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(54) **COMPRESSOR AND METHOD OF DESIGNING COMPRESSOR**
VERDICHTER UND VERFAHREN ZUR KONSTRUKTION EINES VERDICHTERS
COMPRESSEUR ET PROCÉDÉ DE CONCEPTION DE COMPRESSEUR

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**EP-A2- 2 275 685** **KR-A- 20150 067 657**



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# Description

## BACKGROUND OF THE INVENTION

### Field of the Invention

**[0001]** The present invention relates to a compressor and a method of designing a compressor.

### Description of Related Art

**[0002]** Compressors such as a scroll compressor configured to send a working fluid such as a refrigerant under pressure using a rotational motion of a scroll are known. In a scroll compressor, a refrigerant compressed using a scroll is periodically discharged to a discharge space in response to a rotational period of the scroll (for example, refer to Japanese Unexamined Patent Application, First Publication No. 2001-336484). The discharge space is a space surrounded by a housing or a cover of the compressor, and a compressed refrigerant is discharged to another system through a discharge pipe provided in the cover.
EP2275685 discloses a vacuum pump for vehicles.
KR20150067657 discloses an electro vacuum pump to reduce the noise.

## SUMMARY OF THE INVENTION

**[0003]** In such compressors, pressure pulsation occurs when a refrigerant is periodically discharged to a discharge space through a discharge port of a scroll. When such pressure pulsation coincides with a natural frequency of the discharge space, resonance may occur in some cases. In a compressor in the related art, the cover vibrates due to such resonance so that noise may occur.

**[0004]** The present invention aims at providing a compressor capable of reducing noise at a cover due to resonance in a compressor configured to periodically compress and discharge a fluid to a discharge space.

**[0005]** According to a first aspect of the present invention, a compressor according to claim 1 is provided.

**[0006]** With such a constitution, reinforcing parts are formed at the cover so that vibrations of the cover which occur due to resonance occurring in response to the periodically discharged fluid and the discharge space can be minimized.

**[0007]** In the above-described compressor, the reinforcing parts may extend in a circumferential direction with respect to the center of the cover main body.

**[0008]** In the above-described compressor, the cover main body has a polygonal pyramid shape having a top part protruding in the axial direction, and the reinforcing parts are oblique ridges of the cover main body.

**[0009]** According to a second aspect of the present invention, a method of designing a compressor includes: a compressor designing step of designing the compressor including a compressor main body including a rotary shaft rotatably driven and configured to periodically compress and discharge a fluid using rotation of the rotary shaft and a cover defining a discharge space into which the fluid discharged from the compressor main body is introduced; a resonance mode measuring step of measuring a resonance mode occurring in the discharge space using a compressor model modeled on the basis of the compressor designed in the compressor designing step; and a reinforcing part designing step of designing a plurality of reinforcing parts, the plurality of reinforcing parts being provided on at least one of an outer surface and an inner surface of the cover to pass through antinodes of the resonance mode on the basis of the resonance mode measured in the resonance mode measuring step and extending along at least one of the outer surface and the inner surface of the cover.

**[0010]** According to the present invention, reinforcing parts are formed at a cover so that vibrations of the cover which occur due to resonance occurring in response to periodically discharged fluid and a discharge space can be minimized.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]**

FIG. 1 is a cross-sectional view of a scroll compressor of an example of the present invention, which does not fall within the scope of the claims.
FIG. 2 is a perspective view of an upper cover of the scroll compressor of the example of the present invention.
FIG. 3 is a schematic diagram illustrating a resonance mode of a discharge chamber of the scroll compressor of the example of the present invention.
FIG. 4 is a perspective view of an upper cover of a scroll compressor of a first modified example of the present invention.
FIG. 5 is a perspective view of an upper cover of a scroll compressor of a second modified example of the present invention.
FIG. 6 is a perspective view of an upper cover of a scroll compressor of an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

[Example of the invention, which does not fall within the scope of the claims]

**[0012]** Hereinafter, a compressor of an example of the present invention will be described in detail with reference to the drawings. The compressor of this example is a scroll compressor in which a turning scroll performs a turning motion, a compression chamber volume is decreased as a compression chamber formed between the turning scroll and a fixed scroll is moved to a central portion, and thus a compression action is performed. The scroll compressor of this example is used for a refrigeration cycle and a working fluid is a refrigerant.

**[0013]** As shown in FIG. 1, a scroll compressor 1 has an electric motor 3, a rotary shaft 2 rotatably driven about an axis O1 by the electric motor 3, a compressor main body 4 configured to compress and discharge a refrigerant using rotation of the rotary shaft 2, a housing 5 accommodating the rotary shaft 2, the electric motor 3, and the compressor main body 4, an upper cover 6 closing one end at first side D1 in an axial direction of the housing 5, and a lower cover 7 closing the second side D2 in the axial direction of the housing 5.

**[0014]** Note that, in the following description, a direction in which the axis O1 of the rotary shaft 2 extends is an axial direction D. Furthermore, a direction perpendicular to the axis O1 is a radial direction, a side away from the axis O1 in the radial direction is referred to as an outer side in the radial direction, and a side close to the axis O1 in the radial direction is referred to as an inner side in the radial direction. An upper side in FIG. 1 in the axial direction D is referred to as a first side D1 in the axial direction and a lower side in FIG. 1 in the axial direction D is referred to as a second side D2 in the axial direction.

