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(54) A HERMETIC COMPRESSOR

HERMETISCHER VERDICHTER

COMPRESSEUR HERMÉTIQUE

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EP 2 580 475 B1

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Description

[0001] The present invention relates to a compressor comprising an exhaust muffler.

[0002] In reciprocating hermetic compressors, the pressure of the refrigerant fluid sucked from the suction muffler is increased as a result of the reciprocating motion made by the piston inside the cylinder and the high pressure fluid is delivered to the exhaust muffler to be sent to the refrigeration cycle from there. The pressure of the refrigerant fluid delivered to the exhaust muffler is 5 to 20 times more than the pressure of the fluid in the suction muffler depending on working conditions of the cooling device.

[0003] Under high pressure, pressure fluctuations occur in the refrigerant fluid upon exit from the cylinder originating from the reciprocating motion of the piston. Noise is generated resulting from these pressure fluctuations and flow of the refrigerant during passage of the fluid into the exhaust muffler. The exhaust muffler provides attenuation in certain frequencies of the generated noise and the pressure fluctuations thus providing the noise power level to be kept at the desired level. However, while this function is implemented, the fluid pressure loss is desired to be low during the flow of the high pressure gas through the exhaust muffler.

[0004] The exhaust mufflers (2') in the state of the art hermetic compressors (1') generally have a cylindrical shape (Figure 1). The pressure losses of the refrigerant fluid are aimed to be decreased by increasing the inner volume of the exhaust mufflers. Because the losses incurred in the refrigerant fluid pressure adversely affect the compressor efficiency. Increasing dimensions of the exhaust muffler is an undesired situation since it will also increase the size of the compressor. Furthermore, it is not possible to increase the dimensions of the exhaust muffler by maintaining its present shape due to space limitations inside the compressor casing. When the dimensions of the exhaust muffler are desired to be increased by keeping the size of the compressor constant, the problem of the exhaust muffler bumping into the crankshaft and the piston rod connected thereto inside the casing arises.

[0005] In the state of the art Japanese Patent Document No. JP58128481, a compressor is defined which comprises an exhaust muffler having a cylindrical body. EP 0588381 discloses the closest prior art.

[0006] The aim of the present invention is the realization of a hermetic compressor the refrigeration capacity of which is increased and efficiency of which is improved.

[0007] The hermetic compressor realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a suction muffler disposed in the casing, that provides the noise generated during suction of the refrigerant fluid to be attenuated, an exhaust muffler disposed on the block wherein the basic mechanical elements like the cylinder, piston, crankshaft and piston rod are borne, providing the noise generated during pumping of the refrigerant fluid to be attenuated. The cross section length of the exhaust muffler in the horizontal plane is longer than its width. The cross sectional area in the horizontal plane of the exhaust muffler, having a hollow, closed volume, is increased such that the total width of the hermetic compressor does not change. Consequently, the interior volume of the exhaust muffler is enlarged. Accordingly, the pressure fluctuations and the pressure decrease occurring in the exhaust muffler are diminished. Furthermore, the feature of the exhaust muffler for attenuating noises at certain frequencies is improved.

[0008] In an embodiment of the present invention, the base of the exhaust muffler seated on the block is in elliptical form. The side walls surrounding the base extend almost perpendicularly to the base. The cross section of the side walls in the horizontal plane has an oval form. Thus, the base area of the exhaust muffler is enlarged without changing the dimensions of the hermetic compressor. Consequently, the feature of the exhaust muffler for attenuating noises at certain frequencies is improved.

[0009] In another embodiment of the present invention, the base of the exhaust muffler is in oblong form, such that the short sides are rounded to be almost semicircular. Thus, the production of the exhaust muffler is facilitated.

[0010] In another embodiment of the present invention, the base of the exhaust muffler is in rectangular form with rounded corners.

[0011] By the present invention, the pressure loss occurring in the exhaust muffler is decreased and hence the efficiency of the hermetic compressor is increased by enlarging the interior volume of the exhaust muffler by means of its configuration. Furthermore, the feature of the exhaust muffler for attenuating noises at certain frequencies is improved.

