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(54) **COMPRESSOR SHELL FOR A REFRIGERANT COMPRESSOR**

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CARTER DE COMPRESSEUR POUR UN COMPRESSEUR DE RÉFRIGÉRANT

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Description

FIELD OF THE INVENTION

[0001] The invention relates to compressor shell for a refrigerant compressor comprising a lower shell part and an upper shell part;

wherein the compressor shell encloses an inner containing space for housing a pump unit of the refrigerant compressor; wherein the compressor shell extends along a length direction, a width direction and a height direction, wherein the length direction and the width direction define a horizontal plane; wherein the lower shell part comprises a bottom wall and a lower circumferential wall; wherein the upper shell part comprises a top wall and an upper circumferential wall; wherein four mounting pins are extending from the bottom wall into the containing space, wherein each mounting pin is configured to mount a support spring assembly for supporting the pump unit, wherein the four mounting pins are arranged in a rectangular shape being aligned with the length direction and the width direction.

[0002] Reference to elements being aligned in the horizontal plane is synonymous to elements (or points) being congruent when viewed in the height direction, so that all elements are projected into the horizontal plane.

PRIOR ART

[0003] Encapsulated, especially hermetically sealed, refrigerant compressors have been known for a long time and are mainly used in refrigeration cabinets, such as refrigerators or refrigerated shelves, but can also be used in mobile appliances. An example of such a refrigerant compressor is for example disclosed in prior art document EP 3 882 463 A1.

[0004] The refrigerant process as such has also been known for a long time. Refrigerant is thereby heated by energy absorption from the space to be cooled in an evaporator and finally superheated and pumped to a higher pressure level using the refrigerant compressor having a cylinder and a reciprocating piston. At this higher pressure level the refrigerant is cooled via a condenser and is conveyed back into the evaporator via a throttle, via which throttle the pressure is reduced and the refrigerant is further cooled down, before the cycle starts anew.

[0005] The path of the (usually gaseous) refrigerant through the compressor can be described as follows: The refrigerant enters a compressor shell of the refrigerant compressor, which compressor shell encapsulates a pump unit of the refrigerant compressor, through a suction pipe, which is in the operating state connected to the evaporator of the refrigerant appliance. During a suction cycle, the refrigerant is sucked through a suction muffler,

a suction opening of a valve plate, which suction opening is released by a suction valve spring, into a cylinder of the pump unit of the refrigerant compressor. The suction is caused by linear movement of a piston inside the cylinder. During a compression part of a compression and discharge cycle, the refrigerant is compressed within the cylinder by the linear movement of the piston until a discharge valve spring releases a discharge opening of the valve plate. During a discharge part of the compression and discharge cycle, the so compressed refrigerant then flows through the discharge opening of the valve plate into a discharge muffler and leaves the compressor shell through a discharge pipe, which is connected to the discharge muffler by a discharge connection tube. The discharge tube is in the operating state connected to the condenser of the refrigerant appliance.

[0006] The pump unit comprises a cranktrain, which includes the piston and is causing the linear movement of the piston inside the cylinder, a crankcase, in which a crankshaft of the cranktrain is mounted, the crankcase also having a cylinder housing, an electric drive unit, which comprises a rotor and a stator, and a cylinder head assembly. The cylinder head assembly includes the valve plate, the suction valve spring, the discharge valve spring, the suction muffler and the discharge muffler. The pump unit is supported within the compressor shell on a plurality of support spring assemblies, preferably on four support spring assemblies.

[0007] The shell usually comprises a lower shell part and an upper shell part, which are welded together. The discharge pipe and the suction pipe as well as a maintenance pipe (also known as service pipe) are hermetically connected to the shell. As the refrigerant compressor is a stand-alone product, which is integrated into a refrigerant appliance at some stage of the assembly process, the discharge pipe, the suction pipe and the maintenance pipe are also called discharge connector, suction connector and maintenance connector as they are configured to be connected with respective elements with the refrigerant appliance during assembly and/or in the operation state.

