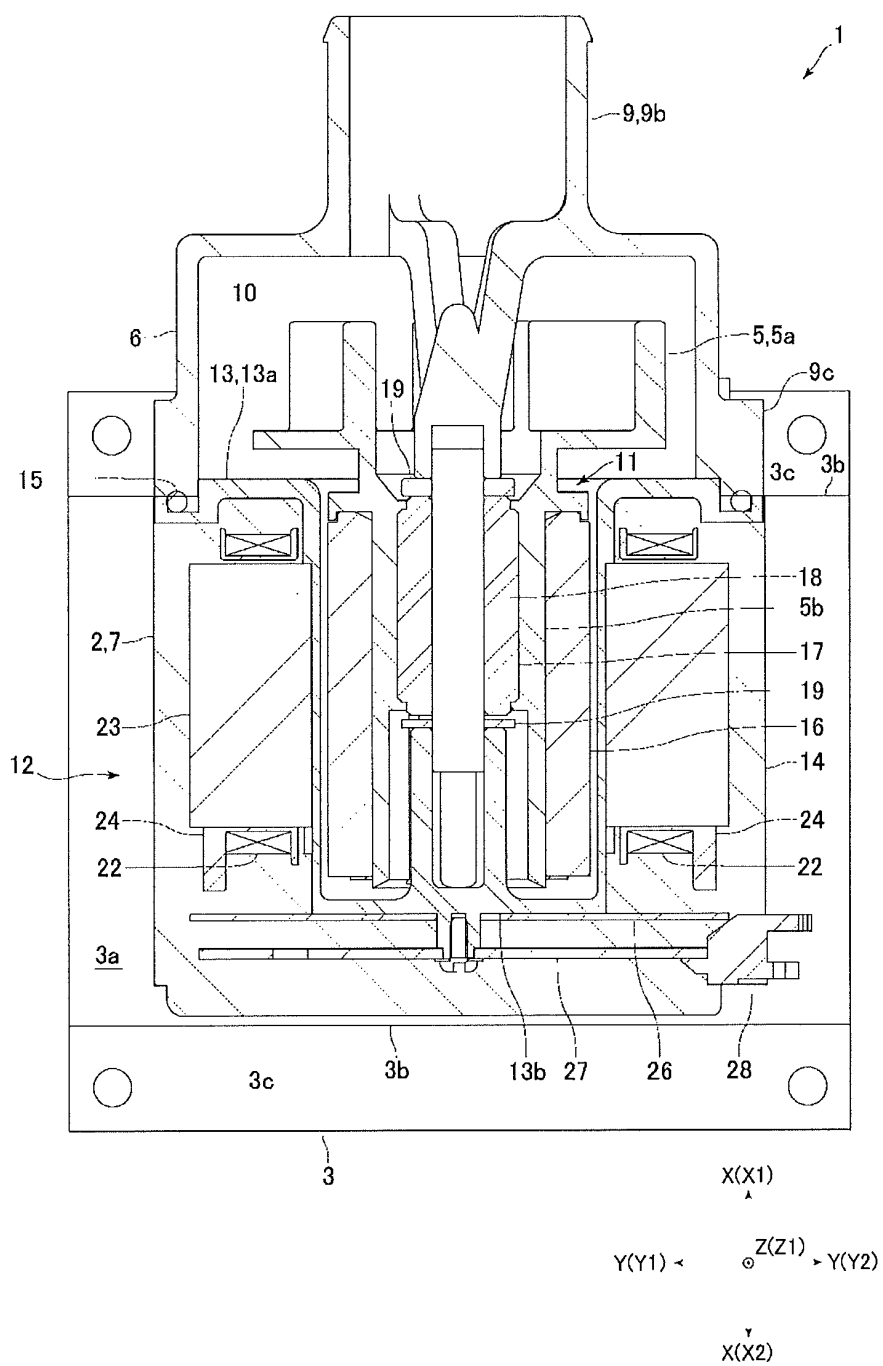


Fig. 5