[0012] The hermetic compressor realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the top view of a state of the art hermetic compressor.

Figure 2 - is the cross sectional view of a hermetic compressor.

Figure 3 - is the top view of the hermetic compressor related to an embodiment of the present invention.

Figure 4 - is the perspective view of the exhaust muffler and some portion of the block related to an embodiment of the present invention.

Figure 5 - is the top view of the exhaust muffler and some portion of the block related to an embodiment of the present invention.

[0013] The elements illustrated in the figures are numbered as follows:

1. Hermetic compressor

2. Casing
3. Suction muffler
4. Exhaust muffler
5. Motor
6. Cylinder
7. Piston
8. Crankshaft
9. Piston rod
10. Block
11. Cylinder head
12. Valve table
13. Suction valve
14. Exhaust valve
15. Lid
16. Duct
17. Base
18. Side wall

[0014] In cooling devices, for example in refrigerators, the circulation of the refrigerant fluid is provided by a hermetic compressor (1).

[0015] The hermetic compressor (1) comprises a casing (2) which carries the components therein, a motor (5) disposed inside the casing (2), a cylinder (6) providing the refrigerant fluid to be pumped, a piston (7) functioning in the cylinder (6), providing the refrigerant fluid to be compressed into the cylinder (6) hole, a crankshaft (8) that transfers the motion delivered from the motor (5) and a piston rod (9) that transfers the motion received from the crankshaft (8) to the piston (7) (Figure 2). The rotational motion in the motor (5) is delivered to the piston (7) by the crankshaft (8)-piston rod (9) mechanism and thus the reciprocating motion of the piston (7) is provided.

[0016] The hermetic compressor (1) furthermore comprises a cylinder head (11) that provides circulation of the refrigerant fluid which is sucked and pumped by the motion of the piston (7), a valve table (12) disposed between the cylinder (6) and the cylinder head (11), the suction valve (13) and the exhaust valve (14) disposed on the valve table (12) (Figure 2).

[0017] The compressor (1) furthermore comprises a block (10) disposed inside the casing (2) that carries and/or bears the basic mechanical components like the cylinder (6), the piston (7), the crankshaft (8) and the piston rod (9), a suction muffler (3), disposed in the casing (2), providing the noise generated during suction of the refrigerant fluid to be attenuated and at least one exhaust muffler (4), disposed on the block (10), having a hollow, closed volume, providing the noise generated during pumping of the refrigerant fluid to be attenuated (Figure 2, Figure 3 and Figure 4). The pressure of the refrigerant fluid, sucked by means of the suction valve (13) from the suction muffler (3) that is disposed under the cylinder head (11), through which the sucked refrigerant fluid passes, is increased as a result of the motion made by the piston (7) in the cylinder (6). The refrigerant fluid having high pressure is pumped into the exhaust muffler (4) by means of the exhaust valve (14). The refrigerant fluid delivered to the exhaust muffler (4) joins the refrigeration cycle from there.

[0018] In the compressor (1) of the present invention, the cross sectional length (l) of the exhaust muffler (4) in the horizontal plane is more than its width (w) (Figure 3, Figure 4 and Figure 5). The exhaust muffler (4) is produced on the block (10), shaped as a framework and that is preferably produced of cast material, and integrated with the block (10). The exhaust muffler (4) has a base (17) that is disposed on the block (10), the side walls (18) surrounding the base (17), a lid (15) covering its upper surface and a duct (16) attached to the lid (15). A hollow, closed volume is obtained by mounting the lid (15) with a method like screwing etc. on the upper surface of the exhaust muffler (4).

[0019] Entry of the refrigerant fluid into the exhaust muffler (4) is provided by an opening arranged thereon that communicates with the cylinder head (11). The refrigerant fluid compressed in the cylinder (6) hole by the motion of the piston (7) fills into the cylinder head (11) upon opening of the exhaust valve (14) and passes into the exhaust muffler (4) from there by means of the opening. The refrigerant fluid inside the exhaust muffler (4) reaches the outlet duct of the hermetic compressor (1) by passing through the duct (16) disposed on the lid (15) and is delivered to the cooling device refrigeration system from there.

