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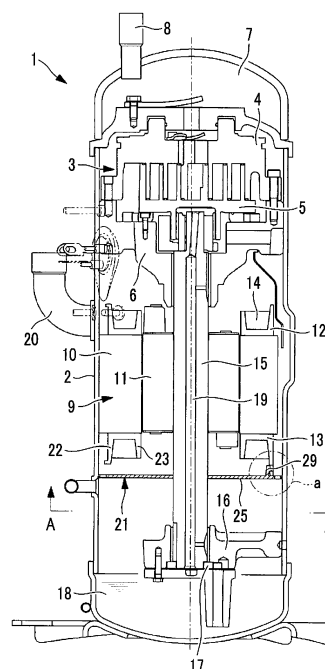
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(54) **HERMETICALLY SEALED ELECTRIC COMPRESSOR**

(57) Provided is a hermetic compressor with which oil rising caused by agitation or lifting of oil is suppressed to improve the reliability in ensuring the oil level, and with which it is possible to ensure installation precision and ease of assembly of the oil agitation/lifting preventive cover, a simplified configuration, and lower costs. The hermetic compressor is provided with a housing (2), a compressor (3) installed in the upper interior of the housing (2), a motor (9) which is installed in the housing (2) on the lower part of the compressor (3) and which drives the compressor (3) via a drive shaft (15), and the oil feed pump (17) which is provided on the lower end of the drive shaft (15) and which feeds oil that has been filled into the housing (2) to sliding parts of the compressor (3) via an oil feed hole (19) in the drive shaft (15); the motor (9) being a concentrated winding motor having a stator (10) around which a coil winding (14) is wound in concentrated fashion via resinous insulation bobbins (12, 13), and an oil agitation/lifting preventive cover (21) being detachably or integrally provided to the lower resinous insulation bobbin (13).

FIG. 1



Description

[PTL 3] Japanese Unexamined Patent Application
Publication No. 2010-121583

Technical Field

[0001] The present invention relates to a hermetic compressor in which a compressor and a motor driving the compressor are built within a housing of a hermetically sealed structure.

Background Art

[0002] In recent years, hermetic compressors tend to be smaller in size and larger in capacity. In that case, a technique of realizing the larger capacity with the size maintained due to improvements in a compression mechanism, higher-speed rotation of the compressor, or the like without enlarging the compressor itself is taken. In this case, the space volume inside the compressor becomes small relative to the amount of circulation of a refrigerant. For this reason, sensitivity to an oil circulation ratio (OC%) depending on the oil level (oil volume) of lubricating oil (hereinafter, simply referred to as oil) filled into the housing tends to become large, and countermeasures against oil rising become important.

[0003] As the countermeasures against the oil rising, the following (1) to (4), and the like are provided. (1) A countermeasure in which, in order to lower the oil level, the oil volume itself is reduced or in which an oil tank is separately installed. (2) A countermeasure in which a rotor of a motor is provided with an oil separation plate and an agitation preventive cover and a lower coil end is provided with a partition member that isolates a vertical gas stream or in which a lifting preventive plate that prevents contact with the oil level of the gas stream is provided on a lower bearing (refer to PTL 1). (3) A countermeasure in which a cylindrical partition member that extends downward is provided at an inner periphery of a lower coil end and a lower space of the motor is into an inner-peripheral-side space and an outer-peripheral-side space (refer to PTL 2). (4) A countermeasure in which a bearing installation member provided with a lower bearing vertically partitions a motor lower space and isolates an oil level from a gas stream and a bearing installation member is provided with a communication port having an opening opposite to an oil reservoir side directed to a circumferential direction (refer to PTL 3).

Citation List

Patent Literature

[0004]

[PTL 1] Japanese Unexamined Patent Application
Publication No. 2006-336545 (Japanese Patent No.
4654774)

[PTL 2] Japanese Unexamined Patent Application
Publication No. 2010-38058

Summary of Invention

Technical Problem

[0005] As described above, in the method of reducing the oil volume to lower the oil level, a risk caused by oil level break increases, and higher precision of oil level management control is required. Another tank type has problems, such as running counter to a reduction in size and causing the complication of structure and an increase in cost. As shown in PTLs 1 and 2, in a case where the coil end of the rotor or the lower coil end of a stator is provided with the oil separation plate, the agitation preventive cover, partition member, or the like, there are problems like higher-speed rotation of the motor is affected, and ensuring of installation precision is difficult, there is a risk that a winding wire may be damaged, or the like. In a case where the oil lifting preventive plate is provided on the lower bearing, there are problems like the oil is lifted from a gap of the lifting preventive plates due to an increase in gas flow velocity caused by an increase in the amount of circulated refrigerant and an oil rising preventive effect decreases.

[0006] As shown in PTL 3, in a case where the installation member of the lower bearing vertically partitions the lower space of the motor and the oil level rises above the installation member, the effect decreases. For that reason, there are problems like it is necessary to enlarge the oil reservoir so that the oil level does not rise above the installation member as much as possible, the installation member that is a strengthening member is enlarged as well as running against reduction in size, complication of structure and an increase in costs are caused.

[0007] The invention has been made in view of such circumstances, and an object thereof is to provide a hermetic compressor that can suppress oil rising caused by agitation or lifting of oil when realizing smaller size and larger capacity of an electric compressor to improve reliability in ensuring the oil level and that can ensure installation precision and ease of assembly of an oil agitation/lifting preventive cover, a simplified configuration, and lower costs.

Solution to Problem

[0008] In order to solve the above-described problems, the hermetic compressor of the invention adopts the following means.

[0009] That is, a hermetic compressor related to the invention includes a housing of a hermetically sealed structure; a compressor installed in an upper part within the housing; a motor that is installed within the housing in a lower part of the compressor and that drives the compressor via a drive shaft; and an oil feed pump that is provided at a lower end of the drive shaft and that feeds

oil, which has been filled into the housing, to a sliding part of the compressor via an oil feed hole within the drive shaft. The motor is a concentrated winding motor having a stator around which coil winding is wound in a concentrated fashion via resinous insulation bobbins. An oil agitation/lifting preventive cover is being detachably or integrally provided to a lower resinous insulation bobbin.

[0010] According to the invention, the oil agitation/lifting preventive cover is detachably or integrally provided to the lower resinous insulation bobbin, using the resinous insulation bobbins in the concentrated winding motor. For that reason, by virtue of the agitation/lifting preventive cover that is detachably or integrally provided to the lower resinous insulation bobbin of the resinous insulation bobbins used when the coil winding is wound in a concentrated fashion around the stator of the concentrated winding motor, the lower space of the motor can be isolated vertically or into inner and outer peripheral spaces, and the agitation of an oil level and the lifting of the oil, which are caused by the rotation of the rotor, or the lifting of the oil by a refrigerant gas stream can be suppressed. By detachably or integrally providing the agitation/lifting preventive cover in the lower resinous insulation bobbin, even in the compressor of a twin bearing structure in which both ends of the drive shaft are supported by bearings, the agitation/lifting preventive cover can be easily installed on internal insertion sides of the bearings in a state where the stator is shrinkage-fitted, without adopting a special method. Therefore, even if it the smaller size and larger capacity of the hermetic compressor are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, and with which it is possible to ensure installation precision and ease of assembly of the oil agitation/lifting preventive cover, a simplified configuration, and lower costs.

[0011] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have the drive shaft passed through a through-hole provided at a central part thereof, and may be detachably locked to an inner periphery or an outer periphery of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a plurality of claws and locking holes.

[0012] According to one aspect of the invention, the agitation/lifting preventive cover has the drive shaft passed through the through-hole provided at the central part thereof, and is detachably locked to the inner periphery or the outer periphery of any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin via the plurality of claws and locking holes. For that reason, the agitation/lifting preventive cover can be simply attached to the inner periphery or the outer periphery of any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin of the motor stator in a state where the drive shaft is passed through the through-hole at the central part thereof, by locking the plurality of

claws to the locking holes using the elastic deformation thereof. Therefore, the agitation/lifting preventive cover can be precisely installed on the lower end surface side of the motor stator so that motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[0013] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have the drive shaft passed through a through-hole provided at a central part thereof, and may be detachably press-fitted to an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a cylindrical part.

[0014] According to one aspect of the invention, the agitation/lifting preventive cover has the drive shaft passed through the through-hole provided at the central part thereof, and is detachably press-fitted to an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a cylindrical part. For that reason, the agitation/lifting preventive cover can be simply attached to the inner peripheral surface or the outer peripheral surface of any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin of the motor stator in a state where the drive shaft is passed through the through-hole at the central part, by press-fitting the cylindrical part. Therefore, the agitation/lifting preventive cover can be precisely installed on the lower end surface side of the motor stator so that the motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[0015] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have the drive shaft passed through a through-hole provided at a central part thereof, and may be detachably screwed into an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a screw part.

[0016] According to the above one aspect, the agitation/lifting preventive cover has the drive shaft passed through the through-hole provided at the central part thereof, and is detachably screwed into the inner peripheral surface or the outer peripheral surface of any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin via the screw part. For that reason, the agitation/lifting preventive cover can be simply attached to the inner peripheral surface or the outer peripheral surface of any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin of the motor stator in a state where the drive shaft is passed through the through-hole at the central part thereof, by screwing the screw part. Therefore, the agitation/lifting preventive cover can be precisely installed on the lower end surface side of the motor stator so that the motor performance is not affected, and the

ease of assembly, a simplified configuration, and lower costs can be ensured.

[0017] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have an external diameter that is close-fitted to an inner peripheral surface of the housing, and may have a refrigerant and oil flow passage provided at an outer peripheral part thereof.

[0018] According to the above one aspect, the agitation/lifting preventive cover has the external diameter that is close-fitted to the inner peripheral surface of the housing, and has the refrigerant and oil flow passage provided at the outer peripheral part thereof. For that reason, by close-fitting the external diameter of the agitation/lifting preventive cover installed in the lower resinous insulation bobbin of the motor stator to the inner peripheral surface of the housing, the motor lower space within the housing can be vertically isolated, the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be suppressed, and the oil can be guided to the lower space and the refrigerant can be guided to an upper space through the flow passage. Therefore, when the smaller size and larger capacity of the hermetic compressor are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, the agitation/lifting preventive cover can be simply installed on the lower end surface side of the motor stator precisely so that motor performance is not affected.

[0019] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have an external diameter equivalent to an outer peripheral flange diameter of the lower resinous insulation bobbin.

[0020] According to the above one aspect, the agitation/lifting preventive cover has the external diameter equivalent to the outer peripheral flange diameter of the lower resinous insulation bobbin. For that reason, the motor lower space within the housing can be isolated into a space that covers an inner peripheral side of the lower resinous insulation bobbin and a space other than the space due to the external diameter of the agitation/lifting preventive cover installed in the lower resinous insulation bobbin of the motor stator, and the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be suppressed. Therefore, when the smaller size and larger capacity of the hermetic compressor are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, the agitation/lifting preventive cover can be simply installed in the motor stator precisely so that the motor performance is not affected.

[0021] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may have an external diameter equivalent to an inner peripheral flange diameter of the lower resinous insula-

tion bobbin.

[0022] According to the above one aspect, since agitation/lifting preventive cover has the external diameter equivalent to the inner peripheral flange of the lower resinous insulation bobbins, the motor lower space within the housing can be isolated into a space that covers a lower part of the rotor closer to the inner peripheral side than the lower resinous insulation bobbin and a space other than the space due to the external diameter of the agitation/lifting preventive cover installed in the lower resinous insulation bobbin of the motor stator, and the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be suppressed. Therefore, when the smaller size and larger capacity of the hermetic compressor are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, the agitation/lifting preventive cover can be simply installed in the motor stator precisely so that the motor performance is not affected.

[0023] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may be provided at a position lower than a position of the lower resinous insulation bobbin by a predetermined dimension in a lower space of the motor.

[0024] According to the above one aspect, the agitation/lifting preventive cover are provided at the position lower than the position of the lower resinous insulation bobbin by the predetermined dimension in the lower space of the motor. As described above, the upper space in the motor lower space vertically isolated by the agitation/lifting preventive cover can be enlarged to a suitable size by an amount such that the agitation/lifting preventive cover is located on a lower side, and the effect of separating the oil contained in the refrigerant gas stream can be enhanced. Therefore, the oil rising followed by the refrigerant gas stream and the oil rising caused by the lifting of the oil of the refrigerant gas stream can be suppressed, and the reliability in ensuring the oil level can be improved.

[0025] In the hermetic compressor related to one aspect of the invention, the agitation/lifting preventive cover may include a plurality of ribs in a radial direction on a surface thereof.

[0026] According to the above one aspect, the agitation/lifting preventive cover includes the plurality of ribs in the radial direction on the surface thereof. Therefore, even if the stress caused by a pressure difference acts on the agitation/lifting preventive cover due to a pressure fluctuation within the housing, the plurality of ribs in the radial direction can ensure the strength of the cover, and can suppress the deformation thereof. Therefore, degradation in the performance caused by the pressure deformation of the agitation/lifting preventive cover can be prevented, and the reliability in ensuring the oil level can be maintained.

[0027] Moreover, in the hermetic compressor related to the invention, the agitation/lifting preventive cover may

be configured integrally with the lower resinous insulation bobbin by forming a downwardly extending tubular part in any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin.

[0028] According to the above one aspect, the agitation/lifting preventive cover is configured integrally with the lower resinous insulation bobbin by forming the downwardly extending tubular part in any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin. For that reason, the oil agitation/lifting preventive cover can be configured integrally with the lower resinous insulation bobbin by the tubular part formed by extending any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin downward, and the lower space of the motor can be isolated in to the inner and outer peripheral spaces by the agitation/lifting preventive cover. Therefore, simply by providing the tubular part integrally with the lower resinous insulation bobbin that is a motor component and assembling the lower resinous insulation bobbin as the motor component, the agitation/lifting preventive cover is installed and the lower space of the motor is isolated into the inner and outer peripheral spaces, so that the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be suppressed. Moreover, the hermetic compressor can be assembled by a method that is not different from the related art, and ease of assembling, a simplified configuration, lower costs, and the like in the hermetic compressor including the oil agitation/lifting preventive cover can be ensured.

[0029] In the hermetic compressor related to one aspect of the invention, the tubular part that constitutes the agitation/lifting preventive cover may be configured such that an inner peripheral flange of the lower resinous insulation bobbin is extended downward, and may include an outwardly bent horizontal flange part, of which an outer periphery is brought into close contact with the inner peripheral surface of the housing, at a lower end thereof.

