(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 707 380 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
08.06.2022 Bulletin 2022/23

(21) Application number: **18783415.5**

(22) Date of filing: **02.10.2018**

(51) International Patent Classification (IPC):
F04B 39/00 *(2006.01)* ***F04B 39/10*** *(2006.01)*
F04B 39/12 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F04B 39/125; F04B 39/0061; F04B 39/1066

(86) International application number:
PCT/EP2018/076777

(87) International publication number:
WO 2019/091665 (16.05.2019 Gazette 2019/20)

(54) **A HERMETIC COMPRESSOR WITH IMPROVED SEALING**

HERMETISCHER VERDICHTER MIT VERBESSERTER ABDICHTUNG

COMPRESSEUR HERMÉTIQUE À ÉTANCHÉITÉ AMÉLIORÉE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **10.11.2017 TR 201717699**

(43) Date of publication of application:
16.09.2020 Bulletin 2020/38

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Description

[0001] The present invention relates to a hermetic type compressor suitable for use in cooling devices.

[0002] In hermetic compressors, the refrigerant is sucked from and pumped back to the refrigeration cycle by means of a piston operating in a cylinder. In hermetic compressors, the refrigerant with increased pressure and temperature while the refrigerant in the cylinder volume is compressed by the piston fills into the exhaust chamber in the cylinder head and from there is sent to the refrigeration cycle. The cylinder head in the compressor compensates the compressive stress occurring due to the compression of the refrigerant as a result of the piston movement and enables the refrigerant with high temperature and pressure to be delivered to the exhaust muffler. After being compressed by the piston and reaching a high pressure, the refrigerant is directed to the exhaust chamber, and the pressure difference between the interior of the compressor casing and the exhaust chamber in the cylinder head. In this case, the refrigerant leaks into the interior of the casing through the walls of the cylinder head and valve table, casing pressure losses due to the passage of the refrigerant into the casing and decreasing the pressure of the refrigerant introduced into the refrigerant cycle. Moreover, the mixing of the refrigerant with the lubricant in the casing causes a decrease in the refrigerant amount and lubrication problems.

[0003] In the International Application No. WO2012166051, a valve table used in a compressor and the thermal insulation embodiment are disclosed.

[0004] In the European Patent No. EP1960669 (B1), a hermetic compressor wherein thermal insulation is provided is disclosed.

[0005] In document US5577898A, a hermetic reciprocating compressor having a Suction muffler arrangement is disclosed. The compressor of this document comprises a channel arranged on a surface of a cylinder head and a rim on a surface of an insulating plate, wherein the rim of the insulating plate is fitted into the channel of the cylinder head. However, this document does not disclose a clamp which increases the pressing force between the cylinder head and the insulating plate.

[0006] In the US Patent No. US6553893B2, a piston assembly for reducing the temperature of a compressor cup seal having is disclosed.

[0007] In the International Application No. WO2017030986A1, a cylinder head for a compressor and a compressor including the head is disclosed. Further, a refrigeration system is also disclosed, including the compressor.

[0008] The aim of the present invention is the realization of a compressor wherein refrigerant losses are prevented by improving the sealing between the cylinder head and the valve table.

[0009] The compressor realized in order to attain the aim of the present invention is explicated in the claims.

[0010] The hermetic compressor comprises a valve table that is disposed between the cylinder and the cylinder head, that enables the refrigerant sucked from and pumped to the refrigeration cycle to be guided and whereon suction and exhaust ports and valves are disposed, and a cylinder heat that enables the pumped refrigerant to be directed. A plastic insulating plate is disposed between the valve table and the cylinder head so as to provide leak-proofing. In the embodiment of the present invention, in order to improve the leak-proofing between said insulating plate and the cylinder head, a channel that peripherally extends at the inner side of the edges of the cylinder head is provided, and a protrusion that is arranged on the surface of the insulating plate seated on the cylinder head and that is fitted into said channel is provided.

[0011] In an embodiment of the present invention, while the cylinder head is being mounted, the protrusion is press-fitted into the channel.

[0012] In an embodiment of the present invention, an o-ring is disposed between the protrusion and the channel.

[0013] In another embodiment of the present invention, in addition to said channel and protrusion, cavities are provided on the cylinder head and pins that are fitted into said cavities are provided on the insulating plate.

[0014] In the compressor of the present invention, the leak-proofing between the cylinder head and the valve table is improved, refrigerant losses are prevented and the performance is increased.