[0008] The movement of the piston is caused by rotation of the crankshaft, wherein the piston is connected to a crank-pin of the crankshaft via a connecting rod. The electric drive unit is required to facilitate the rotation of the crankshaft, wherein the rotor is fixed to the crankshaft.

[0009] Usually an electronic control unit is mounted to an outside surface of the compressor shell, wherein the stator is connected to an electric pass through element (also known as "fusite") via an inner harness and the electronic control unit is connected to the electric pass through element via an outer harness. The electronic control unit powers the stator and thereby controls the rotational speed of the pump unit of the refrigerant compressor.

[0010] In order to lubricate the piston moving within the cylinder and the cranktrain, in particular the crankshaft, during operation, the refrigerant compressor has a lubri-

cant conveying system, by means of which lubricant is transported from a lubricant sump building up in the lower housing part of the compressor housing during operation towards the piston and along the crankshaft. The lubricant conveying system includes an oil pick up mounted to a lower side of the crankshaft, preferably directly on the rotor. In order to convey lubricant, the oil pick up has to immerse into the lubricant sump, so that lubricant can enter the oil pickup in order to be conveyed by the rotation of the crankshaft.

[0011] As it cannot be guaranteed that the compressor shell is mounted to a completely horizontal plane, in refrigerant compressors according to the prior art there is a certain risk that the oil pickup does not immerse into the lubricant sump, when the compressor shell is mounted on an inclined surface, which leads to malfunction and increased wear, as the lubrication is interrupted for a certain period of time, generally until enough lubricant has drained from the pump unit back into the lubricant sump. Mostly oil is used as a lubricant in refrigerant compressors; therefore the lubricant sump is often also referred to simply as oil sump.

OBJECT OF THE INVENTION

[0012] It is therefore an object of the invention to provide a compressor shell which overcomes the disadvantages of the prior art and provides an improved design with regard to the formation of an oil pocket in which the oil sump forms during operation, in order to reduce the probability of malfunction of the lubricant conveying system. A further object of the invention is to reduce the overall size of the compressor shell in order to reduce the required space within the refrigerant appliance, while at the same time providing enough space to avoid collisions between the pump unit and the inner surface of the compressor shell.

SUMMARY OF THE INVENTION

[0013] In order to achieve at least one of the objects set out above in a compressor shell as initially defined, it is provided according to the invention that a first centre point of the four mounting pins in the horizontal plane is offset in the length direction with regard to a second centre point of an outline of the compressor shell in the horizontal plane and that a curved section of the bottom wall is convexly curved in order to form an oil pocket, wherein a lowest point of the oil pocket, seen in the height direction, is aligned with the first centre point in the horizontal plane. Preferably the mounting pins are arranged in a square shape.

[0014] The position of the pump unit within the compressor shell is defined by the support spring assemblies. I.e. the position of the mounting pins, on which the support spring assemblies are mounted, can be used to adjust the position of the pump unit with regard to the compressor shell. Due to the offset of the mounting pins, de-

fined by the first centre point, with regard to the second centre point, which is defined by the outline or contour of the compressor shell, the distance between the pump unit and the compressor shell can be reduced in the offset direction. Thereby the overall size of the refrigerant compressor can be reduced.

[0015] In order to secure the functioning of the lubricant conveying system, the curved section of the bottom wall forming the oil pocket, in which oil pocket the oil sump forms during operation, is aligned with the first centre point of the mounting points in such a way that the lowest point of the curved section is aligned with the first centre point when viewed in the height direction. This design ensures that the oil pick up mounted on the crankshaft, which crankshaft is preferably also aligned with the first centre point, is always positioned adjacent to the section of the lower shell part in which the most oil is accumulated in the oil pocket, also when the compressor shell is in an inclined position.

[0016] In a further embodiment variant of the invention it is provided that the curved section of the bottom wall extends from the lower circumferential walls inward, wherein the curved section of the bottom wall is interrupted by four support areas, wherein each mounting pin is located in one of the support areas. An essentially continuously curved shape of the curved section further improves the function of the oil pocket as the oil always accumulates at the lowest point of the curved section even if the compressor shell is mounted on an inclined surface. As the mounting pins require a flat surface for being fixed, preferably welded, to the bottom wall, the support areas for the mounting pins are exempt from the continuously curved section of the bottom wall, but the support areas are accordingly designed to be integrated into the oil pocket.