[0030] According to the above one aspect, the tubular part that constitutes the agitation/lifting preventive cover is configured such that the inner peripheral flange of the lower resinous insulation bobbin is extended downward, and includes the outwardly bent horizontal flange part, of which the outer periphery is brought into close contact with the inner peripheral surface of the housing, at the lower end thereof. For that reason, not only the lower space of the motor can be isolated into the inner and outer peripheral spaces by the tubular part, but also the lower space of the motor can be vertically isolated by the horizontal flange part. Therefore, the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be effectively suppressed, and the reliability in ensuring the oil level can be improved.

[0031] In the hermetic compressor related to one aspect of the invention, the tubular part that constitutes the agitation/lifting preventive cover may be configured such

that an outer peripheral flange of the lower resinous insulation bobbin is extended downward, and may include a horizontal flange part, which is bent to an inner peripheral side, at a lower end thereof.

[0032] According to the invention, the tubular part that constitutes the agitation/lifting preventive cover may be configured such that the outer peripheral flange of the lower resinous insulation bobbin is extended downward, and includes the horizontal flange, which is bent to the inner peripheral side, at the lower end thereof. Therefore, the lower space of the motor can be isolated into the inner and outer peripheral spaces by the tubular part, but also the lower space of the motor can be vertically isolated by the horizontal flange part. Therefore, the agitation of the oil level and the lifting of the oil, which are caused by the rotor, or the lifting of the oil by the refrigerant gas stream can be effectively suppressed, and the reliability in ensuring the oil level can be improved.

[0033] In the hermetic compressor according to one aspect of the invention, internal diameters of the tubular part and the horizontal flange part, which is bent to the inner peripheral side, at the lower end thereof, may be larger than an external diameter of a rotor of the motor.

[0034] According to the above one aspect, the internal diameters of the tubular part and the horizontal flange part, which is bent to the inner peripheral side, at the lower end thereof, are larger than the external diameter of the rotor of the motor. For that reason, even if the tubular part is provided integrally with the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin on the motor stator side or the horizontal flange part is bent and formed at the lower end of the tubular part, the motor can be easily incorporated so as not to hinder the insertion of the rotor into the inner periphery of the stator. Therefore, ease of assembling, a simplified configuration, lower costs, and the like in the hermetic compressor including the oil agitation/lifting preventive cover can be ensured.

Advantageous Effects of Invention

[0035] According to the invention, the oil agitation/lifting preventive cover is detachably or integrally provided to the lower resinous insulation bobbin of the resinous insulation bobbins to be used when the coil winding is wound in a concentrated fashion around the stator of the concentrated winding motor. The agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor, or the lifting of the oil by the refrigerant gas stream can be suppressed by isolating the lower space of the motor vertically or into inner and outer peripheral spaces, using the agitation/lifting preventive cover. By detachably or integrally providing the agitation/lifting preventive cover in the lower resinous insulation bobbin, even in the compressor of a twin bearing structure in which both ends of the drive shaft are supported by bearings, the agitation/lifting preventive cover can be easily installed on internal insertion sides of the bearings in a

state where the stator is shrinkage-fitted, without adopting a special method. For that reason, even if the smaller size and larger capacity of the hermetic compressor are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, and with which it is possible to ensure installation precision and ease of assembly of the oil agitation/lifting preventive cover, a simplified configuration, and lower costs.

Brief Description of Drawings

[0036]

Fig. 1 is a sectional view of a hermetic compressor related to a first embodiment of the invention.

Fig. 2 is a view equivalent to section A-A of Fig. 1.

Fig. 3 is a partially perspective view of the oil agitation/lifting preventive cover and a lower resinous insulation bobbin in which the cover is installed, in the hermetic compressor.

Fig. 4 is an explanatory view (A), (B), and (C) of a procedure in which the agitation/lifting preventive cover is installed in the lower resinous insulation bobbin, illustrating a portion of Fig. 1 in an enlarged manner.

Fig. 5 is a sectional view of the hermetic compressor related to Modification Example 1 of the first embodiment.

Fig. 6 is a view equivalent to section B-B of Fig. 5.

Fig. 7 is a sectional view of the hermetic compressor related to Modification Example 2 of the first embodiment.

Fig. 8 is a view equivalent to section C-C of Fig. 7. Fig. 9 is a sectional view (A) of the hermetic compressor related to Modification Example 3 of the first embodiment and is an enlarged view (B) and (C) of portion b and portion c.

Fig. 10 is a sectional view (A) of the hermetic compressor related to Modification Example 4 of the first embodiment and is an enlarged view (B) and (C) of portion d and portion e.

Fig. 11 is a sectional view (A) of the hermetic compressor related to Modification Example 5 of the first embodiment and is an enlarged view (B) and (C) of portion f and portion g.

Fig. 12 is a view equivalent to section D-D of Fig. 11.

Fig. 13 is a sectional view (A) of the hermetic compressor related to Modification Example 6 of the first embodiment and is an enlarged view (B) and (C) of portion h and portion i.

Fig. 14 is a view equivalent to section E-E of Fig. 13.

Fig. 15 is a sectional view (A) of the hermetic compressor related to Modification Example 7 of the first embodiment and is an enlarged view (B) and (C) of portion j and portion k.

Fig. 16 is a view equivalent to section F-F of Fig. 15.

Fig. 17 is a sectional view of a hermetic compressor

related to a second embodiment of the invention.

Fig. 18 is a view equivalent to section G-G of Fig. 17.

Fig. 19 is a sectional view of the hermetic compressor related to Modification Example 1 of the second embodiment.

Fig. 20 is a view equivalent to section H-H of Fig. 19.

Fig. 21 is a sectional view of the hermetic compressor related to Modification Example 2 of the second embodiment.

Fig. 22 is a view equivalent to section I-I of Fig. 21.

Description of Embodiments

[0037] Hereinafter, embodiments related to the invention will be described with reference to the drawings.

[First Embodiment]

[0038] Hereinafter, a first embodiment of the invention will be described with reference to Figs. 1 to 4.

[0039] A sectional view of a hermetic compressor related to the first embodiment of the invention is illustrated in Fig. 1. A view equivalent to section A-A of Fig. 1 is illustrated in Fig. 2. A partially perspective view of the oil agitation/lifting preventive member and a lower resinous insulation bobbin in which the member is installed is illustrated in Fig. 3. An explanatory view of a procedure in which the agitation/lifting preventive member is installed in the lower resinous insulation bobbin is illustrated in Fig. 4.

[0040] A hermetic compressor 1 includes a vertically long cylindrical housing 2 having a hermetically sealed structure that constitutes an outer shell thereof.

[0041] A compressor 3 is assembled into an upper part within the housing 2. The compressor 3 herein is a scroll compressor 3 consisting of a pair of fixed scrolls 4 and an orbiting scroll 5. The compressor 3 is assembled to the housing 2 via a bearing member (also referred to as a frame member) 6 that is fixedly installed. A high-pressure refrigerant gas compressed by the scroll compressor 3 is discharged into a discharge chamber 7 and delivered to a refrigerating cycle side via a discharge pipe 8. The scroll compressor 3 is known well and does not adopt a special configuration.

[0042] A motor 9 is fixedly installed to the housing 2 at a lower part of the scroll compressor 3 within the housing 2. The motor 9 consists of a stator 10 and a rotor 11. The stator 10 is obtained by winding coil winding 14 in a concentrated fashion around a stator core via the upper and lower resinous insulation bobbins 12 and 13. A drive shaft 15 is integrally combined with the rotor 11. The scroll compressor 3 is drivable by coupling a crankpin provided at an upper end of the drive shaft 15 to a back surface of the orbiting scroll 5 of the scroll compressor 3 via a drive bush and a turning bearing.

[0043] An upper end side of the drive shaft 15 is supported by a bearing member 6. A lower end of the drive shaft 15 is supported by a bearing member 16 installed

at a lower part within the housing 2. The oil feed pump 17 is provided between the lower end of the drive shaft 15 and the bearing member 16. The oil reservoir 18 of a bottom part within the hermetically sealed housing 2 is filled with lubricating oil (oil). The lubricating oil (oil) is capable of being fed to a sliding part of the scroll compressor 3 via the oil feed hole 19 provided within the drive shaft 15. Such an oil feed mechanism is known well.

[0044] A refrigerant suction pipe 20 opening to a space between the lower part of the scroll compressor 3 and an upper part of the motor 9 is connected to the housing 2. Within the housing 2, the oil separated from a low-pressure refrigerant gas containing the oil suctioned into the housing 2 via the refrigerant suction pipe 20, and then, flows through the inside of the housing 2, is suctioned into the scroll compressor 3, is compressed to a high pressure, and is discharged into the discharge chamber 7. Meanwhile, the oil that has lubricated of the sliding part of the scroll compressor 3 flows down to the oil reservoir 18 of the lower part together with the oil separated from the refrigerant gas via the oil passage running along an inner wall of the housing 2 from the oil drain hole provided in the bearing member 6, and ensures the oil level with a constant height at the bottom part within the housing 2.

[0045] However, if the hermetic compressor 1 is operated, as the oil of the oil reservoir 18 or the oil that separates from the suctioned refrigerant gas and flows downward after lubricating the sliding part of the scroll compressor 3 is agitated or lifted by a refrigerant gas stream flowing through the inside of the housing 2 and the rotation of the motor 9, the oil is suctioned into the scroll compressor 3 together with the refrigerant gas and is circulated from the compressor 1 to the refrigerating cycle side together with the compressed gas. This causes oil rising.

[0046] Since this oil rising hinders heat exchange to degrade the efficiency of the system as the oil circulates to the refrigerating cycle side or the amount of oil for lubricating the sliding part of the compressor 3 is insufficient, which results in lubrication failure, it is desirable to suppress as much as possible. However, since the volume of a space inside the compressor becomes relatively small with respect to the amount of circulated refrigerant along with the realization of smaller size and larger capacity of the hermetic compressor 1, the oil rising tends to be more conspicuous.

[0047] As a countermeasure against this, in the present embodiment, a configuration in which the agitation/lifting preventive cover 21 is installed in a lower space of the motor 9 in order to suppress oil agitation and oil rising is adopted, and the agitation/lifting preventive cover 21 is installed using the lower resinous insulation bobbin 13 that constitutes the stator 10 of the motor 9 that is a concentrated winding motor.

[0048] The resinous insulation bobbins 12 and 13 herein are resin molding products having insulation that are interposed in tooth parts of the stator core when the coil

winding 14 is wound in a concentrated fashion around the tooth parts. The resinous insulation bobbins 12 and 13 have high molding precision and constant strength, and includes an outer peripheral flange 22 that is continuous in a circumferential direction on an outer peripheral side, and an inner peripheral flange 23 having a cutout for winding the coil winding 14 corresponding to a slot between the tooth parts, on an inner peripheral side. The present embodiment has a configuration in which the agitation/lifting preventive cover 21 is detachably provided to the outer peripheral flange 22 of the lower resinous insulation bobbin 13.

[0049] For this reason, as illustrated in Fig. 3, locking holes 24 to which hooking claws (claws) 29 on the agitation/lifting preventive cover 21 side to be described below are locked are provided at equal intervals in a plurality of places (in the present embodiment, an example of four places is illustrated, but it is desirable to provide the locking claws in at least three or more places) in the circumferential direction on a tip side, in the outer peripheral flange 22 of the lower resinous insulation bobbin 13.

[0050] As illustrated in Fig. 3, the oil agitation/lifting preventive cover 21 is configured such that a through-hole 26 passing through the drive shaft 15 is provided at a central part on a disk 25, and a large number of small holes 27 used as a flow passage 28 through which the oil and the refrigerant gas flow are provided in an outer peripheral part. The plurality of hooking claws (claw) 29 that protrude upward are provided in a plurality of places corresponding to the locking holes 24 provided in the outer peripheral flange 22 of the lower resinous insulation bobbin 13 described above, at an outer peripheral part of the disk 24 having an external diameter such that is close-fitted to an inner periphery of the housing 2.

[0051] As illustrated in Fig. 4(A), Fig. 4(B), and Fig. 4(C), the hooking claws (claws) 29 are fitted and locked to the locking holes 24 by being elastically deformed and pushed on the inner peripheral side of the outer peripheral flange 22 of the lower resinous insulation bobbin 13, and the agitation/lifting preventive cover 21 is detachably installed to the outer peripheral flange 22 of the lower resinous insulation bobbin 13. The agitation/lifting preventive cover 21 installed in the outer peripheral flange 22 of the lower resinous insulation bobbin 13 vertically isolates the lower space of the motor 9 within the housing 2 at a predetermined position as an external diameter thereof is close-fitted to the inner periphery of the housing 2.

[0052] According to the present embodiment, the following effects are exhibited by virtue of the above-described configuration.

[0053] The hermetic compressor 1 is driven by starting the motor 9. By driving the orbiting scroll 5 of the scroll compressor 3 in a revolving and orbiting manner around the fixed scrolls 4 via the drive shaft 15 that is rotates by the motor 9, a compression action is performed as is known well. That is, within the housing 2, the oil is separated from the low-pressure refrigerant gas suctioned

into the housing 2 from the refrigerating cycle side via the suction pipe 20 and then, flows through the inside of the housing 2, is suctioned into the scroll compressor 3, is compressed into a high-pressure gas and is discharged into the discharge chamber 7. Then, the refrigerant gas is delivered to the refrigerating cycle side via the discharge pipe 8.

[0054] Meanwhile, the oil that filled in that the oil reservoir 18 of the bottom part within the housing 2 is fed to the sliding part of the scroll compressor 3 through the oil feed hole 19 by the oil feed pump 17 as the drive shaft 15 is rotated. The fed oil lubricates a required sliding portion, and then is discharged into the housing 2 via the oil drain hole provided in the bearing member 6, and flows down the lower oil reservoir 18 via the oil passage or the like so as to avoid any contact with the refrigerant gas stream.

[0055] The oil reserved in the oil reservoir 18 while maintaining the oil level, the oil after lubricating the sliding part of the scroll compressor 3, and the oil separated from the suctioned refrigerant gas are suctioned into the scroll compressor 3 together with the refrigerant gas due to the agitation caused by the rotation of the motor 9 (rotor 11) and the lifting caused by the rotation of the motor, or the lifting caused by the refrigerant gas stream, and rise partially from the hermetic compressor 1 to the refrigerating cycle side together with the compressed gas. In order to suppress this oil rising, the agitation/lifting preventive cover 21 is detachably installed to the stator 10 using the outer peripheral flange 22 of the lower resinous insulation bobbin 13, and the lower space of the motor 9 is vertically isolated by the agitation/lifting preventive cover 21.