[0015] The compressor realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the cross-sectional view of a compressor.
Figure 2 - is the exploded view of a compressor body, a valve table, an insulating plate and a cylinder head.
Figure 3 - is the schematic view of the insulating plate and the cylinder head in separated state in the embodiment of the present invention.
Figure 4 - is the schematic view of the insulating plate and the cylinder head in joined state.
Figure 5 - is the perspective view of a cylinder head.
Figure 6 - is the perspective view of an insulating plate.
Figure 7 - is the perspective view of a cylinder head whereon ribs are provided.
Figure 8 - is the perspective view of the o-ring in an embodiment of the present invention.

[0016] The elements illustrated in the figures are numbered as follows:

1. Compressor
2. Casing
3. Cylinder
4. Piston
5. Body

6. Cylinder head
7. Exhaust chamber
8. Valve table
9. Suction port
10. Exhaust port
11. Insulating plate
12. Channel
13. Rim
14. O-ring
15. Cavity
16. Pin
17. Rib
18. Suction muffler
19. Muffler head

[0017] The hermetic compressor (1) suitable for use for circulation of the refrigerant fluid in cooling devices, for example refrigerators, comprises a casing (2); a cylinder (3) that is disposed in the casing (2) and that enables the refrigerant to be sucked and pumped; a piston (4) that is operated in the cylinder (3); a body (5) that supports the cylinder (3) and the piston (4); a cylinder head (6) that enables the refrigerant sucked and pumped by means of the cylinder head (4) into the cylinder (3) to be directed; an exhaust chamber (7) that is disposed in the cylinder head (6) and wherein the pumped refrigerant fluid is accumulated; a metallic valve table (8) that is disposed between the cylinder (3) and the cylinder head (6); a suction port (9), an exhaust port (10) and suction and exhaust valves (not shown in figures) that are arranged on the valve table (8); an insulating plate (11) that is produced from a thermally insulating material, preferably plastic, and that is disposed between the valve table (8) and the cylinder head (6); a suction muffler (18) that enables the temperature of the refrigerant to be decreased and the noise caused by the refrigerant to be reduced, and a muffler head (19) that enables the refrigerant coming from the suction muffler (18) to be delivered to the cylinder (3) through the suction port (9).

[0018] The compressor (1) of the present invention comprises

- a channel (12) that is arranged on the surface, in contact with the insulating plate (11), of the cylinder head (6) and that peripherally extends at the inner side of the edges of the cylinder head (6) parallel to the edges such that a gap remains at the region where the muffler head (19) passes, and
- a rim (13) that is arranged on the surface, that is seated on the cylinder head (6), of the insulating plate (11), that peripherally extends at the inner side of the edges of the insulating plate (11) parallel to the edges such that a gap remains at the region where the muffler head (19) passes, and that is fitted into said channel (12) when the cylinder head (6) is mounted onto the cylinder (3).

[0019] The channel (12) is borne at a distance of 0.5 - 2.5 mm from the outer edge of the cylinder head (6) and has a depth of 0.5 - 2 mm. The rim (13) is formed at a distance of 0.5 - 2.5 mm from the outer edge of the insulating plate (11) and has a height of 2 mm. The tolerances of the dimensions of the channel (12) and the rim (13) are determined such that the rim (13) is mounted into the channel (12) in a press-fit manner.

[0020] By means of the channel (12) and rim (13) that are formed respectively on the opposite contacting surfaces of the cylinder head (6) and the insulating plate (11), the leak-proofing is improved and refrigerant losses into the casing (2) are prevented.

[0021] In an embodiment of the present invention, the compressor (1) comprises an o-ring (14) that is formed as an open curve so as to leave a gap where the muffler head (19) passes, that is fitted into the channel (12) and that is squeezed between the base of the channel (12) and the rim (13) (Figure 8).

[0022] In another embodiment of the present invention, the compressor (1) comprises a plurality of cavities (15) that are arranged on the surface, in contact with the insulating plate (11), of the cylinder head, at a region surrounded by the channel (12), and a plurality of deformable pins (16) that are provided at the surface, in contact with the cylinder head (6), of the insulating plate (11), at the region surrounded by the rim (13), that extend towards the cylinder head (6) in a direction perpendicular to the insulating plate (11) and that are crushed by being fitted into said cavities (15) (Figure 5, Figure 6).

[0023] In another embodiment of the present invention, the compressor (1) comprises a channel (12) the length of which is increased by bending outwards two opposite arms of the quadrilateral channel (12), and a rim (13) the length of which is increased by bending outwards two opposite arms thereof so as to be fitted into said channel (12). The channel (12) and the rim (13) with increased lengths, hence increased contact areas improve the leak-proofing, the strength and the centering of the cylinder head (6) with the insulating plate (11) - valve table (8) (Figure 5, Figure 6).