[0020] The interior volume of the exhaust muffler (4) is enlarged by means of the cross sectional length (l) extending in the horizontal plane of the exhaust muffler (4) of the present invention being larger than its width (w). Consequently, the pressure fluctuations occurring in the exhaust muffler (4) are decreased and the refrigerant fluid pressure decrease resulting from pressure fluctuations is minimized. Improvement in compressor (1) efficiency is provided by minimizing the pressure decrease in the exhaust muffler (4). Furthermore, attenuation of noise at a certain frequency is realized more effectively by means of the exhaust muffler (4) configuration. Consequently, an improvement is also provided in the vibrational acoustic properties of the com pressor (1).

[0021] The distance between the outer periphery of the exhaust muffler (4) seated on the block (10) and the crankshaft (8) is one of the factors that determine the width of the compressor (1). Decreasing the width (w) of the hermetic compressor (1) is possible without decreasing the interior volume of the exhaust muffler (4) by means of decreasing the cross sectional width (w) of the exhaust muffler (4) in the horizontal plane with respect to its length (l). Furthermore, by producing the exhaust muffler (4) with the cross sectional width (w) unequal to the length (l), the possibility of the exhaust muffler (4), with increased cross sectional area and hence interior volume, bumping to the crankshaft (8) and the piston rod (9) connected to the crankshaft (8) due to space limitation in the casing (2) is eliminated.

[0022] The length (l) of the exhaust muffler (4) in the movement direction of the piston (7) is longer than its

length (l) that is perpendicular to the movement direction of the piston (7). Thus, the cross sectional area of the exhaust muffler (4) in the horizontal plane and hence the interior volume is increased without the possibility of the exhaust muffler (4) bumping to the crankshaft (8) in the casing (2) and to the piston rod (9) transferring the motion received from the crankshaft (8) to the piston (7).

[0023] In an embodiment of the present invention, the exhaust muffler (4) has an elliptical base (17) and side walls (18) that extend almost perpendicularly to the base (17). The cross section of the side walls (18) that extend almost parallel to the base (17) are also in elliptical form. Accordingly, attenuation of the noise generated during pumping of the refrigerant fluid is made effective by increasing the cross sectional area of the exhaust muffler (4) in the horizontal plane and hence the volume.

[0024] In an embodiment of the present invention, the exhaust muffler (4) has an oblong base (17) and side walls (18) that extend almost perpendicularly to the base (17) (Figure 3, Figure 4 and Figure 5). The cross section of the exhaust muffler (4) in the horizontal plane is in form of a rectangular with the short sides rounded in almost semicircular form. Accordingly, when space limitations in the casing (2) are taken into account, the cross section of the exhaust muffler (4) in the horizontal plane is provided to be in the largest value as possible. Thus, on one hand the pressure decrease of the refrigerant fluid in the exhaust muffler (4) is minimized and on the other hand the production of the exhaust muffler (4) is facilitated.

[0025] In another embodiment of the present invention, the exhaust muffler (4) has a rectangular base (17) with rounded corners and side walls (18) that extend almost perpendicularly to the base (17). Thus, the production of the exhaust muffler (4) is facilitated.

[0026] In the hermetic compressor (1) of the present invention, not only efficiency of the hermetic compressor (1) is increased but also the ability of the exhaust muffler (4) to attenuate noises at certain frequencies is improved by means of the exhaust muffler (4) configuration.

[0027] It is to be understood that the present invention is not limited to the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These different embodiments should also be considered within the scope of the claims of the present invention.