[0056] In this way, the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed by providing the agitation/lifting preventive cover 21 and vertically isolating the lower space of the motor 9. By detachably providing the agitation/lifting preventive cover 21 in the lower resinous insulation bobbin 13, even in the compressor 1 of a twin bearing structure in which both ends of the drive shaft 15 are supported by the bearings (bearing members) 6 and 16, the agitation/lifting preventive cover 21 can be easily installed on internal insertion sides of the bearings (bearing members) 6 and 16 in a state where the stator 10 is shrinkage-fitted to the housing 2, without adopting a special method.

[0057] Therefore, even if it the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, and with which it is possible to ensure installation precision and ease of assembly of the oil agitation/lifting preventive cover 21, a simplified configuration, and lower costs.

[0058] The agitation/lifting preventive cover 21 has the drive shaft 15 passed through the through-hole 26 pro-

vided at a central part thereof, and is detachably locked to the inner periphery of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 via the plurality of claws (hooking claws) 29 and locking holes 24. For that reason, the agitation/lifting preventive cover 21 can be simply attached to the inner periphery of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 of the motor stator 10 in a state where the drive shaft 15 is passed through the through-hole 26 at the central part, by locking the plurality of claws (hooking claws) 29 to the locking holes 24 using the elastic deformation thereof. Therefore, the agitation/lifting preventive cover 21 can be precisely installed on a lower end surface side of the motor stator 10 so that motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[0059] The agitation/lifting preventive cover 21 has the external diameter that is close-fitted to an inner peripheral surface of the housing 2, and has the refrigerant and oil flow passage 28 (the large number of small holes 27) provided at the outer peripheral part thereof. In this way, by close-fitting the external diameter of the agitation/lifting preventive cover 21 installed in the lower resinous insulation bobbin 13 of the motor stator 10 to the inner peripheral surface of the housing 2, the motor lower space within the housing 2 can be vertically isolated, and the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed. Moreover, the oil can be guided to a lower space of the agitation/lifting preventive cover 21 via the flow passage 28, and the refrigerant can be guided to an upper space of the cover via the flow passage 28.

[0060] Accordingly, when the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level. Along with that, the agitation/lifting preventive cover 21 can be precisely simply installed on the lower end surface side of the motor stator 10 so that motor performance is not affected.

[0061] The above-described first embodiment has a configuration in which the agitation/lifting preventive cover 21 is detachably installed on the inner peripheral surface of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 via the hooking claws (claws) 29 and the locking holes 24. However, the agitation/lifting preventive cover 21 may be installed in the lower resinous insulation bobbin 13 according to various Modification Examples 1 to 7 to be described below.

[Modification Example 1]

[0062] In Modification Example 1, instead of the hooking claws (claws) 29 and the locking holes 24, as illustrated in Figs. 5 and 6, a cylindrical part 30 having a predetermined height, which protrudes upward, is integrally provided at the outer peripheral part on the disk 25 of the

agitation/lifting preventive cover 21. The cylindrical part 30 is press-fitted to an outer peripheral surface of the outer peripheral flange 22 of the lower resinous insulation bobbin 13. Accordingly, the agitation/lifting preventive cover 21 is detachably installed in the lower resinous insulation bobbin 13 of the stator 10. In this case, as illustrated in the drawing, it is desirable that the height of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 is slightly higher.

[0063] In this way, the agitation/lifting preventive cover 21 can be simply attached by press-fitting the cylindrical part 30 to the outer peripheral surface of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 of the motor stator 10 in a state where the drive shaft 15 is passed through the through-hole 26 at the central part, even if the agitation/lifting preventive cover 21 is detachably press-fitted to the outer peripheral surface of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 via the cylindrical part 30 by passing the drive shaft 15 through the through-hole 26 provided at the central part. For this reason, the agitation/lifting preventive cover 21 can be precisely installed on the lower end surface side of the motor stator 10 so that motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[Modification Example 2]

[0064] In Modification Example 2, as illustrated in Figs. 7 and 8, a cylindrical part 31 having a predetermined height, which protrudes upward, is integrally provided at a radial intermediate site on the disk 25 of the agitation/lifting preventive cover 21. The cylindrical part 31 is press-fitted to an inner peripheral surface of the inner peripheral flange 23 of the lower resinous insulation bobbin 13. Accordingly, the agitation/lifting preventive cover 21 is detachably installed in the lower resinous insulation bobbin 13 of the stator 10. In this case, as illustrated in the drawing, it is desirable that the height of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 is slightly higher.

[0065] As described above, the agitation/lifting preventive cover 21 can be simply attached by press-fitting the cylindrical part 31 to the inner peripheral surface of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 of the motor stator 10 in a state where the drive shaft 15 is passed through the through-hole 26 at the central part, even if the agitation/lifting preventive cover 21 is detachably press-fitted to the inner peripheral surface of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 via the cylindrical part 31 by passing the drive shaft 15 through the through-hole 26 provided at the central part. Therefore, the agitation/lifting preventive cover 21 can be precisely installed on a lower end surface side of the motor stator 10 so that motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[Modification Example 3]

[0066] In Modification Example 3, as illustrated in Fig. 9(A), Fig. 9(B), and Fig. 9(C), the external diameter of the agitation/lifting preventive cover 21 is equal to the diameter of the outer peripheral flange 22 of the lower resinous insulation bobbin 13. Hooking claws (claws) 32 are provided at equal intervals in a plurality of places (at least three places or more) of the outer peripheral part. The hooking claws (claws) 32 are locked to locking holes 33 provided in a plurality of places on a tip side of the outer peripheral flange 22 of the lower resinous insulation bobbin 13, using elastic deformation from an inner peripheral side. Accordingly, the agitation/lifting preventive cover 21 is detachably provided to the outer peripheral flange 22 of the lower resinous insulation bobbin 13.

[0067] In this way, even if the agitation/lifting preventive cover 21 has an external diameter equivalent to the diameter of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 and the agitation/lifting preventive cover 21 is detachably installed to the outer peripheral flange 22 of the lower resinous insulation bobbin 13 via the hooking claws (claws) 32 and the locking holes 33, the motor lower space within the housing 2 can be isolated into a space that covers the inner peripheral side of the lower resinous insulation bobbin 13 and a space other than the space due to the external diameter of the agitation/lifting preventive cover 21 installed in the lower resinous insulation bobbin 13 of the motor stator 10, and the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed.

[0068] Therefore, according to this Modification Example 3, when the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level. Along with that, the agitation/lifting preventive cover 21 can be precisely installed on the lower end surface side of the motor stator 10 so that motor performance is not affected.

[0069] In the case of this modification example, the external diameter of the agitation/lifting preventive cover 21 is approximately equal to the external diameter of the outer peripheral flange 22 of the lower resinous insulation bobbin 13. Therefore, there is no close contact with the inner peripheral surface of the housing 2. For that reason, the flow passage 28 consisting of a large number of the small holes 27 becomes unnecessary. As illustrated in Fig. 9(C), it is needless to say that the agitation/lifting preventive cover 21 is provided with the through-hole 26 of a slightly larger diameter than the external diameter of the drive shaft 15.

[Modification Example 4]

[0070] In Modification Example 4, as illustrated in Fig. 10(A), Fig. 10(B), and Fig. 10(C), the external diameter of the agitation/lifting preventive cover 21 is approximate-

ly equal to the diameter of the outer peripheral flange 22 of the lower resinous insulation bobbin 13, and a plurality of hooking claws (claw) 34 that protrude upward at equal intervals in the circumferential direction are provided in a plurality of places of the radial intermediate site on the disk 25. Along with that, the hooking claws (claws) 34 are locked to locking holes 35 provided in a plurality of places on the tip side of the inner peripheral flange 23 of the lower resinous insulation bobbin 13, using elastic deformation from the inner peripheral side. Accordingly, the agitation/lifting preventive cover 21 is detachably installed to the inner peripheral flange 23 of the lower resinous insulation bobbin 13.

[0071] Even if such a configuration is adopted, similar to the above Modification Example 3, the motor lower space within the housing 2 can be isolated into the space that covers the inner peripheral side of the lower resinous insulation bobbin 13, and the space other than the space, due to the external diameter of the agitation/lifting preventive cover 21 installed in the lower resinous insulation bobbin 13 of the motor stator 10, and the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed. Therefore, when the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level. Along with that, the agitation/lifting preventive cover 21 can be precisely and simply installed on the lower end surface side of the motor stator 10 so that motor performance is not affected.

[Modification Example 5]

[0072] Modification Example 5, as illustrated in Fig. 11(A), Fig. 11(B), Fig. 11(C), and Fig. 12, has a configuration in which the external diameter of the agitation/lifting preventive cover 21 is equal to the external diameter of the outer peripheral flange 22 of the lower resinous insulation bobbin 13, and a bent flange part 36 is provided such that an outer peripheral edge part thereof extends so as to be bent upward. A plurality of hooking claws (claw) 37 that protrude upward at equal intervals in the circumferential direction are provided in a plurality of places of an upper edge of the bent flange part 36. Along with that, the agitation/lifting preventive cover 21 is detachably installed to the outer peripheral flange 22 of the lower resinous insulation bobbin 13 by locking the hooking claws (claws) 37 locked to locking holes 38 provided in a plurality of places on the tip side of the outer peripheral flange 22 of the lower resinous insulation bobbin 13, using elastic deformation from the inner peripheral side.

[0073] The installation position of the agitation/lifting preventive cover 21 can be at a position downwardly lower than a lower end position of the lower resinous insulation bobbin 13 by a predetermined dimension within the lower space of the motor 9. As illustrated in Fig. 12,

a plurality of ribs 39 in a radial direction are provided in the shape of a cross on an upper surface on the disk 25 of the agitation/lifting preventive cover 21 so that the pressure-resistant strength of the agitation/lifting preventive cover 21 against a pressure fluctuation is ensured.

[0074] As described above, by providing the agitation/lifting preventive cover 21 at the position lower than the position of the lower resinous insulation bobbin 13 by the predetermined dimension in the lower space of the motor 9, the upper space in the motor lower space vertically isolated by the agitation/lifting preventive cover 21 can be enlarged to a suitable size by an amount such that the agitation/lifting preventive cover 21 is located on a lower side, and the effect of separating the oil contained in the refrigerant gas stream can be enhanced. For this reason, the oil rising followed by the refrigerant gas stream and the oil rising caused by the lifting of the oil of the refrigerant gas stream can be suppressed, and the reliability in ensuring the oil level can be improved.

[0075] With respect to the agitation/lifting preventive cover 21, the plurality of ribs 39 in the radial direction are provided on the surface on the disk 25. Accordingly, even if the stress caused by a pressure difference acts on the agitation/lifting preventive cover 21 due to a pressure fluctuation within the housing 2, the plurality of ribs 39 in the radial direction can ensure the strength of the cover, and can suppress the deformation thereof. Therefore, degradation in the performance caused by the pressure deformation of the agitation/lifting preventive cover 21 can be prevented, and the reliability in ensuring the oil level can be maintained.

[Modification Example 6]

[0076] In Modification Example 6, as illustrated in Fig. 13(A), Fig. 13(B), Fig. 13(C), and Fig. 14, a tip part of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 is extended to increase its height, a screw part 40 is provided in that portion, and an upwardly bent flange part 41 is provided at the outer peripheral part of the agitation/lifting preventive cover 21 of which the diameter is approximately equal to that of the inner peripheral flange 23 of the lower resinous insulation bobbin 13. A screw part 42 screwed to the screw part 40 is provided on the inner peripheral surface. The agitation/lifting preventive cover 21 is detachably installed by screwing the screw part 42 on the agitation/lifting preventive cover 21 side into the screw part 40 on the inner peripheral flange 23 of the lower resinous insulation bobbin 13.

[0077] In this way, even if a configuration is adopted in which the agitation/lifting preventive cover 21 having the external diameter approximately equal to the inner peripheral flange 23 of the lower resinous insulation bobbin 13 is installed on the inner peripheral flange 23 of the lower resinous insulation bobbin 13, the motor lower space within the housing 2 can be isolated into a space that covers a lower part of the rotor 11 closer to the inner peripheral side than the lower resinous insulation bobbin

13 and a space other than the space and the agitation of the oil level and the lifting of the oil, which are caused by the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed. For this reason, when the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level.

[0078] Since the agitation/lifting preventive cover 21 is detachably screwed into the outer peripheral surface of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 via the screw parts 40 and 42, the agitation/lifting preventive cover 21 can be simply attached by screwing the screw part 42 into the outer peripheral surface of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 of the motor stator 10 in a state where the drive shaft 15 is passed through the through-hole 26 of the central part. Therefore, the agitation/lifting preventive cover 21 can be precisely installed on a lower end surface side of the motor stator 10 so that motor performance is not affected, and the ease of assembly, a simplified configuration, and lower costs can be ensured.

[Modification Example 7]

[0079] In Modification Example 7, as illustrated in Fig. 15(A), Fig. 15(B), Fig. 15(C), and Fig. 16, a tip part of the outer peripheral flange 22 of the lower resinous insulation bobbin 13 is extended to increase its height, and a screw part 43 is provided in that portion. Along with that, an upwardly bent flange part 44 is provided at the outer peripheral part of the agitation/lifting preventive cover 21 of which the diameter is approximately equal to that of the outer peripheral flange 23 of the lower resinous insulation bobbin 13. A screw part 45 screwed to the screw part 43 is provided on the outer peripheral surface, and the screw part 45 on the agitation/lifting preventive cover 21 side is screwed into the screw part 43 on the outer peripheral flange 22 side of the lower resinous insulation bobbin 13. Accordingly, the agitation/lifting preventive cover 21 is detachably installed.

[0080] Even if such a configuration is adopted, similar to the above Modification Example 6, the motor lower space within the housing 2 can be isolated into the space that covers the inner peripheral side of the lower resinous insulation bobbin 13, and the space other than the space, due to the external diameter of the agitation/lifting preventive cover 21 installed in the lower resinous insulation bobbin 13 of the motor stator 10, and the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed.