[0024] In another embodiment of the present invention, the compressor (1) comprises a plurality of ribs (17) that are disposed at the rear surface of the cylinder head (6) where the bolts are mounted and that extend from the center towards the edges and/or towards the corners where the bolt holes are arranged. The ribs (17) improve the strength of the cylinder head (6) and absorb the forces acting on the cylinder head (6) as a result of the movement of the piston (4) in the cylinder (3) (Figure 7).

[0025] According to the present invention, the compressor (1) comprises a clamp (not shown in figures) that is connected to the cylinder head (6) and the body (5) and that increases the pressing force of the cylinder head (6) onto the insulating plate (11), thus improving the leak-proofing.

[0026] In the compressor (1) of the present invention, the leak-proofing between the cylinder head (6) and the valve table (8) is improved, thus refrigerant leaks are pre-

vented, the mass flow rate losses of the refrigerant are minimized, the coefficient of performance (COP) of the compressor (1) is increased, and the efficiency of the refrigeration cycle is improved. The need for using an elastomer gasket between the cylinder head (6) and the insulating plate (11) is eliminated, thus providing cost advantage.

Claims

1. - A hermetic compressor (1) suitable for use in cooling devices, comprising a casing (2); a cylinder (3) that is disposed in the casing (2) and that enables the refrigerant to be sucked and pumped; a piston (4); a body (5) that supports the cylinder (3) and the piston (4); a cylinder head (6) that enables the refrigerant sucked and pumped by means of the cylinder head (4) into the cylinder (3) to be directed; an exhaust chamber (7) that is disposed in the cylinder head (6) and wherein the pumped refrigerant fluid is accumulated; a metallic valve table (8) that is disposed between the cylinder (3) and the cylinder head (6); a suction port (9) and an exhaust port (10) that are arranged on the valve table (8); an insulating plate (11) that is disposed between the valve table (8) and the cylinder head (6); a suction muffler (18), and a muffler head (19) that enables the refrigerant coming from the suction muffler (18) to be delivered to the cylinder (3),

   - a channel (12) that is arranged on the surface, in contact with the insulating plate (11), of the cylinder head (6) and that peripherally extends at the inner side of the edges of the cylinder head (6) parallel to the edges such that a gap remains at the region where the muffler head (19) passes,
   - a rim (13) that is arranged on the surface, that is seated on the cylinder head (6), of the insulating plate (11), that peripherally extends at the inner side of the edges of the insulating plate (11) parallel to the edges such that a gap remains at the region where the muffler head (19) passes, and that is fitted into said channel (12) and

   a clamp that is connected to the cylinder head (6) and the body (5) wherein the clamp is configured to increase the pressing force of the cylinder head (6) onto the insulating plate (11).

2. - A compressor (1) as in Claim 1, wherein the channel (12) is formed at a distance of 0.5 - 2.5 mm from the outer edge of the cylinder head (6) and it has a depth of 0.5 - 2 mm, and the rim (13) is formed at a distance of 0.5 - 2.5 mm from the outer edge of the insulating plate (11) and it has a height of 2 mm.

3. - A compressor (1) as in Claim 1 or 2, wherein the tolerances of the dimensions of the channel (12) and the rim (13) are determined such that the rim (13) is mounted into the channel (12) in a press-fit manner.

4. - A compressor (1) as in Claim 1, wherein an o-ring (14) is formed as an open curve and fitted into the channel (12).

5. - A compressor (1) as in Claim 1, wherein a plurality of cavities (15 is arranged on the surface, in contact with the insulating plate (11), of the cylinder head, and a plurality of deformable pins (16) is provided at the surface, in contact with the cylinder head (6), of the insulating plate (11, wherein said deformable pins (16) are fitted into the cavities (15).

Patentansprüche

1. Ein hermetischer Kompressor (1), der zur Verwendung in Kühlvorrichtungen geeignet ist, umfasst ein Gehäuse (2); einen Zylinder (3), der in dem Gehäuse (2) angeordnet ist und das Ansaugen und Pumpen des Kältemittels ermöglicht; einen Kolben (4); einen Körper (5), der den Zylinder (3) und den Kolben (4) trägt; einen Zylinderkopf (6), der ermöglicht, dass das mittels des Zylinderkopfs (4) in den Zylinder (3) angesaugte und gepumpte Kältemittel geleitet wird; eine Abgaskammer (7), die in dem Zylinderkopf (6) angeordnet ist und in der das gepumpte Kühlmittel gesammelt wird; einen metallischen Ventiltisch (8), der zwischen dem Zylinder (3) und dem Zylinderkopf (6) angeordnet ist; eine Ansaugöffnung (9) und eine Auslassöffnung (10), die auf dem Ventiltisch (8) angeordnet sind; eine Isolierplatte (11), die zwischen dem Ventiltisch (8) und dem Zylinderkopf (6) angeordnet ist; einen Saugschalldämpfer (18) und einen Schalldämpferkopf (19), der ermöglicht, dass das vom Saugschalldämpfer (18) kommende Kältemittel dem Zylinder (3) zugeführt wird,