Claims

1. A hermetic compressor (1) comprising a casing (2), defining a predetermined set-up orientation of the hermetic compressor (1) when arranged on a plane surface, said hermetic compressor (1) further comprising a motor (5) disposed inside the casing (2), a cylinder (6) providing the refrigerant fluid to be pumped, a piston (7) functioning in the cylinder (6) and being movable in a horizontal plane parallel to the plane surface when the hermetic compressor (1) has its set-up orientation and providing the refrigerant fluid to be compressed into the cylinder (6) hole, a crankshaft (8) that transfers the motion delivered from the motor (5) and a piston rod (9) that transfers the motion received from the crankshaft (8) to the piston (7), a block (10) disposed inside the casing (2) that carries and/or bears the cylinder (6), the piston (7), the crankshaft (8) and the piston rod (9), wherein further a suction muffler (3) is disposed in the casing (2), providing the noise generated during suction of the refrigerant fluid to be attenuated, and at least one exhaust muffler (4), disposed on the block (10) adjacent to the piston (7), said exhaust muffler (4) having a hollow, closed volume, providing the noise generated during pumping of the refrigerant fluid to be attenuated, **characterized in that** the exhaust muffler (4) has a cross sectional length (l) in the horizontal plane in which the piston (7) is movable which is greater than a cross sectional width (w) in said horizontal plane.

2. A hermetic compressor (1) as in Claim 1, **characterized by** the exhaust muffler (4) having a base (17) disposed on the block (10), side walls (18) surrounding the base (17), a lid (15) covering its upper surface and a duct (16) attached to the lid (15).

3. A hermetic compressor (1) as in Claim 1 or 2, **characterized in that** in the exhaust muffler (4) the length (l) in the movement direction of the piston (7) is longer than its width perpendicular to the movement direction of the piston (7).

4. A hermetic compressor (1) as in any of Claims 1 to 3, **characterized in that** the exhaust muffler (4) is integrated with the block (10).

5. A hermetic compressor (1) as in any one of the Claims 1 to 4, **characterized by** the exhaust muffler (4) having an elliptic base (17) and side walls (18) that extend perpendicularly to the base (17).

6. A hermetic compressor (1) as in any one of the Claims 1 to 4, **characterized by** the exhaust muffler (4) having an oblong base (17) and side walls (18) that extend perpendicularly to the base (17).

7. A hermetic compressor (1) as in any one of the Claims 1 to 4, **characterized by** the exhaust muffler (4) having a rectangular base (17) with rounded corners and side walls (18) that extend perpendicularly to the base (17).

Patentansprüche

1. Hermetischer Kompressor (1), umfassend ein Gehäuse (2), das eine im Voraus festgelegte Aufstel-

lungsausrichtung des hermetischen Kompressors (1) definiert, wenn dieser auf einer ebenen Fläche angeordnet ist, wobei der hermetische Kompressor (1) ferner einen Motor (5), der im Gehäuse (2) angeordnet ist, einen Zylinder (6), der für das Pumpen des Kühlfluids sorgt, einen Kolben (7) zum Betätigen des Zylinders (6), der in einer horizontalen Ebene parallel zur ebenen Fläche beweglich ist, wenn der hermetische Kompressor (1) seine Aufstellungsausrichtung aufweist, und dafür sorgt, dass das Kühlfluid in die Öffnung des Zylinders (6) verdichtet wird, eine Kurbelwelle (8), die die Bewegung vom Motor (5) überträgt, und eine Kolbenstange (9), die die Bewegung von der Kurbelwelle (8) an den Kolben (7) überträgt, einen Block (10), der im Gehäuse (2) angeordnet ist und den Zylinder (6), den Kolben (7), die Kurbelwelle (8) und die Kolbenstange (9) trägt und/oder lagert, umfasst, wobei ferner ein Ansaugschalldämpfer (3) im Gehäuse (2) angeordnet ist und dafür sorgt, dass das Geräusch, das beim Ansaugen des Kühlfluids erzeugt wird, abgeschwächt wird, und wenigstens ein Auslassschalldämpfer (4) am Block (10) benachbart zum Kolben (7) angeordnet ist, wobei der Auslassschalldämpfer (4) ein hohles geschlossenes Volumen aufweist und dafür sorgt, dass das Geräusch,das beim Pumpen des Kühlfluids erzeugt wird, abgeschwächt wird, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) eine Querschnittlänge (1) in der horizontalen Ebene aufweist, in der der Kolben (7) beweglich ist, die größer als eine Querschnittsbreite (w) in der horizontalen Ebene ist.