[0081] Therefore, when the smaller size and larger capacity of the hermetic compressor 1 are realized, the oil rising caused by the agitation or the lifting of the oil can be suppressed to improve the reliability in ensuring the oil level, the agitation/lifting preventive cover 21 can be

simply installed on the lower end surface side of the motor stator 10 precisely by the screwing so that motor performance is not affected, and ease of assembly, a simplified configuration, and lower costs can be ensured.

[Second Embodiment]

[0082] Next, a second embodiment of the invention will be described with reference to Figs. 17 and 18.

[0083] The present embodiment is different from the above-described first embodiment in that an agitation/lifting preventive cover 21A is integrated with the lower resinous insulation bobbin 13. Since the other points are the same as those of the first embodiment, the description thereof will be omitted.

[0084] In the present embodiment, as illustrated in Figs. 17 and 18, a tip side of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 that constitutes the stator 10 of the concentrated winding motor 9 is extended downward to form a tubular part 50, the tubular part 50 is formed as the agitation/lifting preventive cover 21A, and the agitation/lifting preventive cover 21A is integrated with the lower resinous insulation bobbin 13.

[0085] In this way, the tip side of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 is extended downward to form the tubular part 50, and the tubular part 50 is integrated with the lower resinous insulation bobbin 13 as the agitation/lifting preventive cover 21A. Accordingly, the lower space of the motor 9 can be isolated into inner and outer peripheral spaces with the agitation/lifting preventive cover 21A, and the agitation of the oil level and the lifting of the oil, which are caused by the motor rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed.

[0086] Therefore, simply by providing the tubular part 50 integrally with the lower resinous insulation bobbin 13 that is a motor component and incorporating the lower resinous insulation bobbin 13 into the stator 10 as the motor component, the agitation/lifting preventive cover 21A is installed on the lower end surface side of the motor stator 10 and the lower space of the motor 9 is isolated into the inner and outer peripheral spaces, so that the agitation of the oil level and the lifting of the oil, which are caused by the rotation of the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed. Moreover, the hermetic compressor 1 can be assembled by a method that is not different from the related art, and ease of assembling, a simplified configuration, lower costs, and the like in the hermetic compressor 1 including the oil agitation/lifting preventive cover 21A can be ensured.

[0087] In the above embodiment, the tip side of the inner peripheral flange 23 of the lower resinous insulation bobbin 13 is extended downward to form the tubular part 50, and the tubular part 50 is formed as the agitation/lifting preventive cover 21A. However, it is needless to say that the tubular part may be formed on the outer peripheral flange 22 side and the agitation/lifting preventive cover

may be integrally provided. The following Modification Examples 1 and 2 may be adopted.

[Modification Example 1]

[0088] In a modification example, as illustrated in Figs. 19 and 20, a horizontal flange part 51 of which an outer periphery is brought into close contact with the inner peripheral surface of the housing 2 and that is bent to the outside is provided at a lower end of the above tubular part 50 formed by extending the inner peripheral flange 23 of the lower resinous insulation bobbin 13 downward. Along with that, a refrigerant and oil flow passage 53 consisting of a large number of small holes 52 are provided at an outer peripheral part of the horizontal flange part 51.

[0089] In this way, the horizontal flange part 51 of which the outer periphery is brought into close contact with the inner peripheral surface of the housing 2 and that is bent to the outside is provided at the lower end of the agitation/lifting preventive cover 21A constituted by the tubular part 50 formed by extending the inner peripheral flange 23 of the lower resinous insulation bobbin 13 downward. Accordingly, not only the lower space of the motor 9 can be isolated into the inner and outer peripheral spaces by the tubular part 50, but also the lower space of the motor 9 can be vertically isolated by the horizontal flange part 51. Therefore, the agitation of the oil level and the lifting of the oil, which are caused by the rotor 11, or the lifting of the oil by the refrigerant gas stream can be suppressed, and the reliability in ensuring the oil level can be improved.

[Modification Example 2]

[0090] In a modification example, as illustrated in Figs. 21 and 22, the outer peripheral flange 22 of the lower resinous insulation bobbin 13 is extended downward to form a tubular part 54, the tubular part 54 is formed as the agitation/lifting preventive cover 21A, the agitation/lifting preventive cover 21A is integrated with the outer peripheral flange 22 of the lower resinous insulation bobbin 13, and a horizontal flange part 55 bent to the inner peripheral side is provided at a lower end of the tubular part 54.

[0091] As described above, the outer peripheral flange 22 of the lower resinous insulation bobbin 13 is extended downward to form the tubular part 54, and the tubular part 54 is formed as the agitation/lifting preventive cover 21A. Along with that, the horizontal flange part 55 bent to the inner peripheral side is provided at the lower end. Accordingly, not only the lower space of the motor 9 can be isolated into the inner and outer peripheral spaces by the tubular part 54, but also the lower space of the motor 9 can be vertically isolated by the horizontal flange part 55. Therefore, even by this modification example, similar to Modification Example 1, the agitation of the oil level and the lifting of the oil, which are caused by the rotor

11, or the lifting of the oil by the refrigerant gas stream can be suppressed, and the reliability in ensuring the oil level can be improved.

5 [Modification Example 3]

[0092] In a modification example, in the above second embodiment and Modification Examples 1 and 2, the internal diameter of the tubular part 50 formed by extending the inner peripheral flange 23 of the lower resinous insulation bobbin 13 downward and the internal diameter of the horizontal flange part 55 provided at the lower end of the tubular part 54 formed by extending the outer peripheral flange 22 downward are made slightly greater than the external diameter of the motor rotor 11, respectively. The motor rotor 11 is configured so as to pass through the internal diameter of the tubular part 50 and the internal diameter of the horizontal flange part 55.

[0093] By adopting the above configuration, even if the tubular part 50 is provided integrally with the inner peripheral flange 23 or the outer peripheral flange 22 of the lower resinous insulation bobbin 13 on the motor stator 10 side or the horizontal flange part 55 is bent and formed at the lower end of the tubular part 54, the motor 9 can be easily incorporated so as not to hinder the insertion of the rotor 11 into the inner periphery of the stator 10. Therefore, ease of assembling, a simplified configuration, lower costs, and the like in the hermetic compressor 1 in which the motor stator 10 is provided with the oil agitation/lifting preventive cover 21A can be ensured.

[0094] The invention is not limited to the inventions related to the above embodiments and can be appropriately modified without departing from the scope of the invention. For example, in the above embodiments, the scroll compressor is used as the compressor 3. However, the type of the compressor 3 is not limited to the scroll compressor and may be any type.

[0095] The refrigerant and oil flow passages 28 and 53 consisting of the small holes 27 and 52 provided in the agitation/lifting preventive covers 21 and 21A may be constituted by cutouts or the like without being limited to the small holes 27 and 52, or the like.

[0096] It is needless to say that the claws 29, 32, 34, 37, and the like that detachably lock the agitation/lifting preventive cover 21 are not limited to the hooking claws of the above embodiments and can be changed into various shapes. The claws 29, 32, 34, and 37, the locking holes 24, 33, 35, and 38, and the like may be provided on the opposite sides of the agitation/lifting preventive cover 21 and the lower resinous insulation bobbin 13.

Reference Signs List

[0097]

- 1: HERMETIC COMPRESSOR
- 2: HOUSING
- 3: COMPRESSOR (SCROLL COMPRESSOR)

9: MOTOR
 10: STATOR
 11: ROTOR
 12, 13: RESINOUS INSULATION BOBBIN (13: LOWER RESINOUS INSULATION BOBBIN) 5
 14: COIL WINDING
 15: DRIVE SHAFT
 17: OIL FEED PUMP
 19: OIL FEED HOLE
 21, 21A: AGITATION/LIFTING PREVENTIVE COVER 10
 22: OUTER PERIPHERAL FLANGE
 23: INNER PERIPHERAL FLANGE
 24, 33, 35, 38: LOCKING HOLE
 26: THROUGH-HOLE 15
 28, 53: FLOW PASSAGE
 29, 32, 34, 37: HOOKING CLAW (CLAW)
 30, 31: CYLINDRICAL PART
 39: RIB
 40, 42, 43, 45: SCREW PART 20
 50, 54: TUBULAR PART
 51, 55: HORIZONTAL FLANGE PART

Claims

1. A hermetic compressor comprising:

a housing of a hermetically sealed structure;
 a compressor installed in an upper part within the housing;
 a motor that is installed within the housing in a lower part of the compressor and that drives the compressor via a drive shaft; and
 an oil feed pump that is provided at a lower end of the drive shaft and that feeds oil, which has been filled into the housing, to a sliding part of the compressor via an oil feed hole within the drive shaft,
 wherein the motor is a concentrated winding motor having a stator around which coil winding is wound in a concentrated fashion via resinous insulation bobbins, and
 wherein an oil agitation/lifting preventive cover is detachably or integrally provided to a lower resinous insulation bobbin. 45

2. The hermetic compressor according to Claim 1, wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably locked to an inner periphery or an outer periphery of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a plurality of claws and locking holes. 50

3. The hermetic compressor according to Claim 1, wherein the agitation/lifting preventive cover has the

drive shaft passed through a through-hole provided at a central part thereof, and is detachably press-fitted to an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a cylindrical part.

4. The hermetic compressor according to Claim 1, wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably screwed into an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a screw part.

5. The hermetic compressor according to any one of Claims 1 to 4, wherein the agitation/lifting preventive cover has an external diameter that is close-fitted to an inner peripheral surface of the housing and has a refrigerant and oil flow passage provided at an outer peripheral part thereof.

6. The hermetic compressor according to any one of Claims 1 to 4, wherein the agitation/lifting preventive cover has an external diameter equivalent to an outer peripheral flange diameter of the lower resinous insulation bobbin. 30

7. The hermetic compressor according to any one of Claims 1 to 4, wherein the agitation/lifting preventive cover has an external diameter equivalent to an inner peripheral flange diameter of the lower resinous insulation bobbin. 35

8. The hermetic compressor according to any one of Claims 1 to 7, wherein the agitation/lifting preventive cover is provided at a position lower than a position of the lower resinous insulation bobbin by a predetermined dimension in a lower space of the motor. 40

9. The hermetic compressor according to any one of Claims 1 to 8, wherein the agitation/lifting preventive cover includes a plurality of ribs in a radial direction on a surface thereof.

10. The hermetic compressor according to Claim 1, wherein the agitation/lifting preventive cover is configured integrally with the lower resinous insulation bobbin by forming a downwardly extending tubular part in any one of the inner peripheral flange or the outer peripheral flange of the lower resinous insulation bobbin. 55

11. The hermetic compressor according to Claim 10,
wherein the tubular part that constitutes the agitation/lifting preventive cover is configured such that an inner peripheral flange of the lower resinous insulation bobbin is extended downward, and includes an outwardly bent horizontal flange part, of which an outer periphery is brought into close contact with the inner peripheral surface of the housing, at a lower end thereof.
12. The hermetic compressor according to Claim 10,
wherein the tubular part that constitutes the agitation/lifting preventive cover is configured such that an outer peripheral flange of the lower resinous insulation bobbin is extended downward, and includes a horizontal flange part, which is bent to an inner peripheral side, at a lower end thereof.
13. The hermetic compressor according to any one of Claims 10 to 12,
wherein internal diameters of the tubular part and the horizontal flange part, which is bent to the inner peripheral side at the lower end thereof, are made larger than an external diameter of a rotor of the motor.

Amended claims under Art. 19.1 PCT

1. (Amended) A hermetically sealed electric compressor comprising:
- a housing of a hermetically sealed structure;
 - a compressor installed in an upper part within the housing;
 - a motor that is installed within the housing in a lower part of the compressor and that drives the compressor via a drive shaft; and
 - an oil feed pump that is provided at a lower end of the drive shaft and that feeds oil, which has been filled into the housing, to a sliding part of the compressor via an oil feed hole within the drive shaft,
 - wherein the motor is a concentrated winding motor having a stator around which coil winding is wound in a concentrated fashion via resinous insulation bobbins,
 - wherein an oil agitation/lifting preventive cover is provided to a lower resinous insulation bobbin,
 - wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably locked to an inner periphery or an outer periphery of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a plurality of claws and locking holes.

2. (Amended) A hermetically sealed electric compressor comprising:

- a housing of a hermetically sealed structure;
- a compressor installed in an upper part within the housing;
- a motor that is installed within the housing in a lower part of the compressor and that drives the compressor via a drive shaft; and
- an oil feed pump that is provided at a lower end of the drive shaft and that feeds oil, which has been filled into the housing, to a sliding part of the compressor via an oil feed hole within the drive shaft,
- wherein the motor is a concentrated winding motor having a stator around which coil winding is wound in a concentrated fashion via resinous insulation bobbins,
- wherein an oil agitation/lifting preventive cover is provided to a lower resinous insulation bobbin, and
- wherein the agitation/lifting preventive cover includes a plurality of ribs in a radial direction on a surface thereof.

3. (Amended) The hermetically sealed electric compressor according to Claim 2,
wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably locked to an inner periphery or an outer periphery of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a plurality of claws and locking holes.

4. (Amended) The hermetically sealed electric compressor according to Claim 2,
wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably press-fitted to an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a cylindrical part.

5. (Amended) The hermetically sealed electric compressor according to Claim 2,
wherein the agitation/lifting preventive cover has the drive shaft passed through a through-hole provided at a central part thereof, and is detachably screwed into an inner peripheral surface or an outer peripheral surface of any one of an inner peripheral flange or an outer peripheral flange of the lower resinous insulation bobbin via a screw part.

6. (Amended) The hermetically sealed electric compressor according to any one of Claims 1 to 5,
wherein the agitation/lifting preventive cover has an

external diameter that is close-fitted to an inner peripheral surface of the housing and has a refrigerant and oil flow passage provided at an outer peripheral part thereof.

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7. (Amended) The hermetically sealed electric compressor according to any one of Claims 1 to 5, wherein the agitation/lifting preventive cover has an external diameter equivalent to an outer peripheral flange diameter of the lower resinous insulation bobbin.

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8. (Amended) The hermetically sealed electric compressor according to any one of Claims 1 to 5, wherein the agitation/lifting preventive cover has an external diameter equivalent to an inner peripheral flange diameter of the lower resinous insulation bobbin.

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9. (Amended) The hermetically sealed electric compressor according to any one of Claims 1 to 8, wherein the agitation/lifting preventive cover is provided at a position lower than a position of the lower resinous insulation bobbin by a predetermined dimension in a lower space of the motor.