   - einen Kanal (12), der auf der mit der Isolierplatte (11) in Kontakt stehenden Oberfläche des Zylinderkopfs (6) angeordnet ist und der sich an der Innenseite der Ränder des Zylinderkopfs (6) parallel zu den Rändern umlaufend erstreckt, so dass ein Spalt im Bereich verbleibt, wo der Schalldämpferkopf (19) hindurchtritt,
   - einen Rand (13), der auf der auf dem Zylinderkopf (6) aufsitzenden Oberfläche der Isolierplatte (11) angeordnet ist, die sich an der Innenseite der Kanten der Isolierplatte (11) parallel zu den Kanten umlaufend erstreckt, so dass im Bereich des Durchtritts des Schalldämpferkopfes (19) ein Spalt verbleibt, und die in den Kanal (12) eingepasst ist und
   - eine Klemme, die mit dem Zylinderkopf (6) und

dem Körper (5) verbunden ist, wobei die Klemme konfiguriert ist, um die Druckkraft des Zylinderkopfs (6) auf die Isolierplatte (11) zu erhöhen.

2. - Ein Kompressor (1), wie in Anspruch 1 aufgeführt, wobei der Kanal (12) in einem Abstand von 0,5 - 2,5 mm von der Außenkante des Zylinderkopfes (6) ausgebildet ist und eine Tiefe von 0,5 - 2 mm hat, und der Rand (13) in einem Abstand von 0,5 - 2,5 mm von der Außenkante der Isolierplatte (11) ausgebildet und eine Höhe von 2 mm aufweist.

3. - Ein Kompressor (1), wie in Anspruch 1 oder 2 aufgeführt, wobei die Toleranzen der Abmessungen des Kanals (12) und der Felge (13) derart bestimmt sind, dass die Felge (13) in der Nut (12) durch Pressspassung montiert ist.

4. - Ein Kompressor (1), wie in Anspruch 1 aufgeführt, wobei ein O-Ring (14) als offene Kurve ausgebildet und in den Kanal (12) eingepasst ist.

5. - Ein Kompressor (1), wie in Anspruch 1 aufgeführt, wobei mehrere Hohlräume (15) auf der mit der Isolierplatte (11) in Kontakt stehenden Oberfläche des Zylinderkopfs angeordnet sind und mehrere verformbare Stifte (16) an der mit dem Zylinderkopf (6) in Kontakt stehenden Oberfläche der Isolierplatte (11) vorgesehen sind; wobei die verformbaren Stifte (16) in die Hohlräume (15) eingepasst sind.

Revendications

1. - Un compresseur hermétique (1) approprié pour être utilisé dans des dispositifs de refroidissement, **comprenant** un boîtier (2) ; un cylindre (3) qui est disposé dans le boîtier (2) et qui permet d'aspirer et de pomper le réfrigérant ; un piston (4) ; un corps (5) qui supporte le cylindre (3) et le piston (4) ; une culasse (6) qui permet de diriger le réfrigérant aspiré et pompé au moyen de la culasse (4) dans le cylindre (3) ; une chambre d'échappement (7) qui est disposée dans la culasse (6) et dans laquelle le fluide réfrigérant pompé est accumulé ; un plateau de soupape métallique (8) qui est disposé entre le cylindre (3) et la culasse (6) ; un orifice d'aspiration (9) et un orifice d'échappement (10) qui sont agencés sur le plateau de soupape (8) ; une plaque isolante (11) qui est disposée entre le plateau de soupape (8) et la culasse (6) ; un silencieux d'aspiration (18), et une tête de silencieux (19) qui permet au réfrigérant provenant du silencieux d'aspiration (18) d'être délivré au cylindre (3),

- un canal (12) qui est disposé sur la surface, en contact avec la plaque isolante (11), de la culasse (6) et qui s'étend de manière périphérique sur le côté intérieur des bords de la culasse (6) parallèlement aux bords de telle sorte qu'un espace demeure au niveau de la région où passe la tête du silencieux (19),
- un rebord (13) qui est agencé sur la surface, qui repose sur la culasse (6), de la plaque isolante (11), qui s'étend de manière périphérique sur le côté intérieur des bords de la plaque isolante (11) parallèlement aux bords de sorte qu'un espace reste au niveau de la partie où la tête du silencieux (19) passe, et qui est ajusté dans ledit canal (12) et

une pince qui est reliée à la culasse (6) et au corps (5), la pince étant configurée pour augmenter la force de pression de la culasse (6) sur la plaque isolante (11).