2. Hermetischer Kompressor (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) eine Basis (17), die am Block (10) angeordnet ist, Seitenwände (18), die die Basis (17) umgeben, einen Deckel (15), der seine Oberfläche abdeckt, und eine Leitung (16) aufweist, die am Deckel (15) angebracht ist.

3. Hermetischer Kompressor (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** bei dem Auslassschalldämpfer (4) die Länge (1) in Bewegungsrichtung des Kolbens (7) länger als die Breite senkrecht zur Bewegungsrichtung des Kolbens (7) ist.

4. Hermetischer Kompressor (1) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) einstückig mit dem Block (10) gebildet ist.

5. Hermetischer Kompressor (1) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) eine elliptische Basis (17) und Seitenwände (18) aufweist, die sich senkrecht zur Basis (17) erstrecken.

6. Hermetischer Kompressor (1) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) eine längliche Basis (17) und Seitenwände (18) aufweist, die sich senkrecht zur Basis (17) erstrecken.

7. Hermetischer Kompressor (1) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Auslassschalldämpfer (4) eine rechteckige Basis (17) mit abgerundeten Ecken und Seitenwände (18) aufweist, die sich senkrecht zur Basis (17) erstrecken.

Revendications

1. Un compresseur hermétique (1) comprenant un boîtier (2) qui définit une orientation d'installation prédéterminée du compresseur hermétique (1) lorsqu'il est disposé sur une surface plane, ledit compresseur hermétique (1) comprenant en outre un moteur (5) qui est disposé dans le boîtier (2), un cylindre (6) qui permet le pompage du fluide frigorigène, un piston (7) qui fonctionne dans le cylindre (6) et qui se déplace dans un plan horizontal parallèle à la surface plane lorsque le compresseur hermétique (1) est dans l'orientation d'installation et qui permet au fluide frigorigène d'être comprimé dans le trou du cylindre (6), un vilebrequin (8) qui transmet le mouvement reçu du moteur (5) et une tige de piston (9) qui transmet le mouvement reçu du vilebrequin (8) au piston (7), un bloc (10) qui est disposé dans le boîtier (2) et qui supporte et/ou porte le cylindre (6), le piston (7), le vilebrequin (8) et la tige de piston (9), où en outre un silencieux d'aspiration (3) est disposé dans le boîtier (2), qui permet l'atténuation du bruit généré pendant l'aspiration du fluide frigorigène, et au moins un silencieux d'échappement (4) qui est disposé sur le bloc (10) adjacent au piston (7), ledit silencieux d'échappement (4) présentant un volume creux et fermé, permettant l'atténuation du bruit généré pendant le pompage du fluide frigorigène, **caractérisé en ce que** le silencieux d'échappement (4) présente une longueur transversale (1) dans le plan horizontal dans lequel le piston (7) se déplace, qui est supérieure à une largeur transversale (w) dans ledit plan horizontal.

2. Un compresseur hermétique (1) selon la Revendication 1, **caractérisé par** le silencieux d'échappement (4) qui présente une base (17) disposée sur le bloc (10), des parois latérales (18) entourant la base (17), un couvercle (15) couvrant sa surface supérieure et une conduite (16) fixée au couvercle (15).

3. Un compresseur hermétique (1) selon la Revendication 1 ou 2, **caractérisé en ce que** dans le silencieux d'échappement (4), la longueur (1) dans le

sens de mouvement du piston (7) est supérieure à sa largeur perpendiculaire au sens de mouvement du piston (7).

4. Un compresseur hermétique (1) selon l'une quelconque des revendications de 1 à 3, **caractérisé en ce que** le silencieux d'échappement (4) est intégré avec le bloc (10).

5. Un compresseur hermétique (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** le silencieux d'échappement (4) présentant une base elliptique (17) et des parois latérales (18) qui s'étendent perpendiculairement à la base (17).