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10. (Amended) The hermetically sealed electric compressor according to Claim 1, wherein the agitation/lifting preventive cover includes a plurality of ribs in a radial direction on a surface thereof.

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11. (Amended) A hermetically sealed electric compressor comprising:

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a housing of a hermetically sealed structure;
a compressor installed in an upper part within the housing;

a motor that is installed within the housing in a lower part of the compressor and that drives the compressor via a drive shaft; and

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an oil feed pump that is provided at a lower end of the drive shaft and that feeds oil, which has been filled into the housing, to a sliding part of the compressor via an oil feed hole within the drive shaft,

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wherein the motor is a concentrated winding motor having a stator around which coil winding is wound in a concentrated fashion via resinous insulation bobbins,

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wherein an oil agitation/lifting preventive cover is being provided to a lower resinous insulation bobbin,

wherein the oil agitation/lifting preventive cover is provided at the lower resinous insulation bobbin by forming a downwardly extending tubular part at the inner peripheral flange of the lower resinous insulation bobbin, and

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wherein the tubular part that constitutes the agitation/lifting preventive cover is configured such that an inner peripheral flange of the lower resinous insulation bobbin is extended downward, and includes an outwardly bent horizontal flange part, which is bent to an inner peripheral surface of the housing, at a lower end thereof.