**[0015]** The compressor main body 4 compresses the refrigerant using rotational energy of the rotary shaft 2 and discharges the compressed refrigerant in a high pressure state to an outside thereof.

**[0016]** The compressor main body 4 has a fixed scroll 17 and a turning scroll 18. A discharge cover 8 is a substantially disc-shaped member that partitions a space inside the housing 5 in the axial direction D. A discharge chamber 15 (a discharge space) is a space formed by the discharge cover 8 and the upper cover 6. The discharge chamber 15 is the space into which the refrigerant discharged from the compressor main body 4 is introduced. A discharge port 20 through which the compressed refrigerant flows to the discharge chamber 15 and a discharge valve 21 configured to prevent reversely flowing of the refrigerant from a high pressure side are provided at a central portion of the discharge cover 8.

**[0017]** Note that, although the discharge chamber 15 of this example is formed of the upper cover 6 and the discharge cover 8, the present invention is not limited thereto. For example, the discharge chamber 15 may be formed of the upper cover 6 and a surface of the fixed scroll 17 which faces the first side D1 in the axial direction and may be formed by only the upper cover 6.

**[0018]** A suction pipe 9 configured to suction the refrigerant from an outside thereof is provided on the housing 5. A discharge pipe 10 configured to discharge the compressed refrigerant inside the discharge chamber 15 after being compressed by the compressor main body 4 is provided on the upper cover 6.

**[0019]** The rotary shaft 2 has a cylindrical shape about the axis O1. The rotary shaft 2 is rotatably supported inside the housing 5 by a main bearing 11 provided at the first side D1 in the axial direction and a sub bearing 13 provided at the second side D2 in the axial direction. A main bearing main body 12 is attached between the main bearing 11 and an outer peripheral surface of the rotary shaft 2. A sub bearing main body 14 is attached between the sub bearing 13 and the outer peripheral surface of the rotary shaft 2.

**[0020]** At an end portion of the rotary shaft 2 at the first side D1 in the axial direction, an eccentric shaft 16 having a columnar shape about an eccentric axis O2 different from the axis O1 is provided at a position which is offset (eccentric) with respect to the axis O1. The eccentric axis O2 is parallel to the axis O1. The eccentric shaft 16 has a cylindrical shape which protrudes from an end portion of the rotary shaft 2 toward the first side D1 in the axial direction. Therefore, the eccentric shaft 16 revolves about the axis O1 of the rotary shaft 2 in a state in which the rotary shaft 2 rotates about the axis O1.

**[0021]** The fixed scroll 17 is a substantially discoid member fixed inside the housing 5. The turning scroll 18 faces the fixed scroll 17 from the axial direction D and thus a compression chamber C is formed between both scrolls.

**[0022]** The fixed scroll 17 is a fixed end plate 25 having a disc shape and a fixed wrap 26 standing up in the axial direction D from a surface of the fixed end plate 25 at the second side D2 thereof in the axial direction. The fixed end plate 25 extends along a surface which is substantially perpendicular to the axis O1. The fixed wrap 26 is a wall body which is spirally formed when viewed from the axial direction D. The fixed wrap 26 is formed of plate-like members being wound about a center of the fixed end plate 25. The fixed wrap 26 is preferably constituted to form an involute curve about the axis O1 when viewed from the axial direction D.

**[0023]** An outer peripheral wall 27 extending in a tubular shape along an outer circumference of the fixed end plate 25 is formed at the outer side of the fixed wrap 26 in the radial direction. An annular flange part 28 widening outward in the radial direction is provided at an edge of the outer peripheral wall 27 at the second side D2 in the axial direction. The fixed scroll 17 is fixed to the main bearing 11 using bolts or the like via the flange part 28. A fixed scroll discharge port 29 is formed at a central portion of a spiral of the fixed scroll 17.

**[0024]** The turning scroll 18 has a turning end plate 23 having a disc shape and a spiral turning wrap 31 provided at a surface of the turning end plate 23 at the first side D1 in the axial direction. The turning wrap 31 is also preferably constituted to form an involute curve about the axis O1.

**[0025]** The turning wrap 31 and the fixed wrap 26 are disposed to face each other from the axial direction D and to overlap each other in a direction crossing the axis O1. In other words, the fixed wrap 26 is engaged with the turning wrap 31. A predetermined space is formed between the fixed wrap 26 and the turning wrap 31 in such an engaged state. A volume of the space is changed according to the turning of the turning wrap 31. Thus, the refrigerant can be compressed.

**[0026]** A boss part 30 having a cylindrical shape is formed at a surface of the turning end plate 23 at the second side D2 in the axial direction. A central axis of the boss part 30 is coaxial with the eccentric axis O2. The eccentric shaft 16 formed on the rotary shaft 2 is fit into a space inside the boss part 30 via a dry bush 32 from the axial direction D. A turning bearing 33 is attached between the dry bush 32 and the boss part 30.

**[0027]** An Oldham ring 22 configured to restrict rotation of the turning scroll 18 (rotation about the eccentric axis O2) is provided at the main bearing 11. A protrusion formed on the Oldham ring 22 is fitted into a groove formed in the turning end plate 23 of the turning scroll 18. A thrust bearing 24 is provided at the inner side of the Oldham ring 22 in the radial direction when viewed from the Oldham ring 22. The thrust bearing 24 supports a load in the axial direction D due to the turning scroll 18.