6. Un compresseur hermétique (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** le silencieux d'échappement (4) présentant une base oblongue (17) et des parois latérales (18) qui s'étendent perpendiculairement à la base (17).

7. Un compresseur hermétique (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** le silencieux d'échappement (4) présentant une base rectangulaire (17) dont les coins sont arrondis et des parois latérales (18) qui s'étendent perpendiculairement à la base (17).

Figure 1

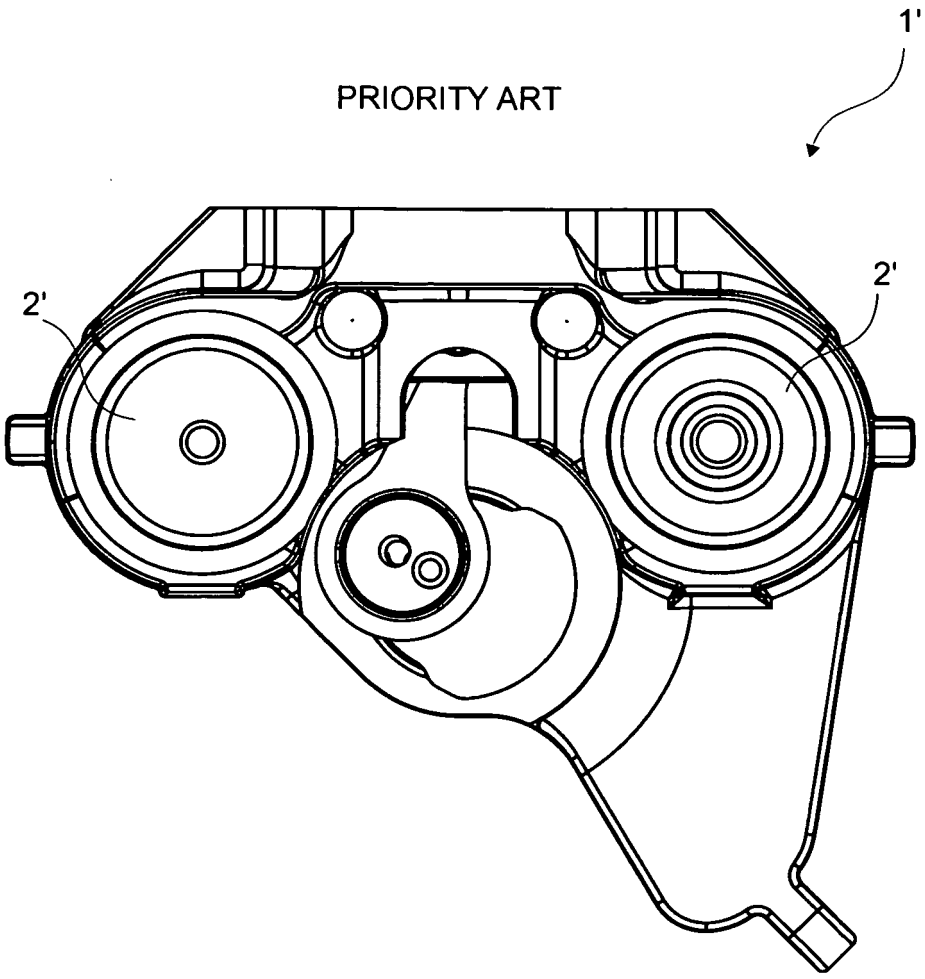


Figure 2