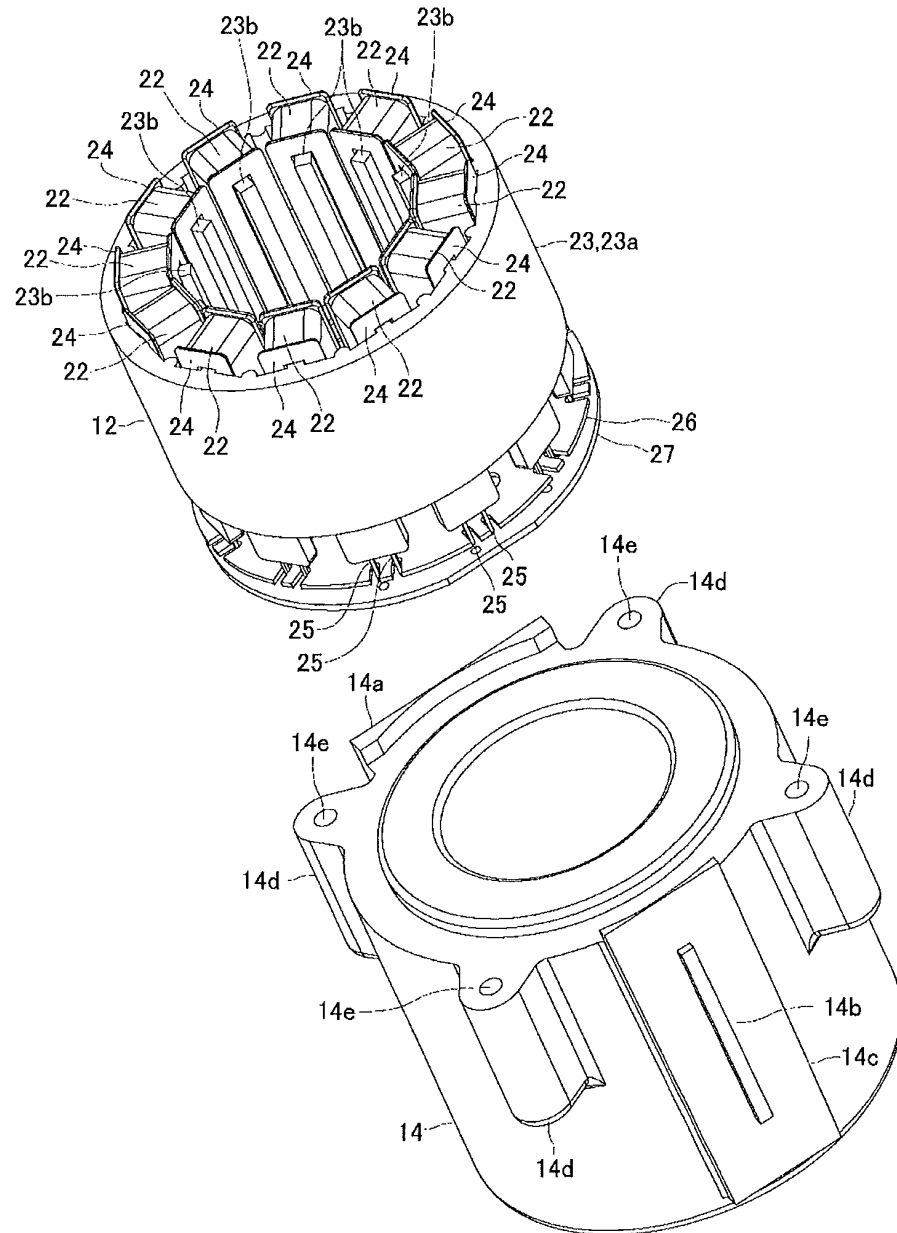
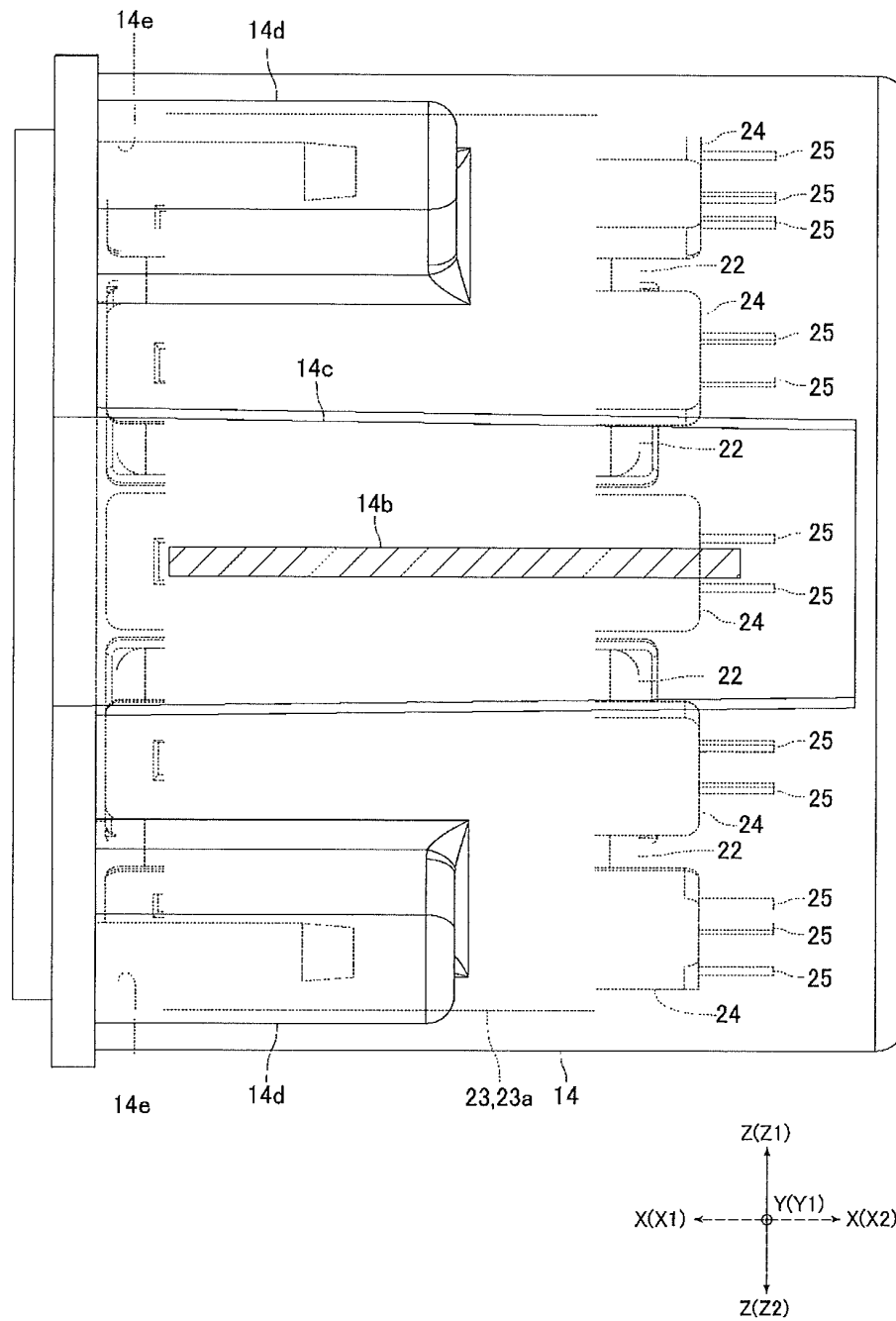