**[0028]** The upper cover 6 of this embodiment will be described.

**[0029]** As shown in Fig. 2, the upper cover 6 has an upper cover main body 34 forming the discharge chamber 15 (refer to Fig. 1) and reinforcing parts 37 (ribs) provided on an outer surface 34a of the upper cover main body 34. The upper cover main body 34 has a circular shape when viewed from the axial direction D and forms part of the discharge chamber 15.

**[0030]** The upper cover main body 34 has a cylindrical part 35 with a cylindrical shape and a dome part 36 configured to block the first side D1 of the cylindrical part 35 in the axial direction. The dome part 36 has a spherical shape. The dome part 36 is smoothly connected to the cylindrical part 35.

**[0031]** The plurality of reinforcing parts 37 extending along the outer surface 34a of the upper cover main body 34 are formed on the outer surface 34a of the upper cover main body 34. The reinforcing parts 37 radially extend from a center T1 of the upper cover main body 34. A center T1 of the upper cover 6 is a point at which the axis O1 crosses the upper cover 6.

**[0032]** The plurality of reinforcing parts 37 are formed at intervals in a circumferential direction. The plurality of reinforcing parts 37 are preferably formed at equal intervals in the circumferential direction. The reinforcing parts 37 are protrusions protruding from the outer surface 34a of the upper cover main body 34. The reinforcing parts 37 have a function of reinforcing the upper cover main body 34.

**[0033]** Next, a method of designing the scroll compressor 1 of this example will be described.

**[0034]** The method of designing the scroll compressor 1 has a compressor designing step, a resonance mode measuring step, and a reinforcing part designing step.

**[0035]** The compressor designing step is a step of designing a scroll compressor on the basis of a required performance or specification or the like. A designer performs selection (design) of an electric motor, design of a scroll, and design of shapes or the like of a housing and an upper cover. Thus, a specification of an electric motor and a shape of a discharge chamber or the like are determined.

**[0036]** The resonance mode measuring step is a step of performing a simulation on a computer using a compressor model (an analysis model) modeled on the basis of the scroll compressor designed in the compressor designing step and measuring a resonance mode (an acoustic eigenvalue and acoustic characteristics) occurring in a discharge chamber.

**[0037]** To be specific, first, a compressor model which can be input to the computer is created on the basis of the designed scroll compressor. Subsequently, a behavior of the compressor model is simulated on the computer using analysis software or the like.

**[0038]** Here, an operation of the scroll compressor 1 will be described. The refrigerant compressed in the compressor main body 4 (a scroll) is periodically discharged from the fixed scroll discharge port 29 of the fixed scroll 17. The refrigerant that has passed through the fixed scroll discharge port 29 passes through a space between the fixed scroll 17 and the discharge cover 8. The refrigerant passes through the discharge port 20 of the discharge cover 8, enters into the discharge chamber 15 defined by the upper cover 6, and is discharged through the discharge pipe 10.

**[0039]** When the refrigerant flows through such a route, pressure pulsation occurs by the periodical discharge of the refrigerant into the discharge chamber 15 (the discharge space) through the discharge valve 21. If such pressure pulsation coincides with a natural frequency of the discharge chamber 15, resonance occurs. The upper cover 6 vibrates due to such resonance.

**[0040]** FIG. 3 illustrates a resonance mode of the discharge chamber 15 measured through a simulation. Furthermore, a resonance frequency is specified through the simulation. In the case of the scroll compressor 1 of this embodiment, the resonance frequency is 4 kHz to 5 kHz.

**[0041]** In FIG. 3, symbols + indicate positions at which a pressure is high due to resonance, symbols - indicate positions at which the pressure is low due to the resonance, and these positions are antinodes of a resonance mode.

**[0042]** The resonance mode is not limited to a case shown in FIG. 3 and changes in accordance with a shape or the like of the discharge chamber 15. For example, intervals of the antinodes of the resonance mode in a circumferential direction change in accordance with a rotational speed or the like of the rotary shaft 2.

**[0043]** In the reinforcing part designing step, the reinforcing parts 37 are designed on the outer surface 34a of the upper cover main body 34 on the basis of positions of the antinodes of the resonance mode measured in the resonance mode measuring step. To be specific, the reinforcing parts 37 are designed to pass through the antinodes of the resonance mode.

**[0044]** According to the above-described examples even when the positions corresponding to the antinodes of the resonance mode at the upper cover 6 vibrate due to the resonance, the reinforcing parts 37 can suppress vibration of the upper cover 6. In other words, the positions corresponding to the antinodes of the resonance mode are reinforced using the reinforcing parts 37 so that noise due to vibrations can be reduced.

**[0045]** Note that shapes of the reinforcing parts 37 are not limited to this and may be shapes in which the reinforcing parts 37 are provided on at least one of the outer surface 34a and an inner surface of the upper cover main body 34 and extend along at least one of the outer surface 34a and the inner surface thereof to reinforce the positions corresponding to the antinodes of the resonance mode.