FIG. 1

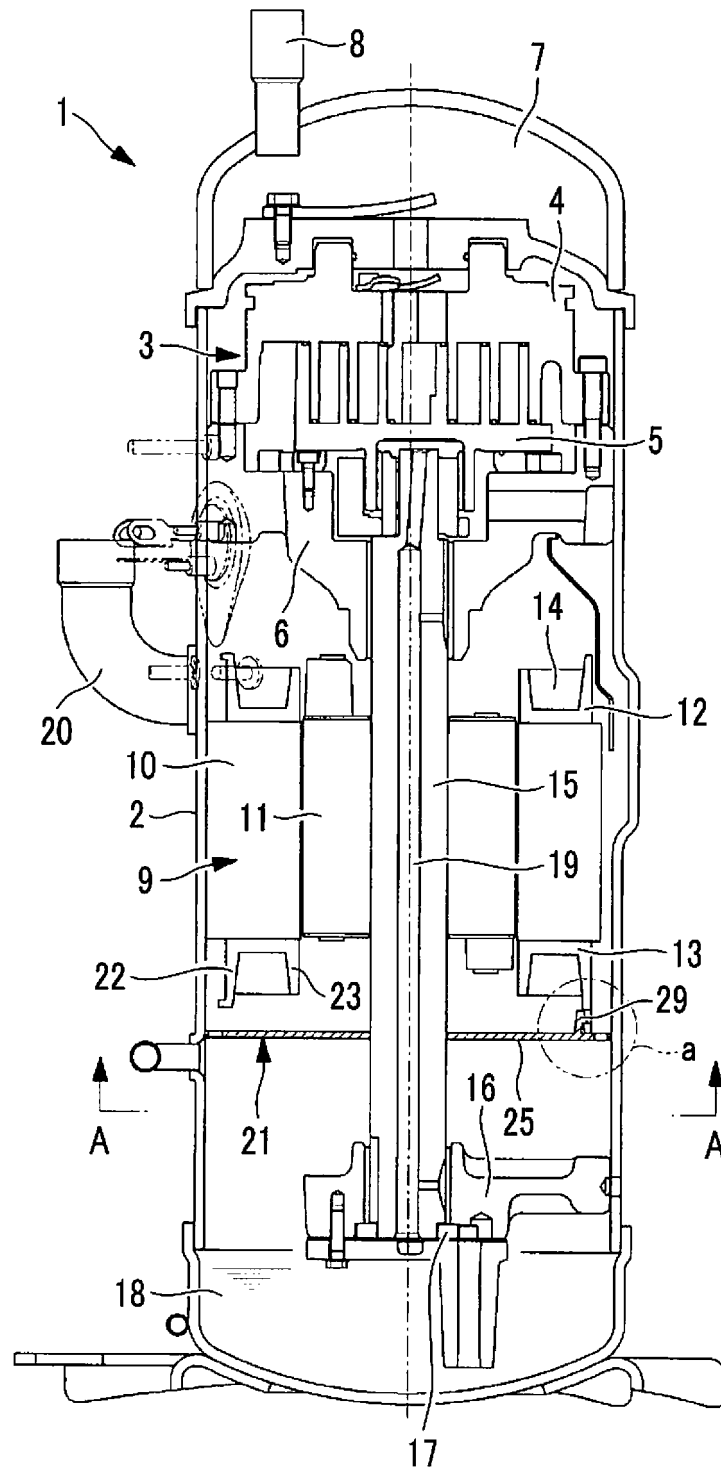


FIG. 2

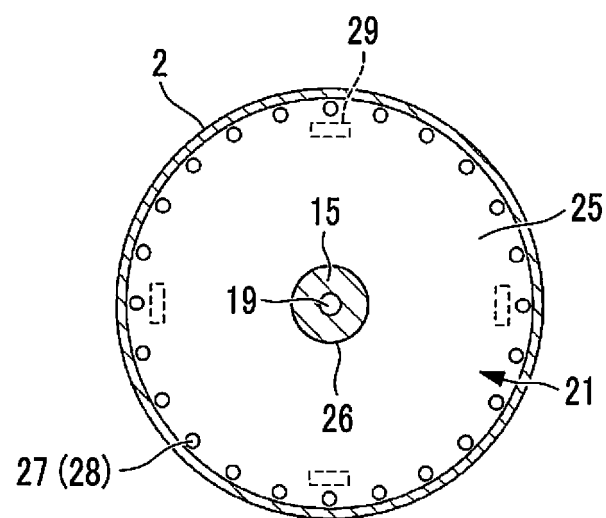


FIG. 3

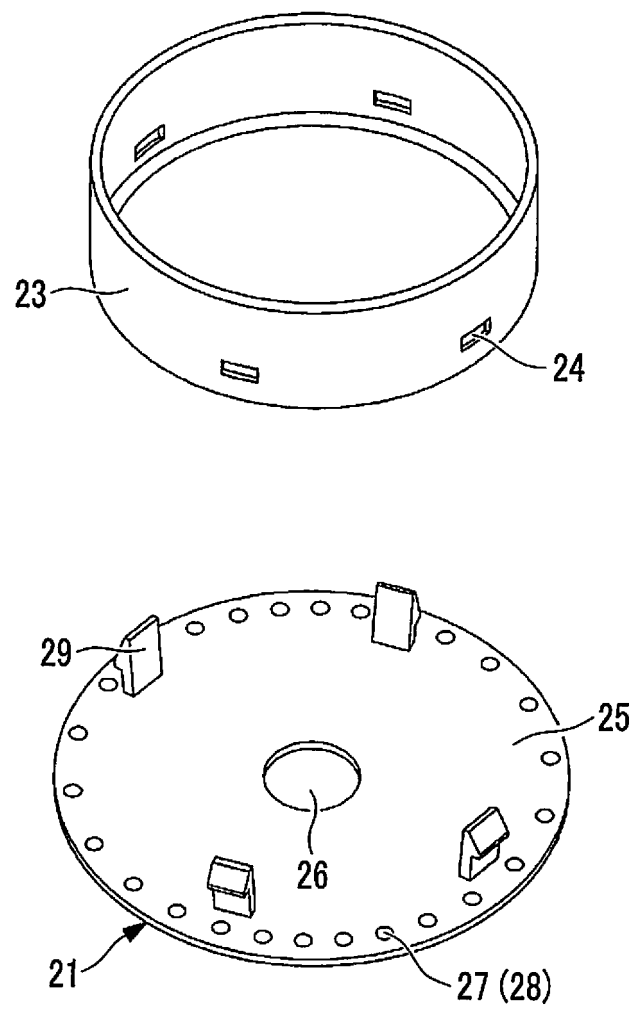


FIG. 4A

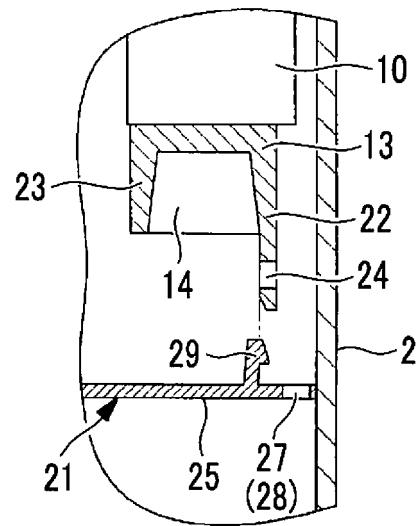


FIG. 4B

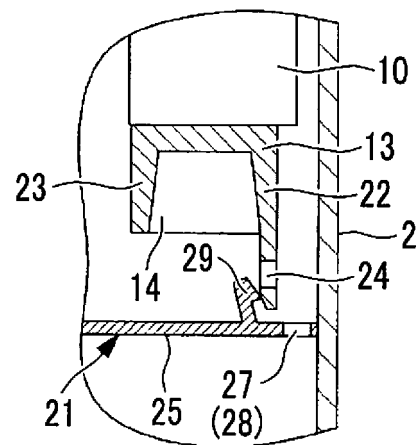


FIG. 4C

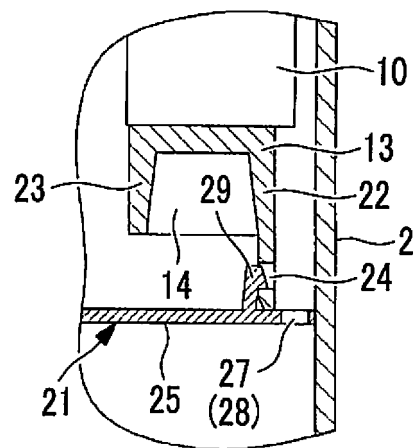


FIG. 5

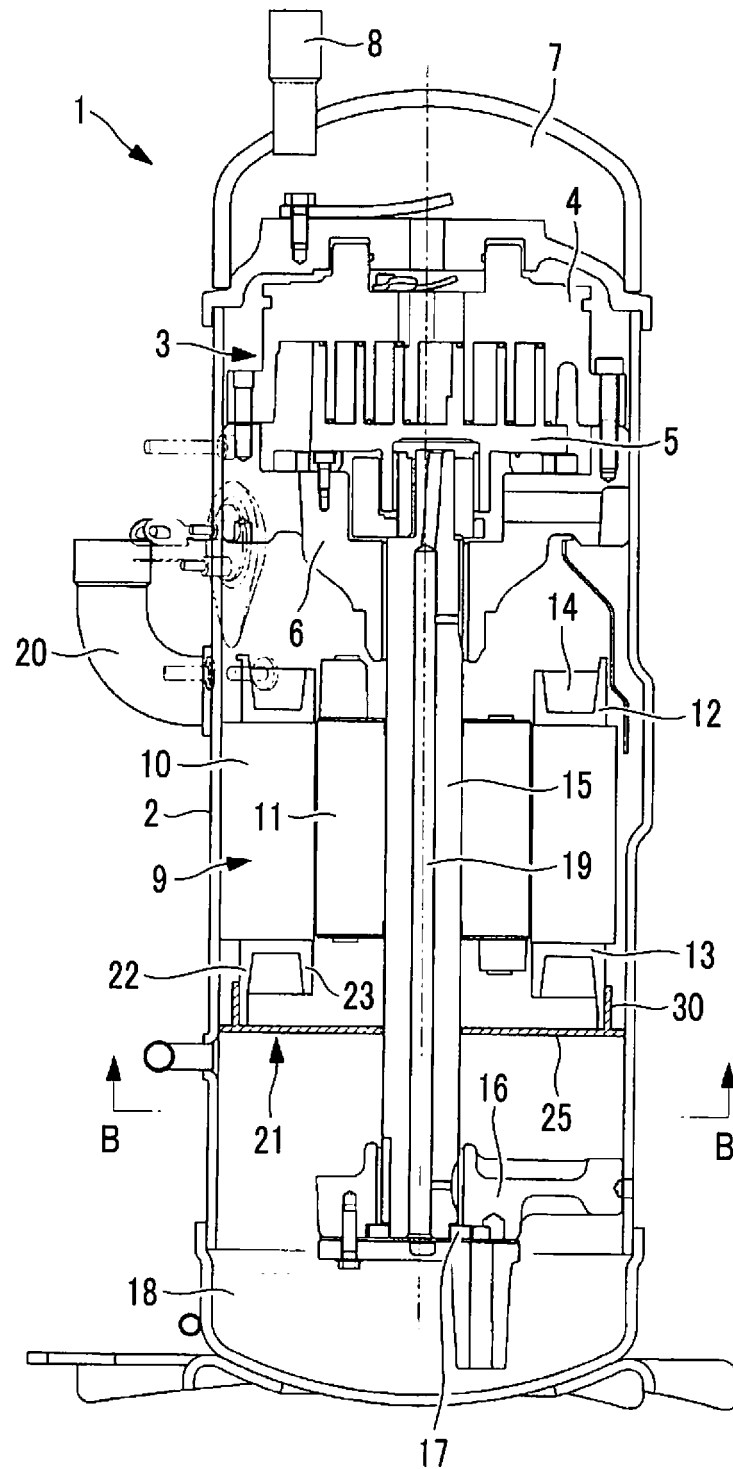


FIG. 6

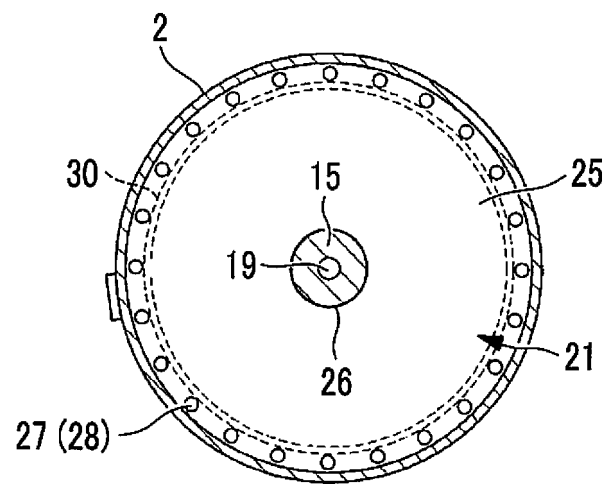


FIG. 7

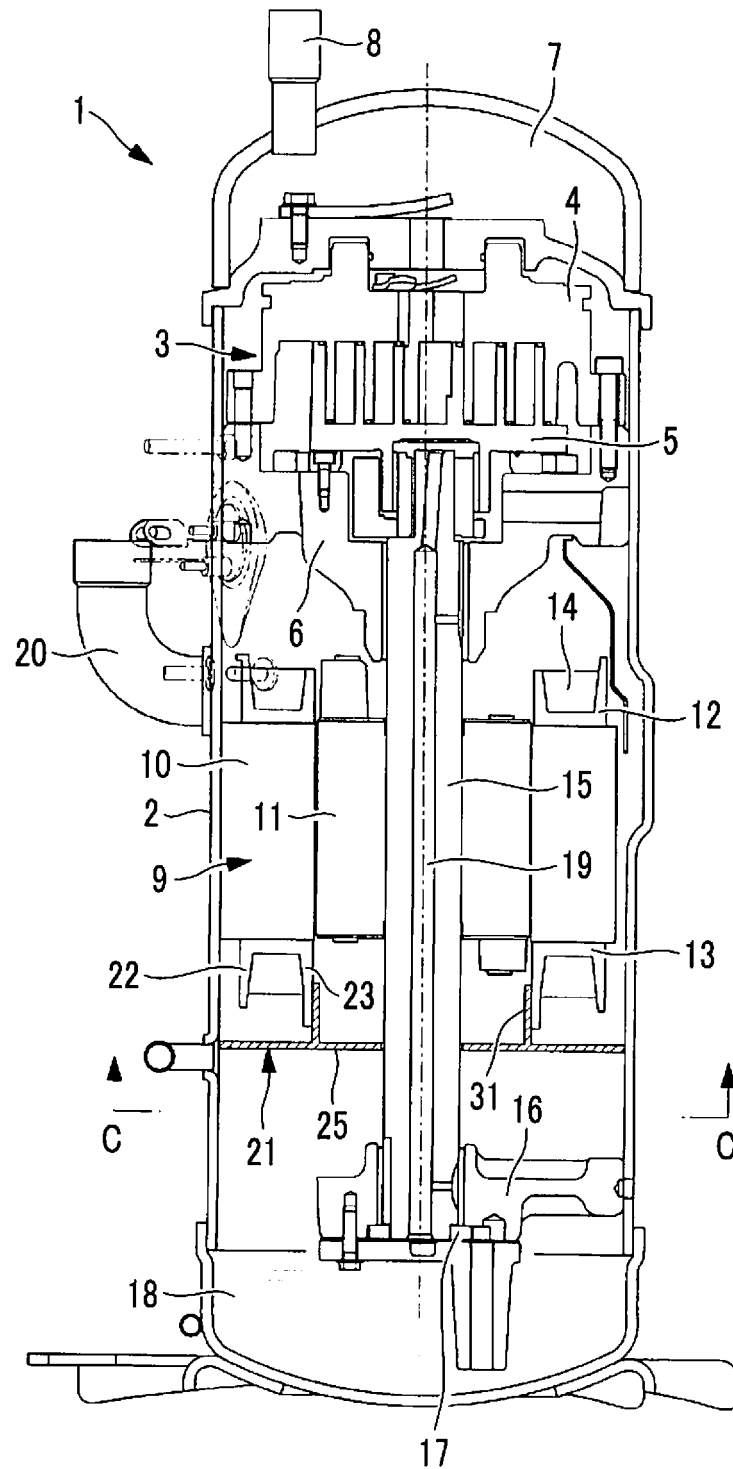


FIG. 8

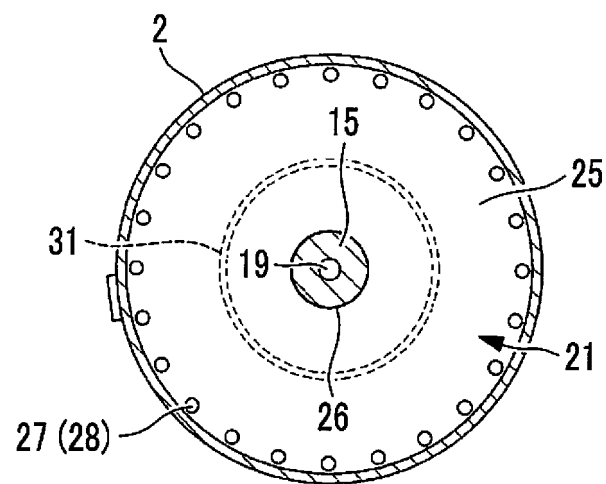


FIG. 9A

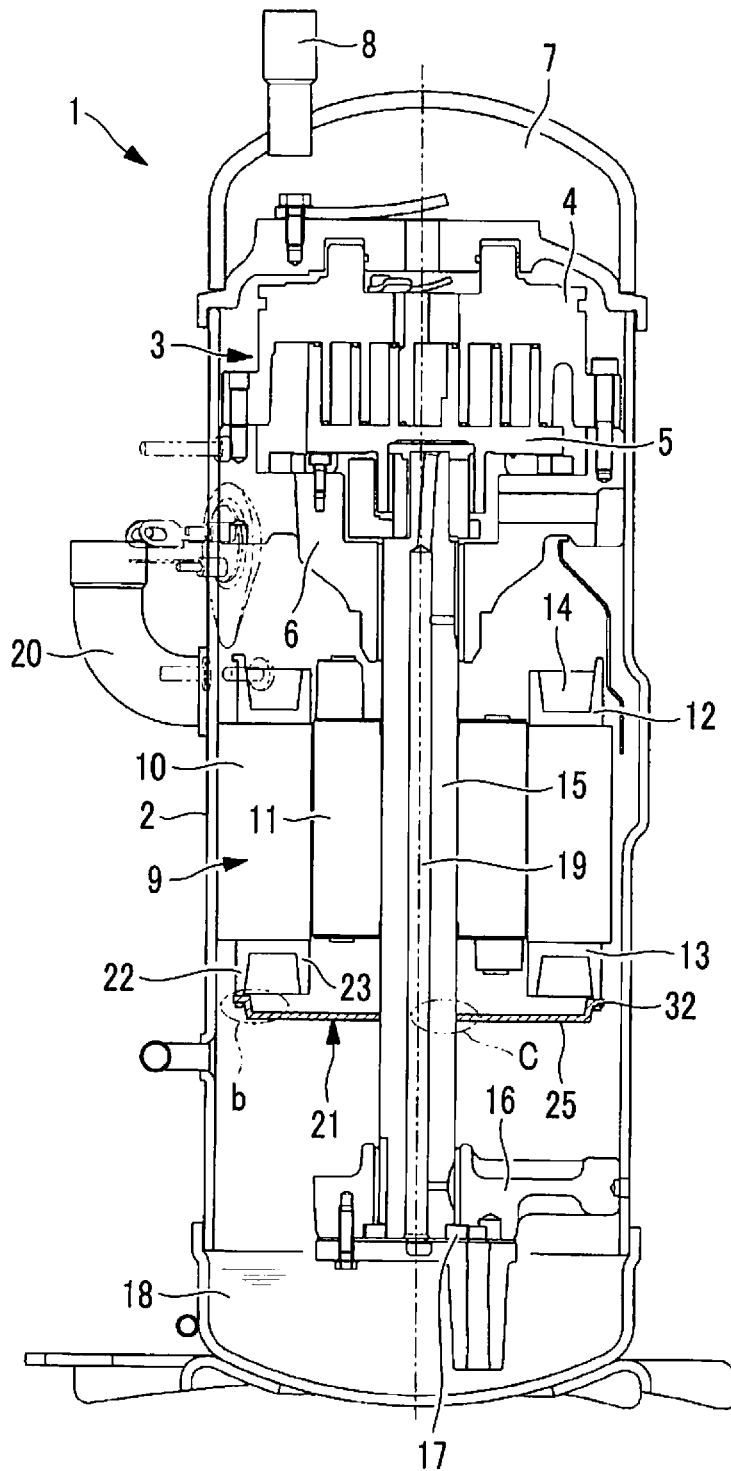


FIG. 9B

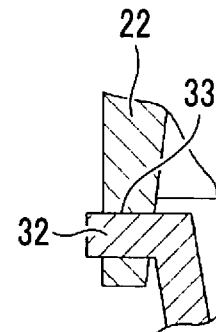


FIG. 9C

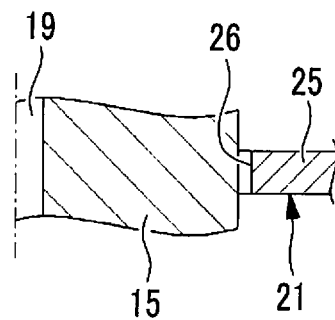


FIG. 10A

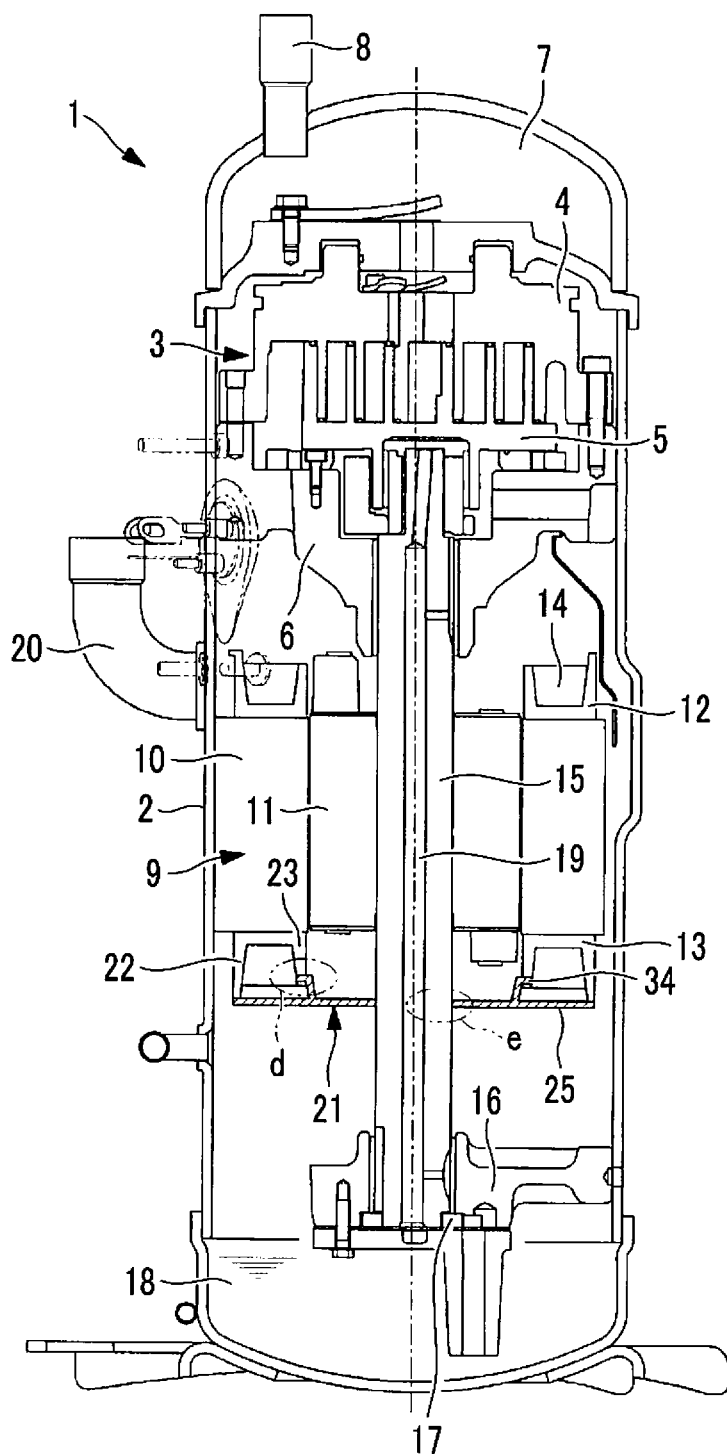


FIG. 10B

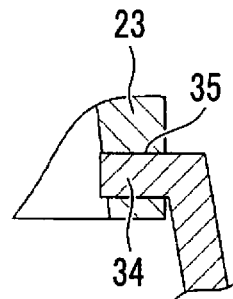


FIG. 10C

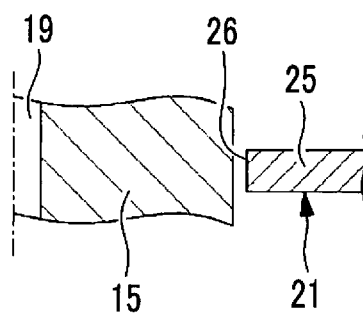


FIG. 11A

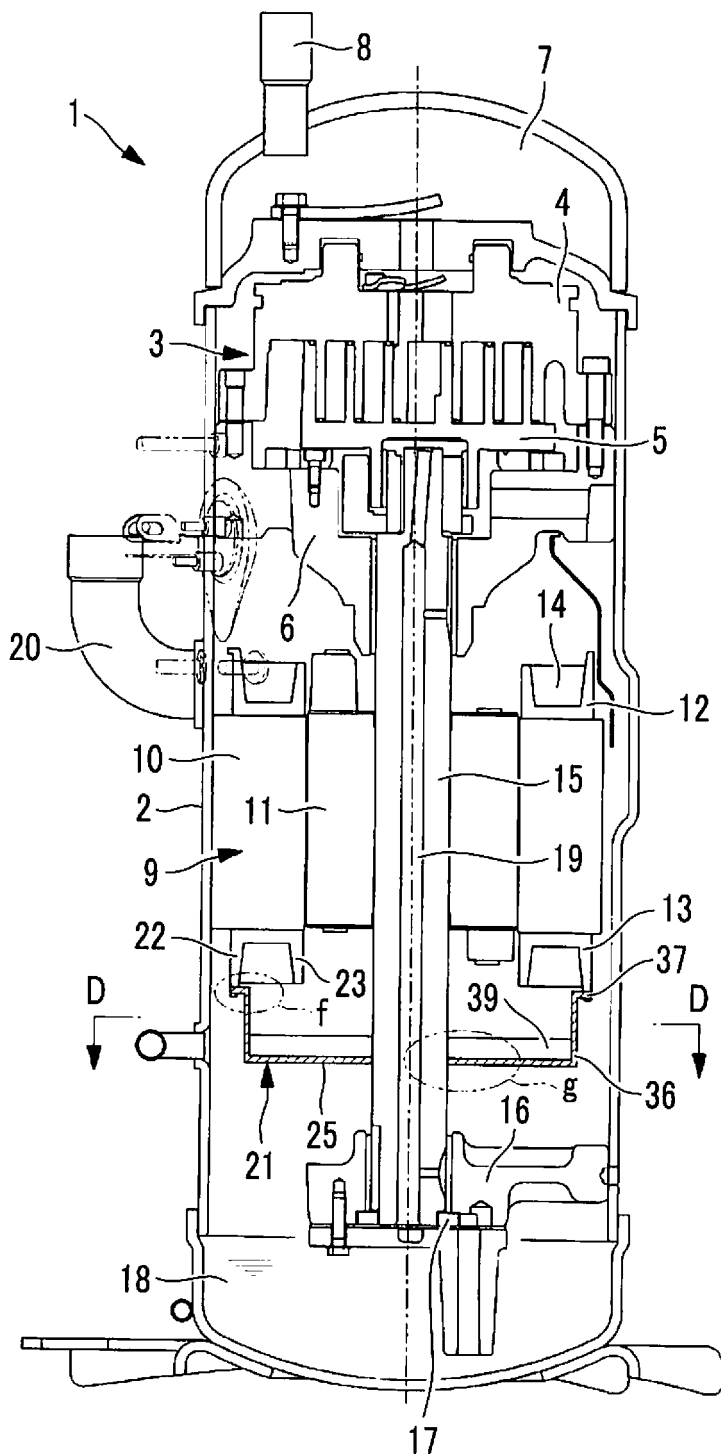


FIG. 11B

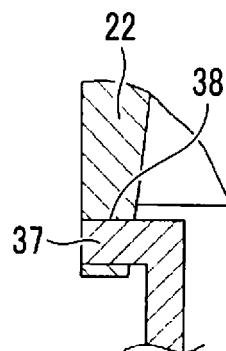


FIG. 11C

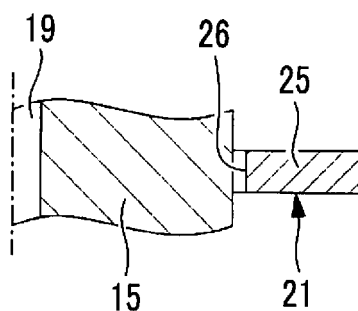


FIG. 12

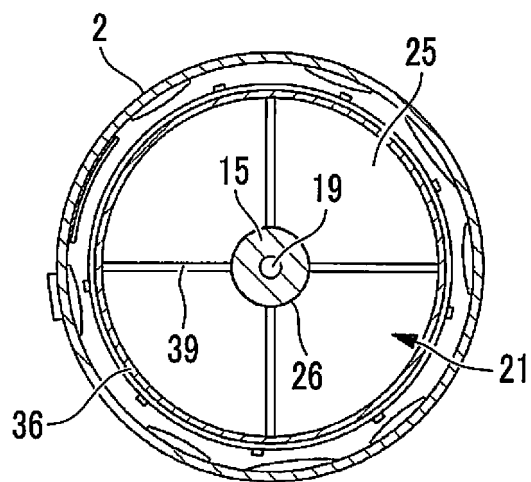


FIG. 13A

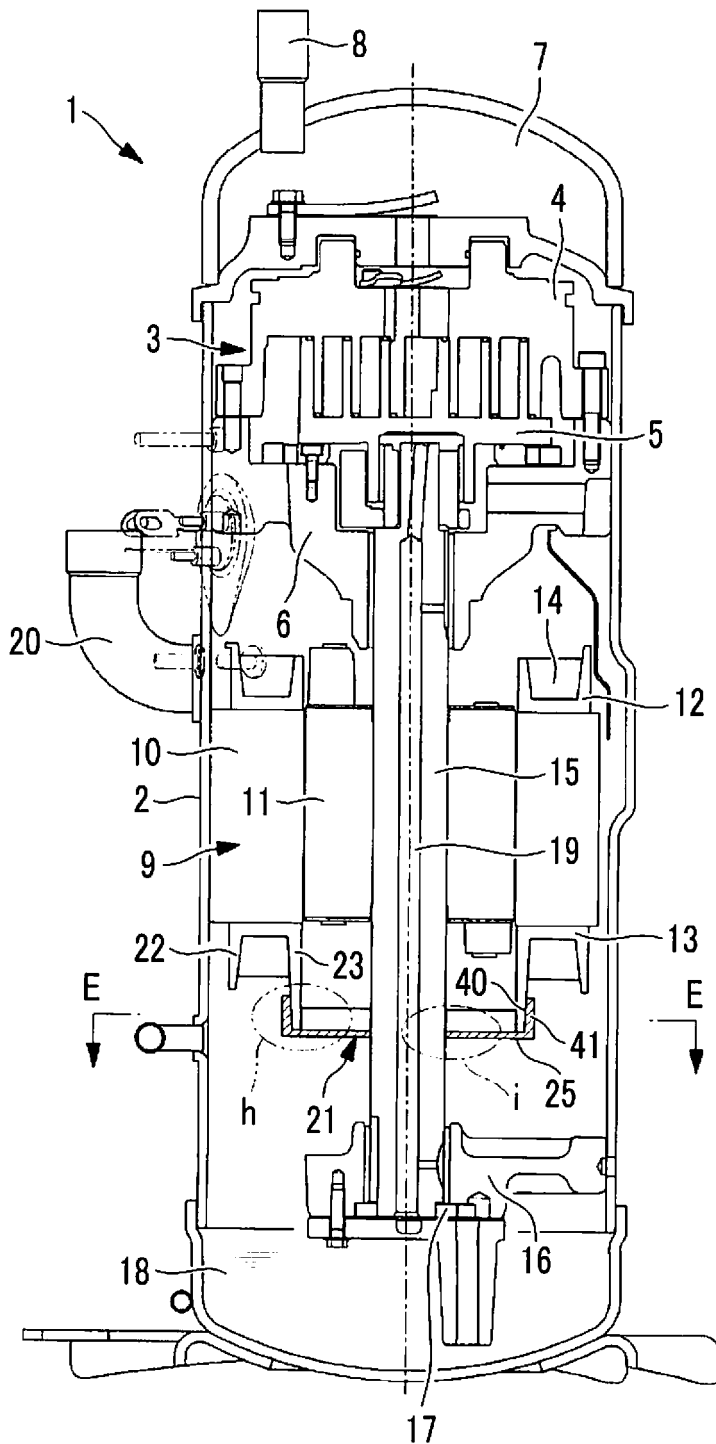


FIG. 13B

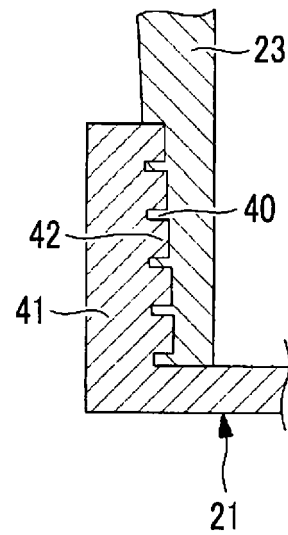


FIG. 13C

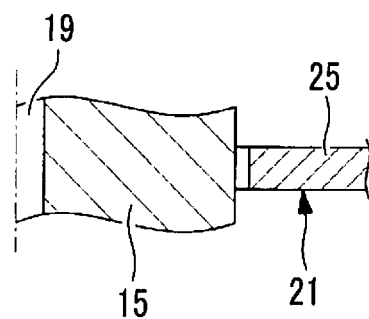


FIG. 14