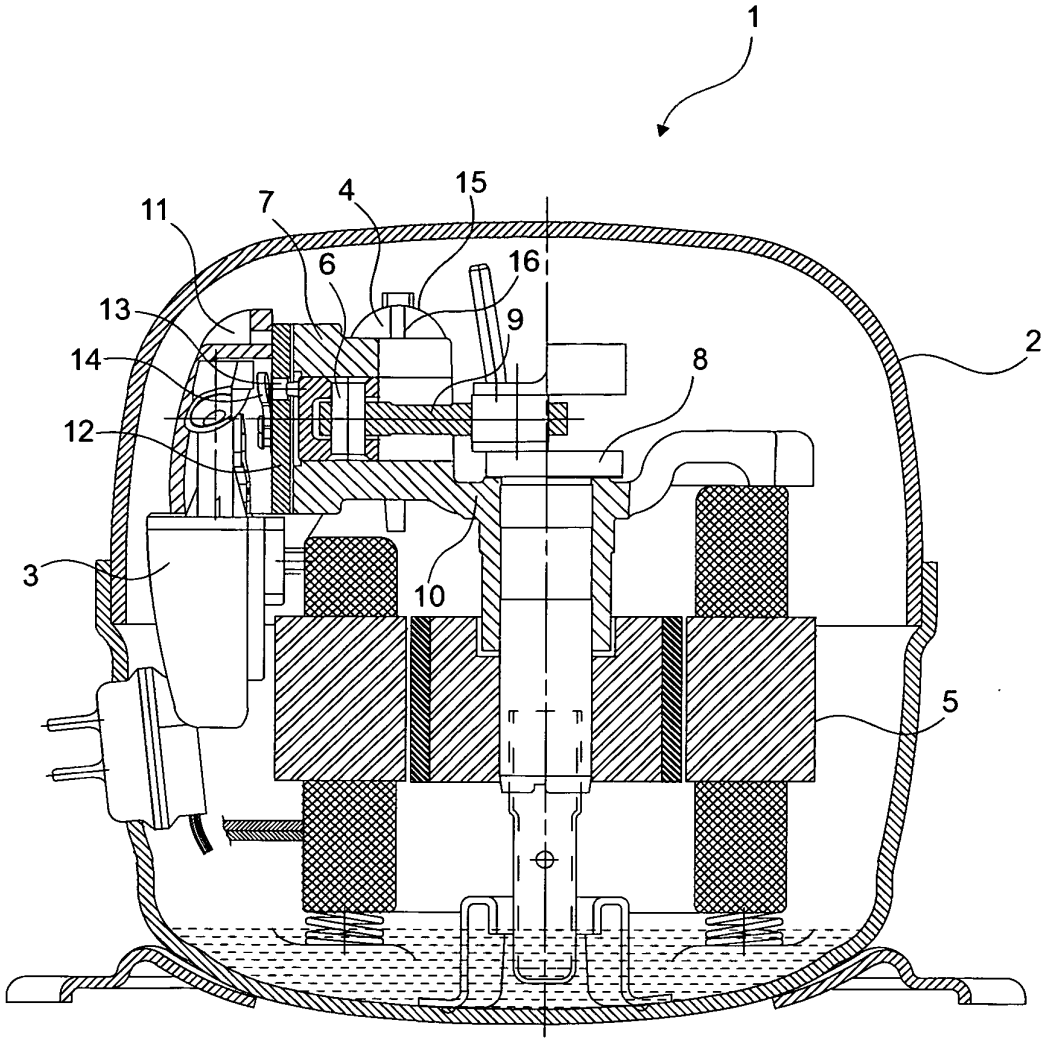


Figure 3

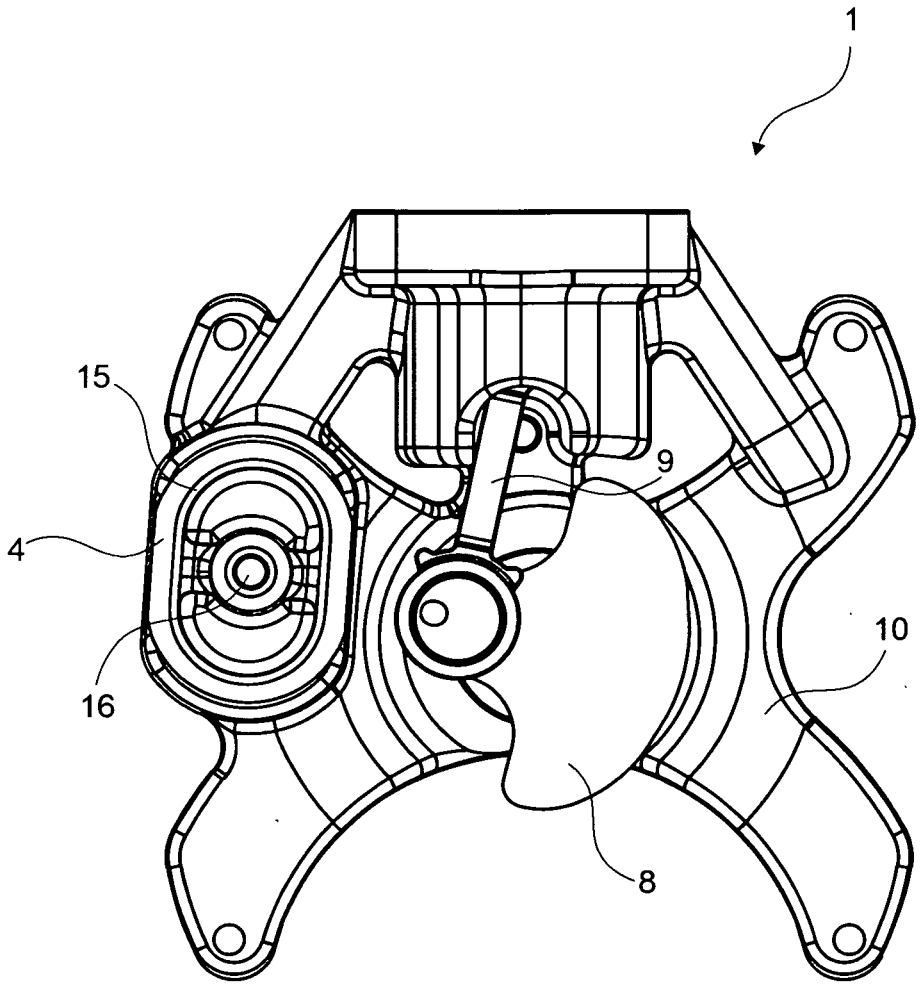


Figure 4

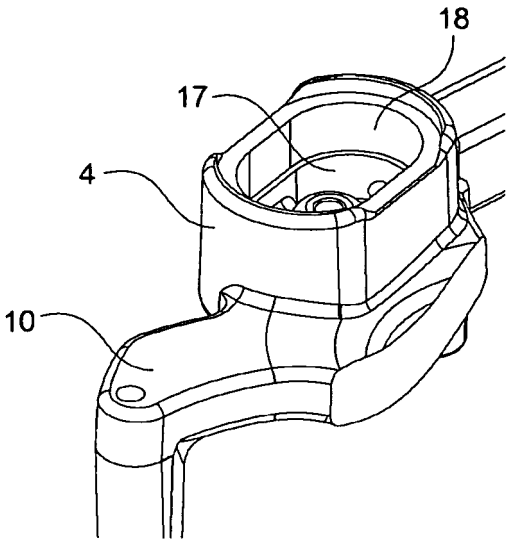
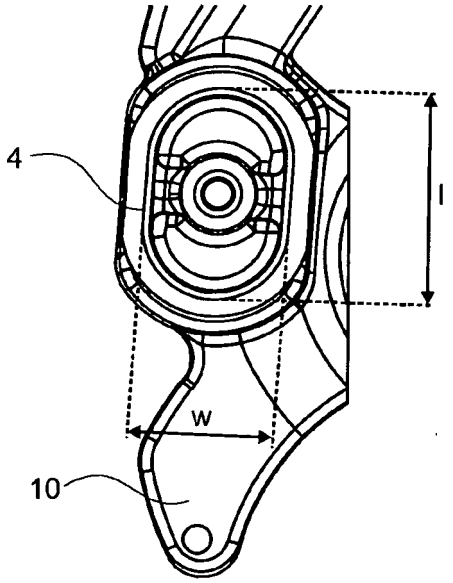


Figure 5



REFERENCES CITED IN THE DESCRIPTION

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