**[0046]** For example, as in reinforcing parts 37B of a first modified example shown in FIG. 4, the reinforcing parts 37B may extend in the circumferential direction to pass through the antinodes of the resonance mode. To be specific, the reinforcing parts 37B of the first modified example of this embodiment are a plurality of annular reinforcing parts which are concentrically formed. At least in part of the reinforcing parts 37B are formed to pass through the antinodes of the resonance mode.

**[0047]** According to this modified example, even if the antinodes of the resonance mode are moved in the circumferential direction, vibrations can be minimized.

**[0048]** Also, as in reinforcing parts of a second modified example shown in FIG. 5, reinforcing parts 37 extending in the radial direction and annular reinforcing parts 37B extending in the circumferential direction may be combined.

**[0049]** According to this modified example, rigidity of the upper cover main body 34 can be further improved.

**[0050]** Also, the above-described examples have a constitution in which peripheries of the reinforcing parts 37 are reinforced by the reinforcing parts 37, but may have a constitution in which sites corresponding to the antinodes of the resonance mode are relatively reinforced compared with other sites by forming concave grooves extending in the radial direction at portions (nodes of the resonance mode) between the neighboring antinodes of the resonance mode.

**[0051]** The upper cover 6 obtained by integrating the upper cover main body 34 and the reinforcing parts 37 may be manufactured through casting and the upper cover 6 obtained by integrating the upper cover main body 34 and the reinforcing parts 37 may be cut through cutting.

**[0052]** The upper cover main body 34 and the reinforcing parts 37 may be separately formed and be joined through welding or the like.

**[0053]** The reinforcing parts 37 are not limited to the outer surface 34a of the upper cover 6 (the surface facing the first side D1 in the axial direction) and may be formed at an inner surface of the upper cover 6. However, since a shape of the discharge chamber 15 is changed when the reinforcing parts 37 are formed at the inner surface of the upper cover 6, this is not preferable.

**[0054]** Also, positions of the reinforcing parts 37 may be determined through measurement using an actual device without performing analysis.

[Embodiment of the invention]

**[0055]** Hereinafter, a compressor of an embodiment of the present invention will be described in detail with reference to the drawings. Note that, in the embodiment, description is provided focusing on differences from the above-described examples and descriptions of the same parts will be omitted.

**[0056]** An upper cover 6B of the compressor of the embodiment has a polygonal pyramid shape having a top part T2 protruding toward the first side D1 in the axial direction. In other words, as shown in FIG. 6, the upper cover 6B may be formed of a tubular part 35B of which a cross-sectional shape has a dodecagon shape and a dodecagonal-pyramid-shaped dome part 36B.

**[0057]** In the case of such a shape, a strength of oblique ridges 39 (ridgelines) of the dodecagonal-pyramid-shaped dome part 36B is higher than a strength of lateral surfaces 40. Thus, positions of the oblique ridges 39 correspond to antinodes of a resonance mode, and therefore, vibrations can be minimized. In other words, the oblique ridges 39 of the dodecagonal-pyramid-shaped dome part 36B are reinforcing parts of this embodiment. The upper cover 6B with such a shape can be manufactured using sheet metal press processing.

**[0058]** Although the embodiment of the present invention has been described in detail above, various changes can be made without departing from the scope of the appended claims.

**[0059]** For example, the scroll compressor is adopted as the compressor in the above-described embodiments; however, it may be adapted to a compressor including a rotary shaft rotatably driven, a compressor main body configured to periodically compress and discharge a fluid using rotation of a rotary shaft, and a cover having a discharge space, into which the fluid discharged from the compressor main body is introduced. The present invention can also be applied to a swash-plate-type compressor, and a rotary compressor as the compressor.

**[0060]** While preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

**Claims**

1. A compressor (1) comprising:

    a rotary shaft (2) rotatably driven;
    a compressor main body (4) configured to periodically compress and discharge a fluid using rotation of the rotary shaft (2); and
    a cover (6) provided with a cover main body (34) having a discharge space into which the fluid discharged from the compressor main body (4) is introduced, and a plurality of reinforcing parts (37) provided on at least one of an outer surface and an inner surface of the cover main body (34) and extending along at least one of the outer surface and the inner surface thereof;
    an electric motor (3) configured to rotatably drive the rotary shaft (2) about an axis; and
    a housing (5) having a cylindrical shape along the axis and accommodating the electric motor (3), the rotary shaft (2), and the compressor main body (4), wherein
    the cover (6) is an upper cover configured to close one end of the housing (5),
    the compressor being **characterized in that** the cover main body (34) has a polygonal pyramid shape having a top part protruding in the axial direction, and
    the plurality of reinforcing parts (37) are oblique ridges of the cover main body (34).

2. The compressor (1) according to Claim 1, wherein the plurality of reinforcing parts (37) extend in a circumferential direction with respect to the center of the cover main body (34).

3. A method of designing a compressor (1) comprising:

    a compressor designing step of designing the compressor (1) including a compressor main body (4) including a rotary shaft (2) rotatably driven and configured to periodically compress and discharge a fluid using rotation of the rotary shaft (2) and a cover (6) defining a discharge space into which the fluid discharged from the compressor main body (4) is introduced;
    a resonance mode measuring step of measuring a resonance mode occurring in the discharge space using a compressor model modeled on the basis of the compressor (1) designed in the compressor designing step; and
    a reinforcing part designing step of designing a plurality of reinforcing parts (37), the plurality of reinforcing parts (37) being provided on at least one of an outer surface and an inner surface of the cover (6) to pass through antinodes of the resonance mode on the basis of the resonance mode measured in the resonance mode measuring step and extending along at least one of the outer surface and the inner surface of the cover (6).