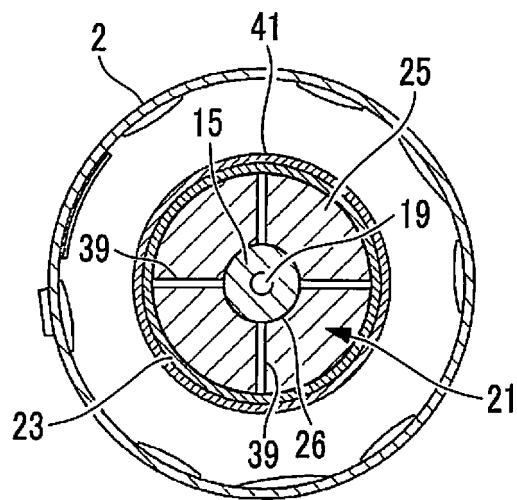


FIG. 15A

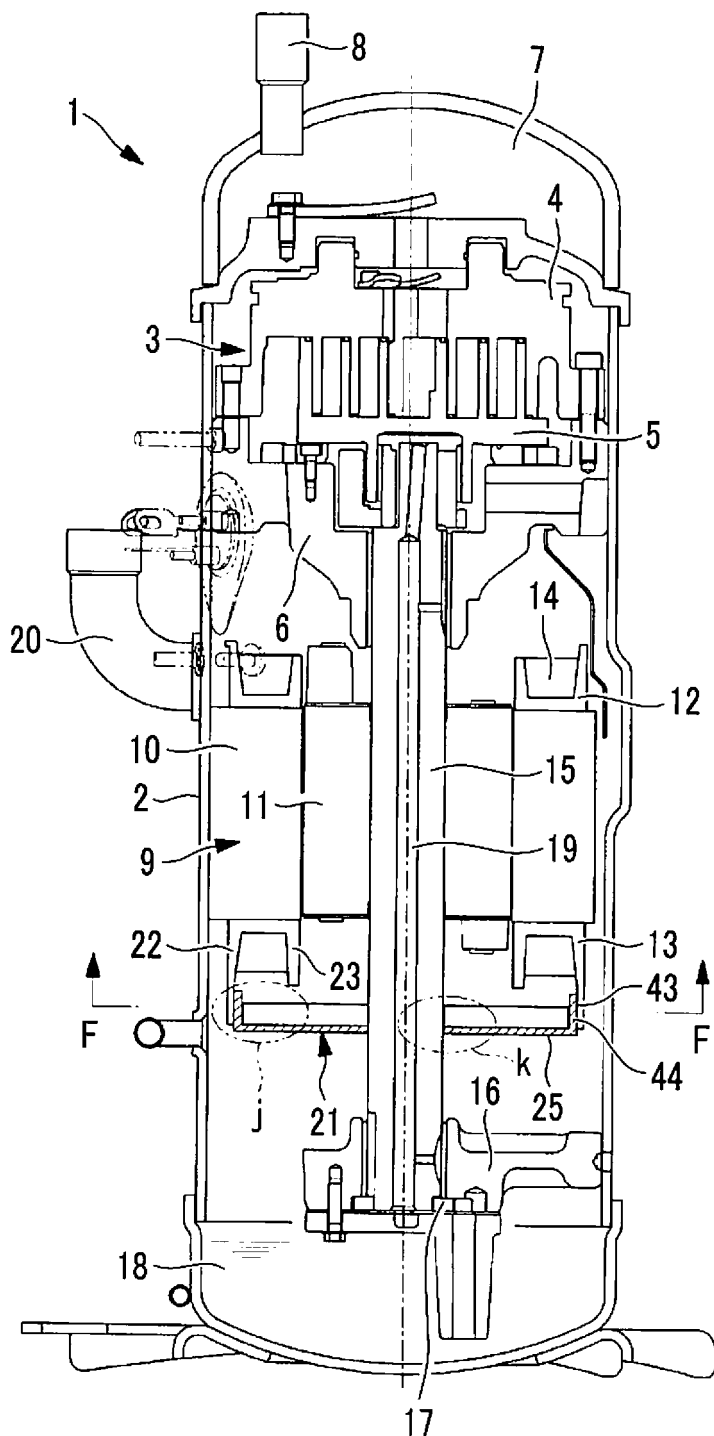


FIG. 15B

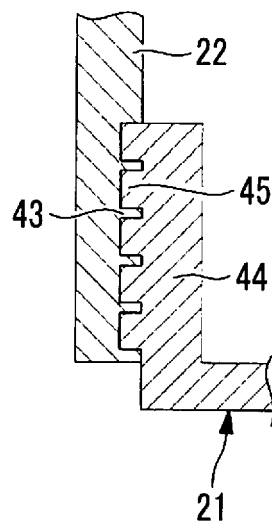


FIG. 15C

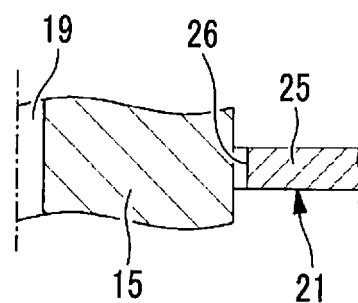


FIG. 16

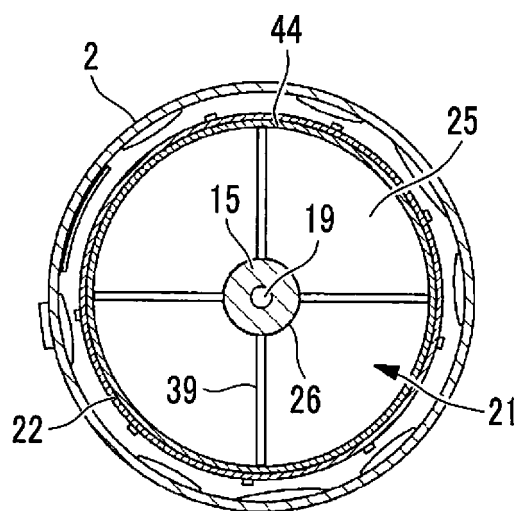


FIG. 17

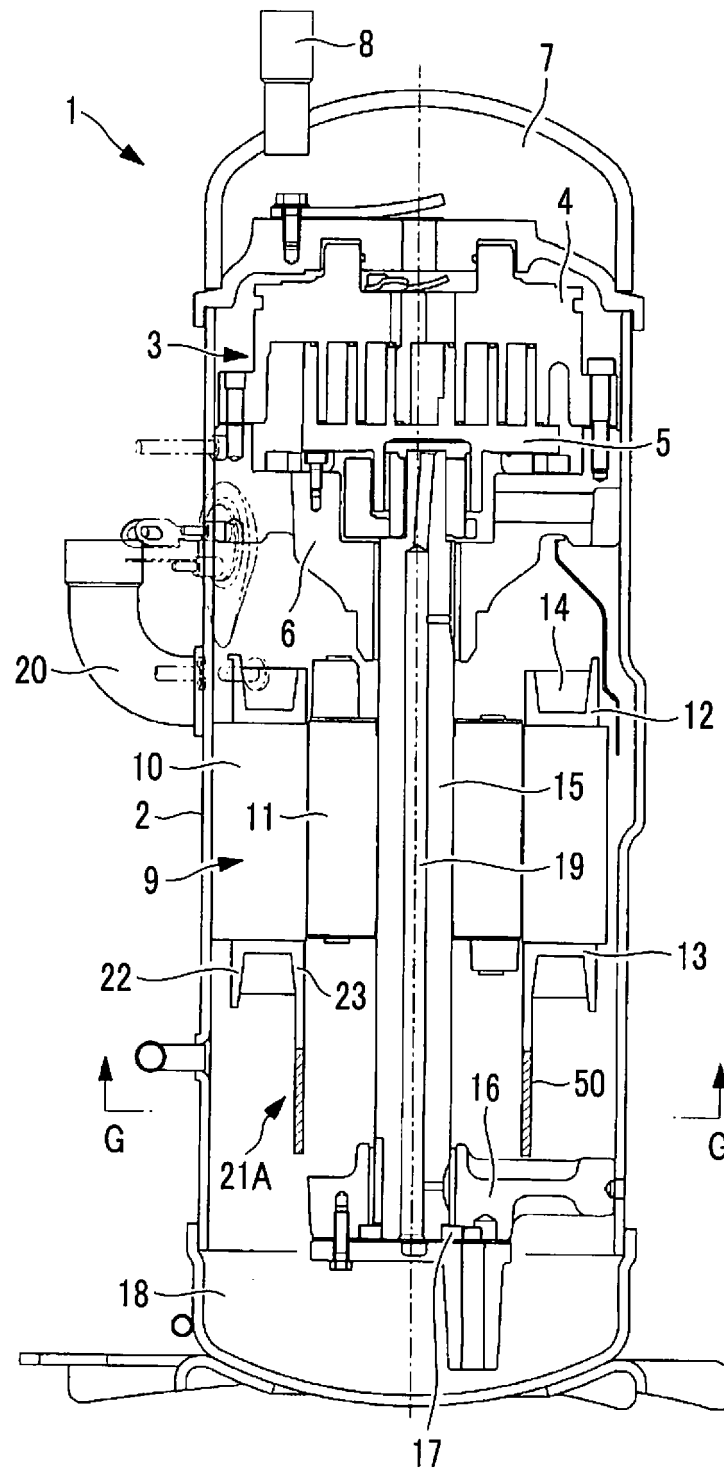


FIG. 18

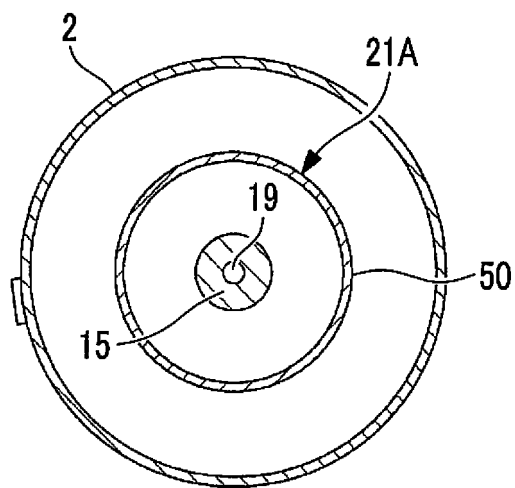


FIG. 19

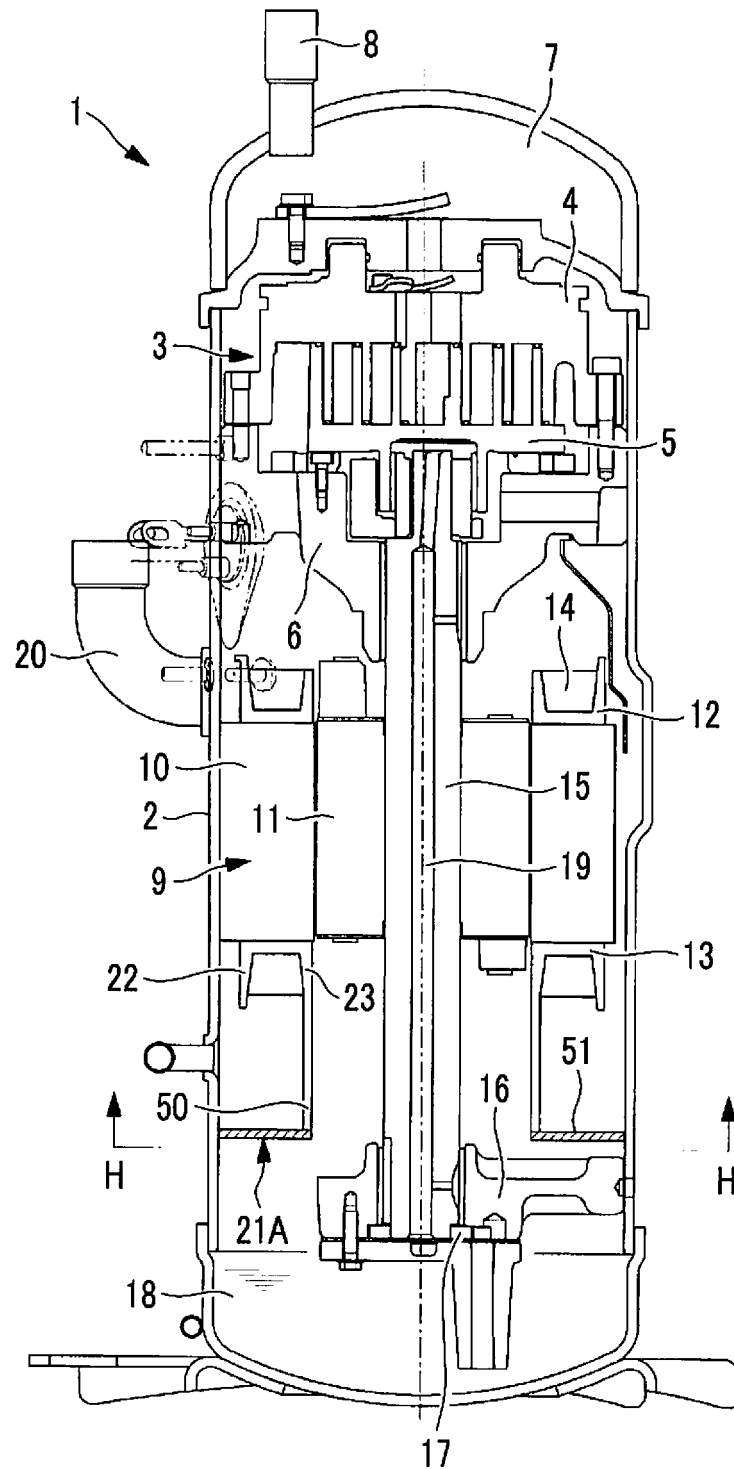


FIG. 20

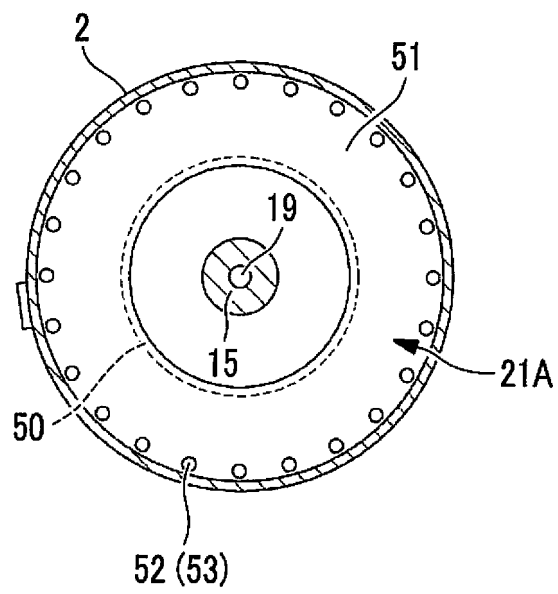


FIG. 21

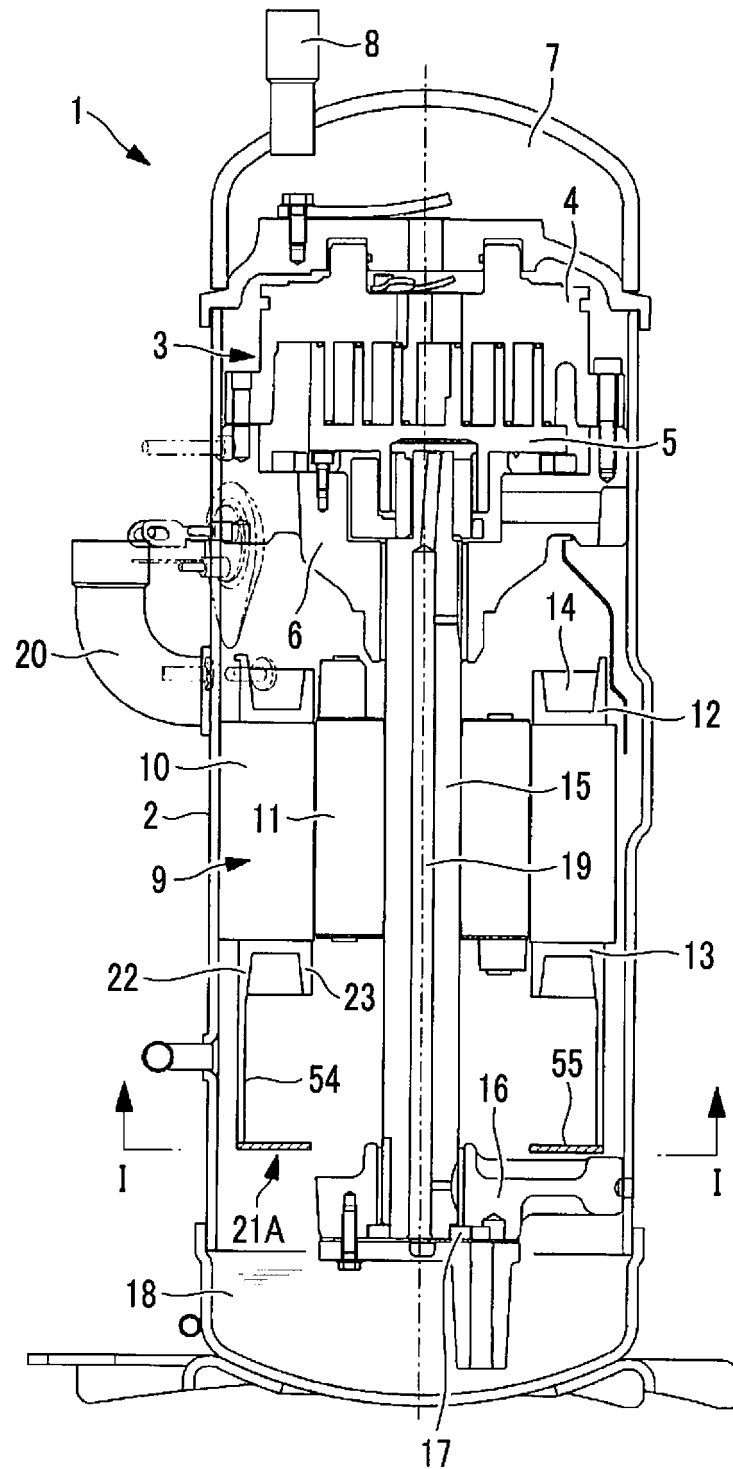
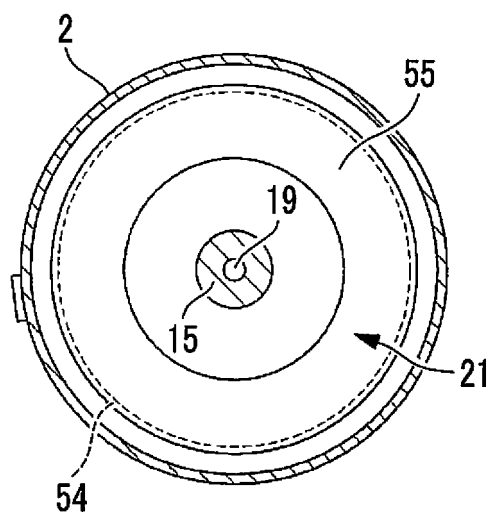


FIG. 22



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/053423

A. CLASSIFICATION OF SUBJECT MATTER

F04B39/04(2006.01)i, F04B39/02(2006.01)i, F04C29/02(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)

F04B39/04, F04B39/02, F04C29/02

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 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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 2012-87675 A (Mitsubishi Heavy Industries, Ltd.), 10 May 2012 (10.05.2012), paragraphs [0021] to [0022]; fig. 1 to 2 & US 2013/0057120 A1 paragraphs [0031] to [0032] & WO 2012/053347 A1 & EP 2631483 A1 & CN 102918270 A	1, 3-5, 8 2, 6-7, 9-13