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/065641

A. CLASSIFICATION OF SUBJECT MATTER

F04D29/66(2006.01) i, F04D29/42(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)
F04D29/66, F04D29/42Documentation 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 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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 A	JP 2001-304200 A (Aisan Industry Co., Ltd.), 31 October 2001 (31.10.2001), entire text; all drawings (Family: none)	1, 5-7 2-4, 8
Y	JP 11-9890 A (Toshiba Corp.), 19 January 1999 (19.01.1999), paragraph [0016]; all drawings (Family: none)	1, 5-7
Y	JP 5-269074 A (Matsushita Electric Industrial Co., Ltd.), 19 October 1993 (19.10.1993), paragraph [0005]; fig. 8 (Family: none)	1, 5-7

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
01 August, 2013 (01.08.13)Date of mailing of the international search report
13 August, 2013 (13.08.13)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/065641

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 2008-8222 A (Nidec Sankyo Corp.), 17 January 2008 (17.01.2008), entire text; all drawings & CN 101860111 A	1, 5-7
Y	JP 2009-284704 A (Panasonic Electric Works Co., Ltd.), 03 December 2009 (03.12.2009), entire text; fig. 9 (Family: none)	5-6
A	JP 2009-144661 A (Yamada Seisakusho Co., Ltd.), 02 July 2009 (02.07.2009), entire text; all drawings (Family: none)	1-8
A	JP 10-266998 A (Corona Corp.), 06 October 1998 (06.10.1998), entire text; all drawings (Family: none)	1-8

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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