**Patentansprüche**

1. Verdichter (1), der Folgendes umfasst:

    eine Drehwelle (2), die drehbar angetrieben wird;
    einen Verdichterhauptkörper (4), der dazu ausgelegt ist, mittels Drehung der Drehwelle (2) ein Fluid periodisch zu verdichten und auszugeben; und
    eine Abdeckung (6), die mit einem Abdeckungshauptkörper (34) versehen ist, der einen Ausgaberaum, in den das aus dem Verdichterhauptkörper (4) ausgegebene Fluid eingeleitet wird, und eine Vielzahl von Verstärkungsteilen (37), die auf mindestens einer von einer Außenfläche und einer Innenfläche des Abdeckungshauptkörpers (34) bereitgestellt sind und sich entlang von mindestens einer der Außenfläche und der Innenfläche davon erstrecken, aufweist;
    einen Elektromotor (3), der dazu ausgelegt ist, die Drehwelle (2) drehbar um eine Achse zu drehen; und
    ein Gehäuse (5), das eine zylindrische Form entlang der Achse aufweist und in dem der Elektromotor (3), die Drehwelle (2) und der Verdichterhauptkörper (4) untergebracht sind, wobei
    die Abdeckung (6) eine obere Abdeckung ist, die dazu ausgelegt ist, ein Ende des Gehäuses (5) zu schließen,
    wobei der Verdichter **dadurch gekennzeichnet ist, dass** der Abdeckungshauptkörper (34) eine polygonale Pyramidenform aufweist, von der ein oberer Teil in der Axialrichtung vorsteht, und
    die Vielzahl von Verstärkungsteilen (37) schräge Erhöhungen des Abdeckungshauptkörpers (34) sind.

2. Verdichter (1) nach Anspruch 1, wobei sich die Vielzahl von Verstärkungsteilen (37) mit Bezug auf die Mitte des Abdeckungshauptkörpers (34) in eine Umfangsrichtung erstrecken.

3. Verfahren zum Konstruieren eines Verdichters (1), das Folgendes umfasst:

    einen Verdichterkonstruktionsschritt zum Konstruieren des Verdichters (1), der einen Verdichterhauptkörper (4), der eine Drehwelle (2) beinhaltet, die drehbar angetrieben wird und dazu ausgelegt ist, mittels Drehung der Drehwelle (2) ein Fluid periodisch zu verdichten und auszugeben, und eine Abdeckung (6), die einen

Ausgaberaum definiert, in den das vom Verdichterhauptkörper (4) ausgegebene Fluid eingeleitet wird, beinhaltet;
einen Resonanzmodusmessschritt zum Messen eines Resonanzmodus, der im Ausgaberaum auftritt, unter Verwendung eines Verdichtermodells, das auf Basis des Verdichters (1), der im Verdichterkonstruktionsschritt konstruiert wird, modelliert ist; und
einen Verstärkungsteilkonstruktionsschritt zum Konstruieren einer Vielzahl von Verstärkungsteilen (37), wobei die Vielzahl von Verstärkungsteilen (37) auf mindestens einer von einer Außenfläche und einer Innenfläche der Abdeckung (6) bereitgestellt sind, um auf Basis des Resonanzmodus, der im Resonanzmodusmessschritt gemessen wird, durch Schwingungsbäuche des Resonanzmodus zu verlaufen, und sich entlang von mindestens einer der Außenfläche und der Innenfläche der Abdeckung (6) erstrecken.