2. - Un compresseur (1) selon la déclaration 1, dans lequel le canal (12) est formé à une distance de 0,5 - 2,5 mm du bord extérieur de la culasse (6) et ayant une profondeur de 0,5 - 2 mm, et le rebord (13) est formé à une distance de 0,5 - 2,5 mm du bord extérieur de la plaque isolante (11) et ayant une hauteur de 2 mm

3. - Un compresseur (1) selon la déclaration 1 ou 2, dans lequel les tolérances des dimensions du canal (12) et de la jante (13) sont déterminées de telle sorte que la jante (13) est montée dans le canal (12) d'une manière ajustée par pression.

4. - Un compresseur (1) comme dans la déclaration 1, dans lequel un joint torique (14) est formé comme une courbe ouverte et ajusté dans le canal (12).

5. - Un compresseur (1) selon la déclaration 1, dans lequel une pluralité de cavités (15) est disposée sur la surface, en contact avec la plaque isolante (11), de la culasse, et une pluralité de broches déformables (16) est prévue à la surface, en contact avec la culasse (6), de la plaque isolante (11), dans lequel lesdites broches déformables (16) sont ajustées dans les cavités (15).

Figure 1

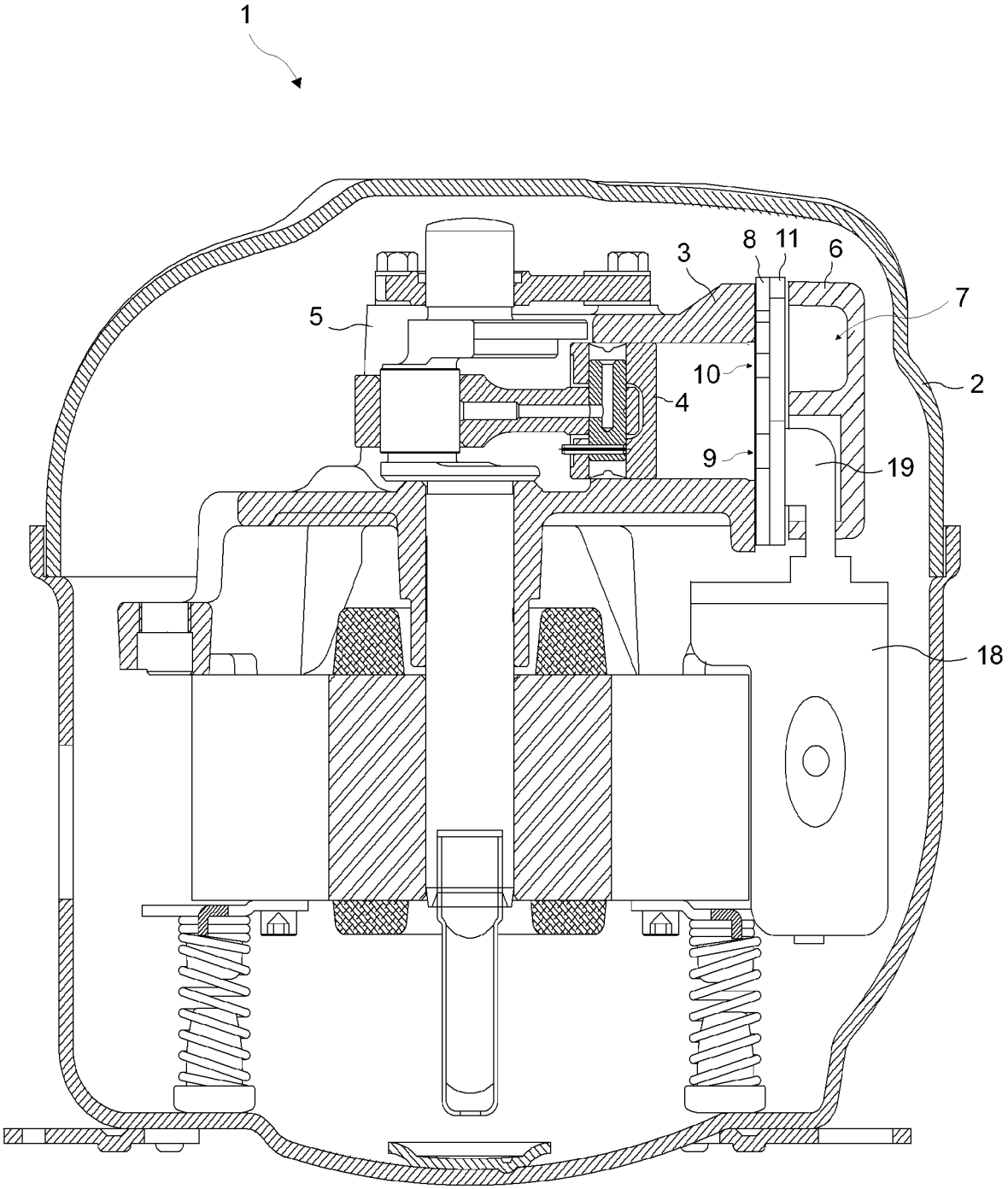


Figure 2

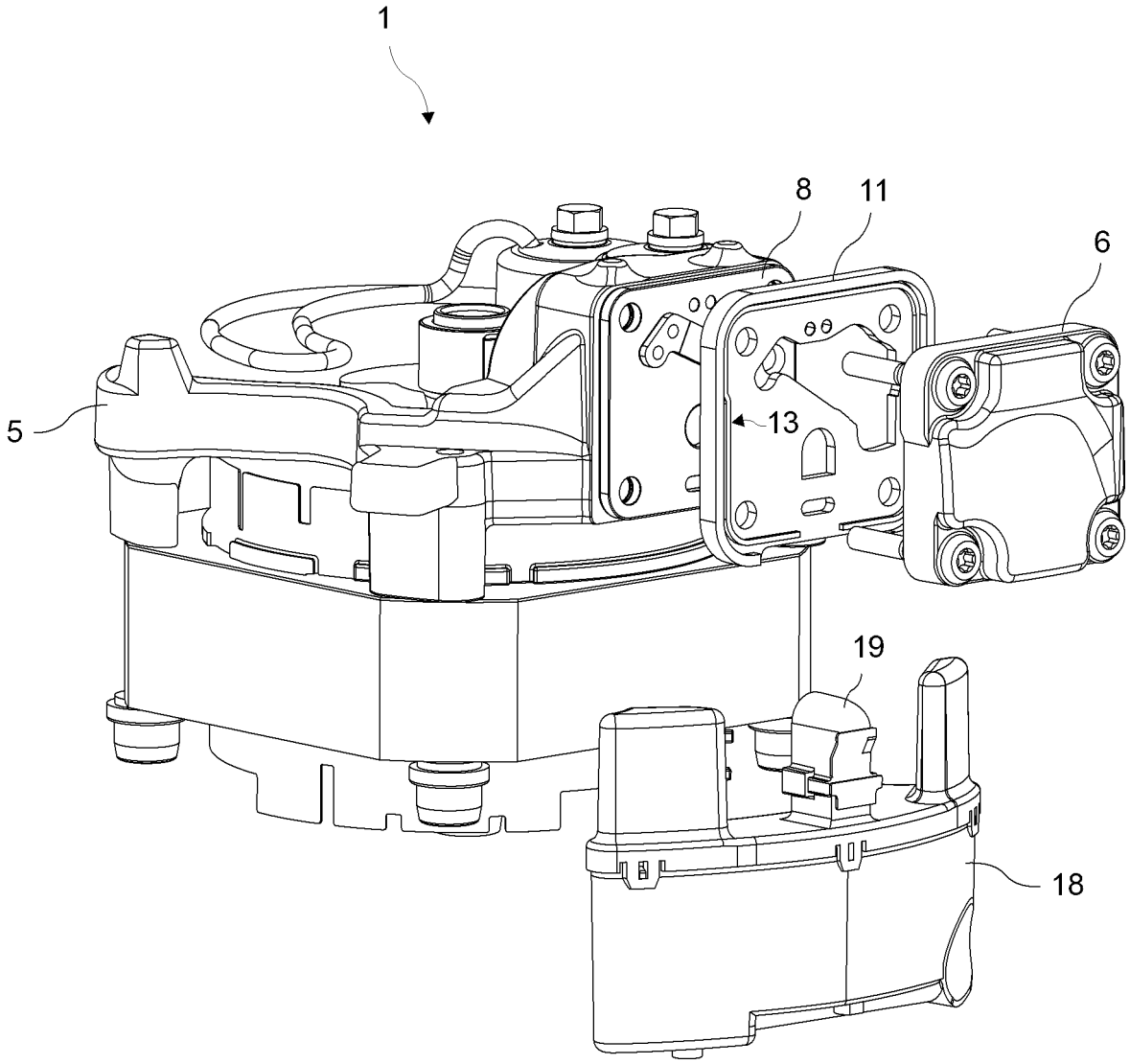