Y	JP 4-365990 A (Hitachi, Ltd.), 17 December 1992 (17.12.1992), paragraph [0018] (Family: none)	1, 3-5, 8

☒ 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
18 April 2016 (18.04.16)Date of mailing of the international search report
17 May 2016 (17.05.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/053423

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 2007-9789 A (Denso Corp.), 18 January 2007 (18.01.2007), paragraphs [0050] to [0051], [0072] to [0073]; fig. 2, 7 (Family: none)	1, 3-5, 8
Y	JP 2008-95520 A (Sanden Corp.), 24 April 2008 (24.04.2008), paragraphs [0017] to [0019]; fig. 1 to 2 (Family: none)	1, 3-4, 6-8, 10, 12-13 2, 5, 9, 11
Y	JP 2004-270668 A (Matsushita Electric Industrial Co., Ltd.), 30 September 2004 (30.09.2004), paragraphs [0031], [0034], [0036]; fig. 3 & WO 2004/081384 A1 & CN 1697928 A	1, 3-4, 6, 8, 10, 12
Y	JP 2013-50079 A (Sanyo Electric Co., Ltd.), 14 March 2013 (14.03.2013), paragraphs [0028] to [0029]; fig. 1 & US 2013/0052068 A1 paragraphs [0040] to [0041] & EP 2565458 A1 & CN 102966549 A	1, 3-4, 7-8, 10, 13

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006336545 A [0004]
- JP 4654774 B [0004]
- JP 2010038058 A [0004]
- JP 2010121583 A [0004]