**Revendications**

**1.** Compresseur (1) comprenant :

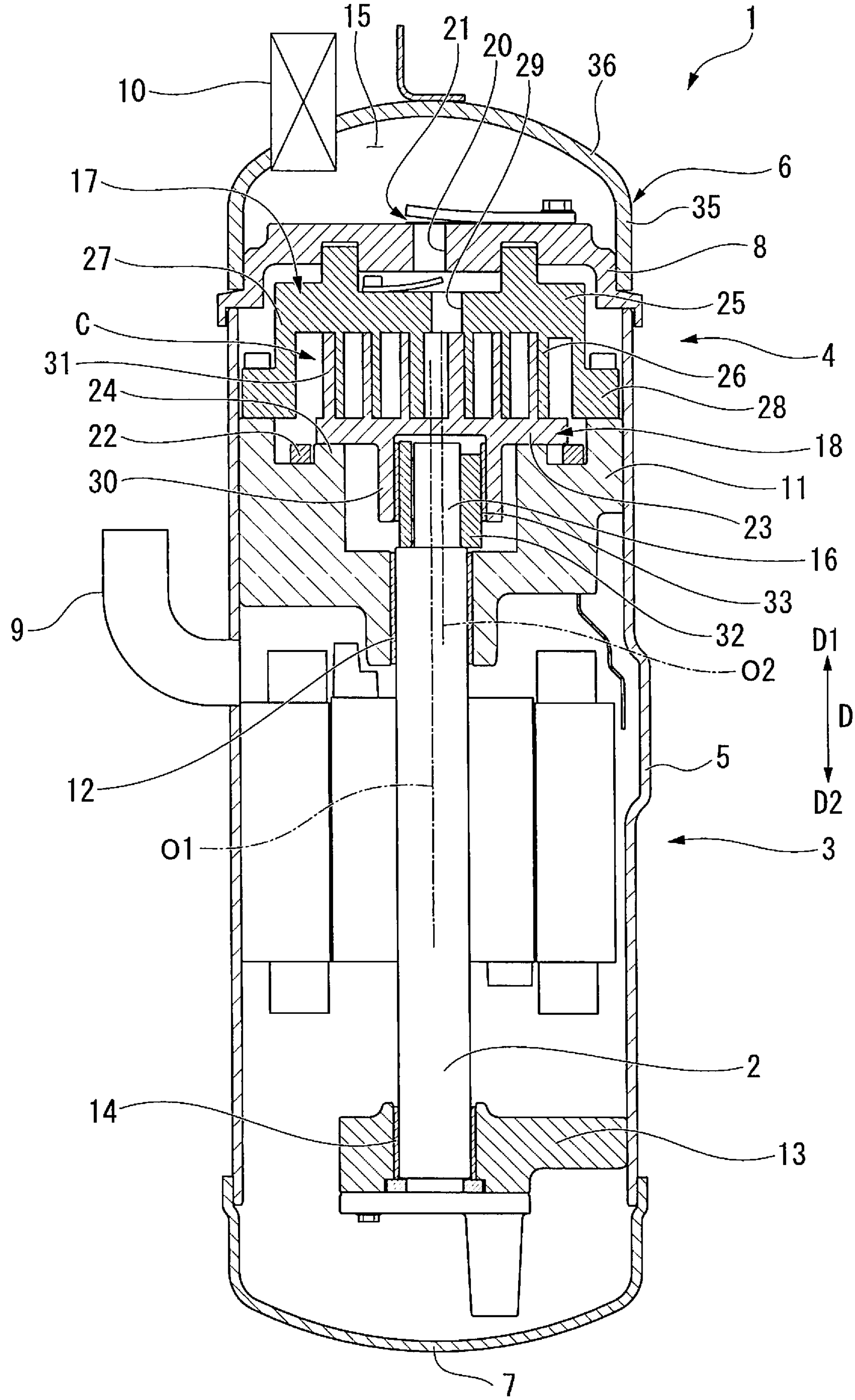
un arbre rotatif (2) entraîné en rotation ;
un corps principal de compresseur (4) configuré pour comprimer et décharger périodiquement un fluide en utilisant la rotation de l'arbre rotatif (2) ; et
un couvercle (6) pourvu d'un corps principal de couvercle (34) ayant un espace de décharge dans lequel est introduit le fluide déchargé du corps principal de compresseur (4), et d'une pluralité de parties de renforcement (37) prévues sur au moins l'une parmi une surface externe et une surface interne du corps principal de couvercle (34), et s'étendant le long d'au moins l'une parmi la surface externe et la surface interne de celui-ci ;
un moteur électrique (3) configuré pour entraîner en rotation l'arbre rotatif (2) autour d'un axe ; et
un logement (5) ayant une forme cylindrique le long de l'axe et logeant le moteur électrique (3), l'arbre rotatif (2), et le corps principal de compresseur (4), dans lequel
le couvercle (6) est un couvercle supérieur configuré pour fermer une extrémité du logement (5),
le compresseur étant **caractérisé en ce que** le corps principal de couvercle (34) a une forme pyramidale polygonale dont une partie en haut fait saillie dans la direction axiale, et
la pluralité de parties de renforcement (37) sont des arêtes obliques du corps principal de couvercle (34).

**2.** Compresseur (1) selon la revendication 1, dans lequel
la pluralité de parties de renforcement (37) s'étendent dans une direction circonférentielle par rapport au centre du corps principal de couvercle (34).

**3.** Procédé de conception d'un compresseur (1) comprenant :

une étape de conception de compresseur consistant à concevoir le compresseur (1) comportant un corps principal de compresseur (4) comportant un arbre rotatif (2) entraîné en rotation et configuré pour comprimer et décharger périodiquement un fluide en utilisant la rotation de l'arbre rotatif (2), et un couvercle (6) définissant un espace de décharge dans lequel est introduit le fluide déchargé du corps principal de compresseur (4) ;
une étape de mesure de mode de résonance consistant à mesurer un mode de résonance se produisant dans l'espace de décharge, en utilisant un modèle de compresseur modélisé sur la base du compresseur (1) conçu à l'étape de conception de compresseur ; et
une étape de conception de parties de renforcement consistant à concevoir une pluralité de parties de renforcement (37), la pluralité de parties de renforcement (37) étant prévues sur au moins l'une parmi une surface externe et une surface interne du couvercle (6), pour passer par des antinœuds du mode de résonance sur la base du mode de résonance mesuré à l'étape de mesure de mode de résonance, et s'étendant le long d'au moins l'une parmi la surface externe et la surface interne du couvercle (6).