Figure 3

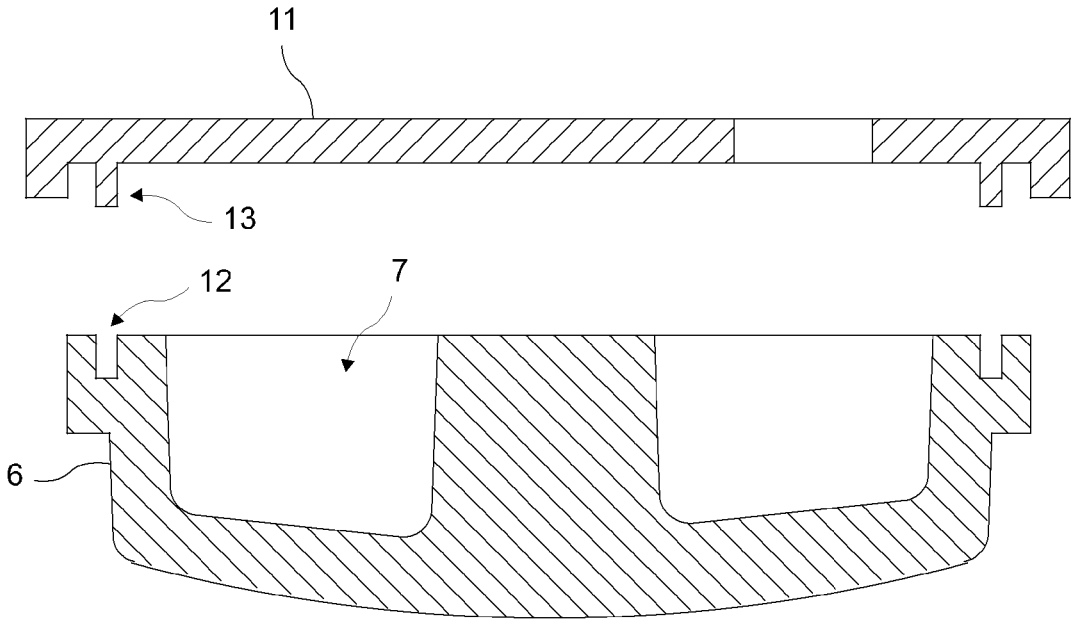


Figure 4

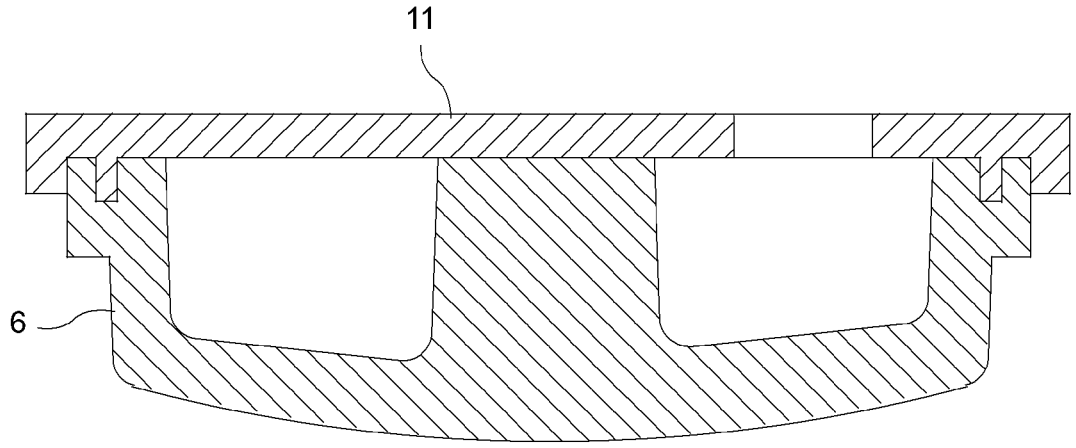


Figure 5

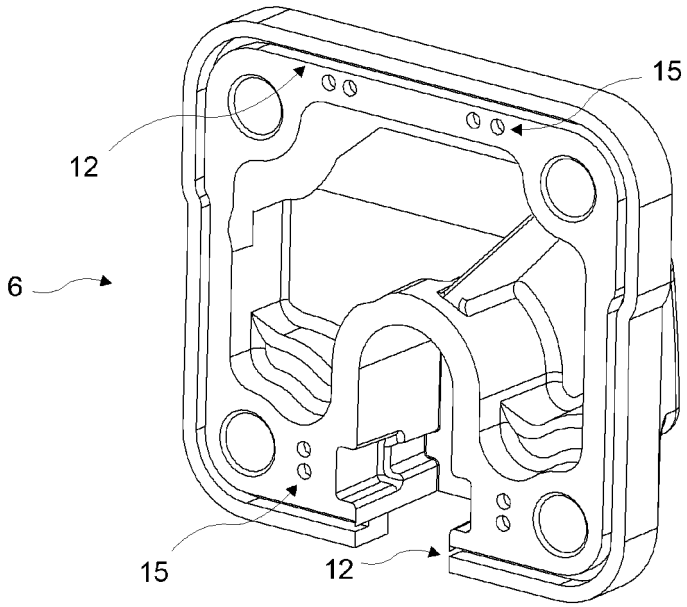


Figure 6

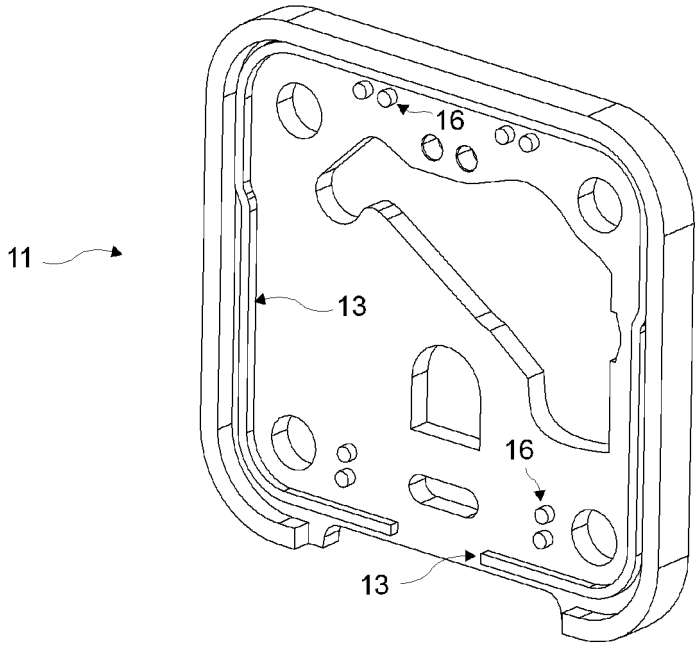


Figure 7

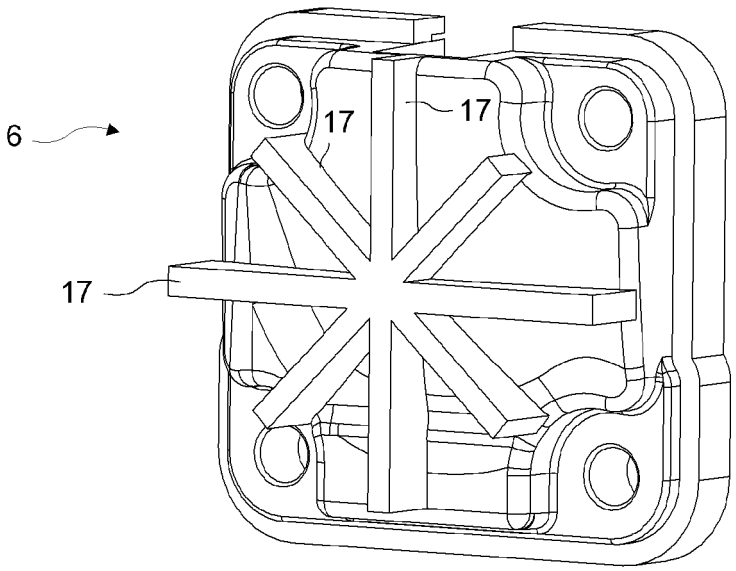
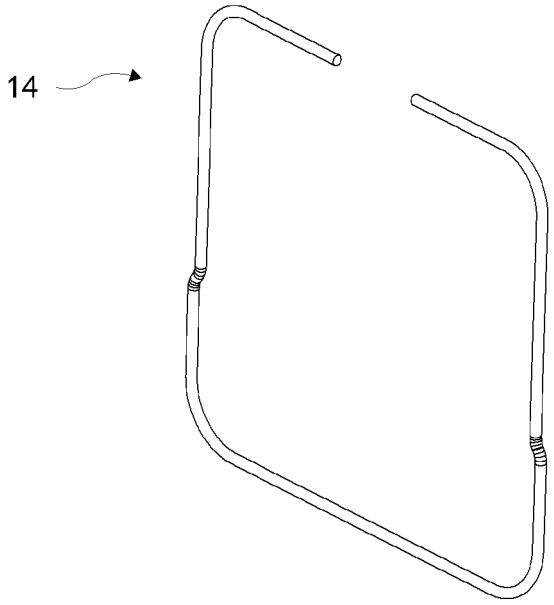


Figure 8



REFERENCES CITED IN THE DESCRIPTION

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