FIG. 1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D2
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O2

FIG. 2

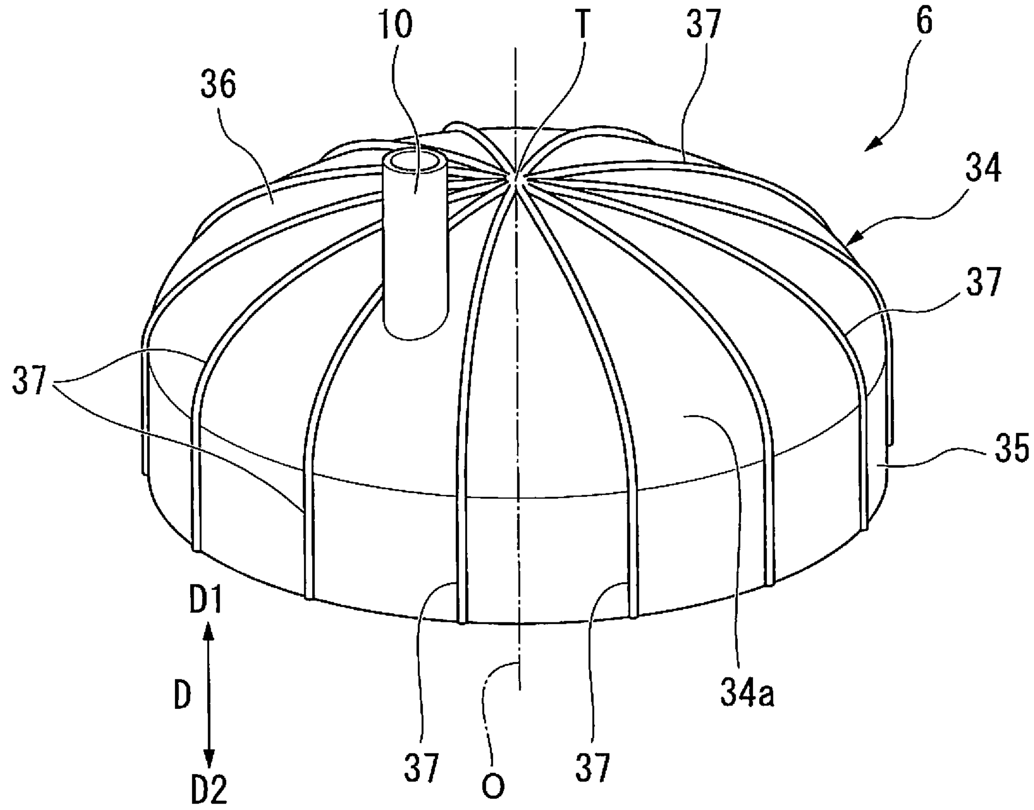



FIG. 3

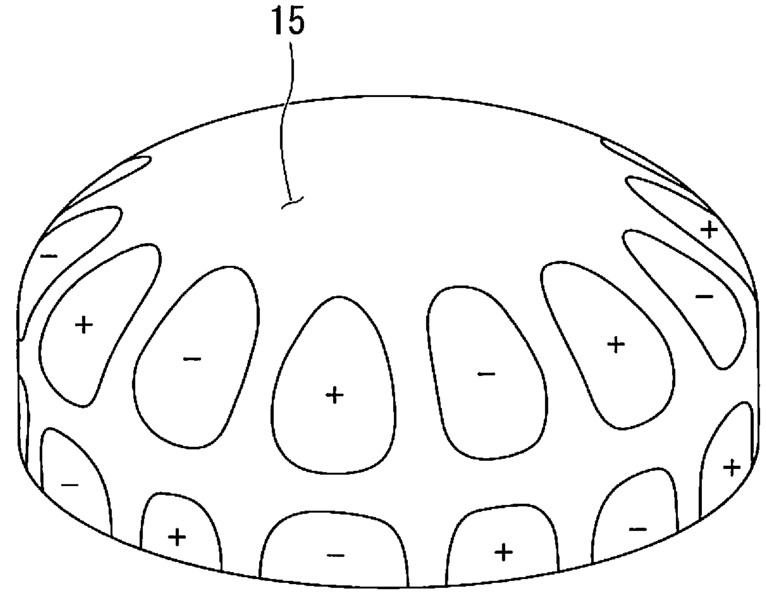


FIG. 4

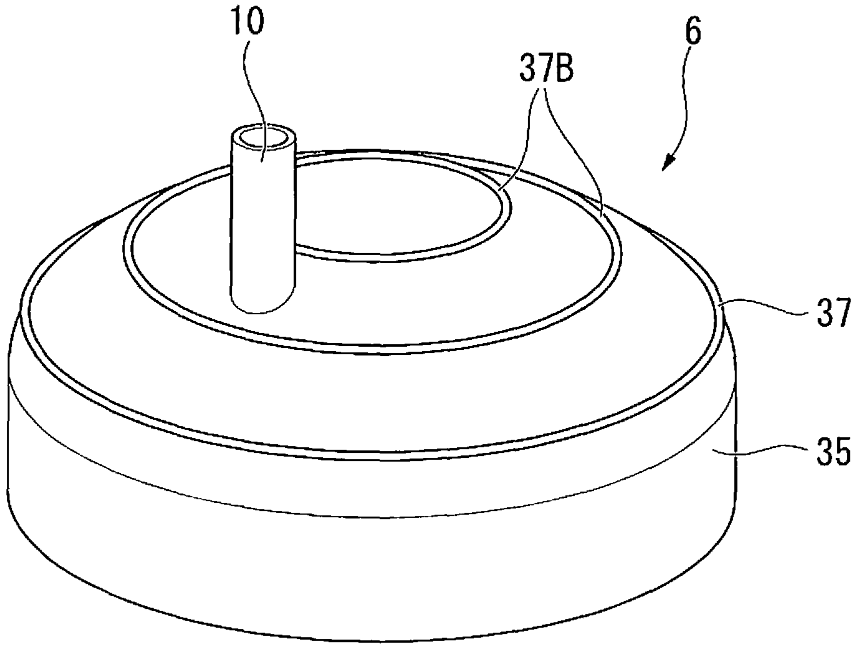



FIG. 5

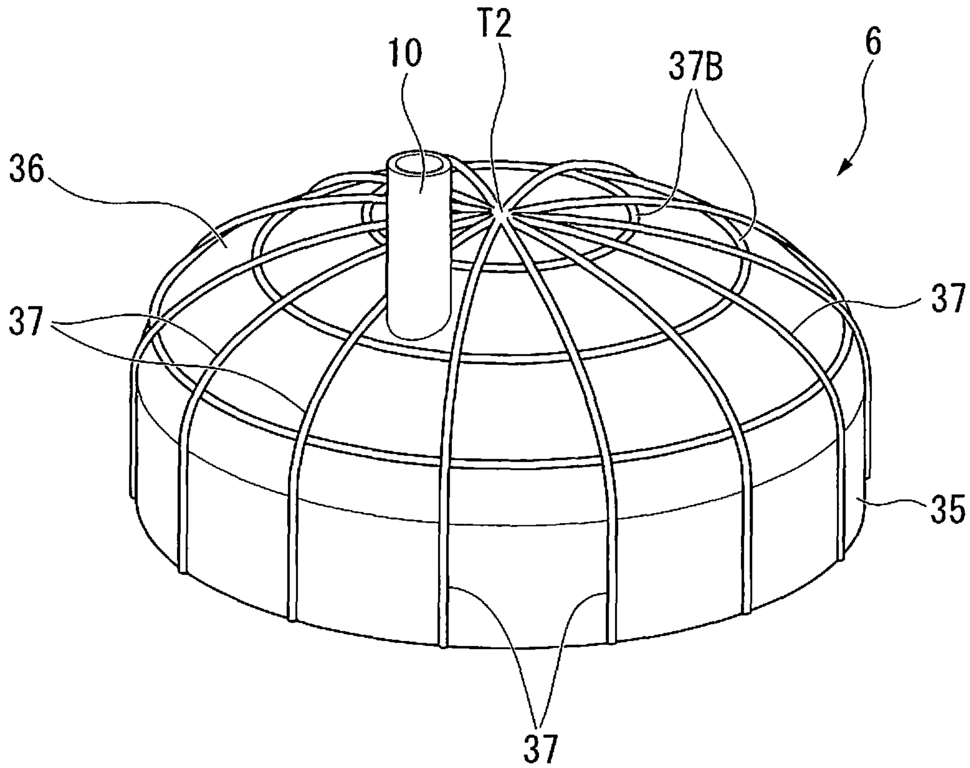
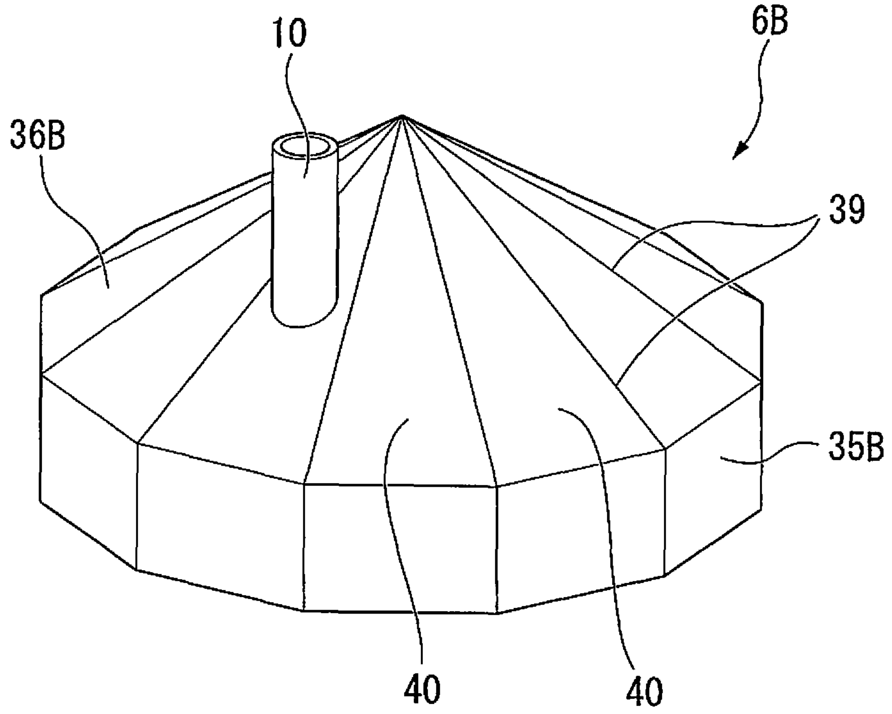


FIG. 6



## REFERENCES CITED IN THE DESCRIPTION



### Patent documents cited in the description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- EP 2275685 A **[0002]**
- KR 20150067657 **[0002]**