[0017] According to a further embodiment variant of the invention it is provided that the curved section of the bottom wall is shaped, preferably essentially or at least in sections, spherically. The spherical shape is particularly suitable for forming the oil pocket.

[0018] To allow easy integration of the refrigerant compressor into a refrigerant appliance on the one hand and to allow an optimal positioning of the pump unit, especially of the cylinder head assembly, within the compressor shell a further embodiment variant of the invention provides that a discharge pipe and a maintenance pipe are located in the lower circumferential wall and a suction pipe is located in the upper circumferential wall. While the discharge pipe is connectable to a highpressure side of the refrigerant appliance, the suction pipe is connectable to a low-pressure side of the refrigerant appliance. The maintenance pipe is used to insert the refrigerant and oil into the compressor shell during an initial assembly.

[0019] In order to allow an electric connection between an electronic control unit mounted to the outside of the compressor shell and the electric drive unit, especially with the stator, a further embodiment variant of the in-

vention provides that an electric pass through element is located in the lower circumferential wall. The electric pass through element has, preferably three, pins which are protruding from the side of the compressor shell to the outside of the compressor shell and are connectable to respective sockets of an inner harness and an outer harness. The pins are insulated against a carrier element of the electric pass through element, usually using ceramic insulators. The carrier element can be connected to the lower circumferential wall of the lower shell part by welding.

[0020] For allowing an easy mounting of the electronic control unit to the compressor shell a further embodiment variant of the invention provides that a connection shield for supporting an electronic control unit of the refrigerant compressor is welded to an outer surface of the lower circumferential wall, wherein the connection shield has a shield base plate with an opening and two support arms extending from the base plate, wherein the opening of the base plate surrounds the electric pass through element. The alignment of the electric pass through element and the connection shield secures an easy way of establishing the electric connection between the electronic control unit and the electric pass through element, when the electronic control unit is slid onto the support arms. Further, the base plate can be welded to the lower circumferential wall of the lower shell part.

[0021] In a further embodiment variant of the invention it is provided that the upper shell part has two sets of contacting regions for limiting the movement of inner dampening elements mounted on the pump unit, preferably on a crankcase of the pump unit, wherein each set contains two contacting regions, wherein each contacting region has a first contact area being essentially aligned to the horizontal plane, a second contact area being essentially aligned with a first vertical plane and a third contact area being essentially aligned with a second vertical plane, wherein the first vertical plane is defined by the length direction and the height direction and the second vertical plane is defined by the width direction and the height direction. Because every contacting region of the upper shell part is able to absorb the movement of the pump unit in one specific direction, namely in or against the length direction, in or against the width direction and in or against the height direction, by making contact with an inner dampening element of the pump unit, nearly every possible relative movement of pump unit and compressor shell can be dampened accordingly. It goes without saying that the upper shell part is formed by deep drawing or respective alternative forming operations, so that the contacting areas are partly curved, especially in transition sections, and no sharp edges are possible. Further the functioning of the contact areas can also be achieved when the contact areas are not perfectly aligned with the respective defining planes.

[0022] For mounting and supporting the refrigerant compressor, e.g. within the refrigerant appliance, a further embodiment variant of the invention provides that

two supporting base plates are welded to an outer surface of the bottom wall, wherein each support base plate has a fixing section and a mounting section, wherein the fixing section is welded to the bottom wall and the mounting section has two openings for receiving outer dampening elements, which are preferably part of a support damper assembly, wherein the openings are spaced apart in the length direction. The supporting base plates together with the spaced apart openings for the outer dampening elements provide an increased area of contact for the outer dampening elements, which are preferably made of a rubber material in order to dampen vibrations of the compressor shell so that the adjacent parts of the refrigerant appliance are excited as little as possible. Further the steadiness of the refrigerant compressor is increased.

[0023] In order to be able to further adjust the overall height of the refrigerant compressor a further embodiment variant of the invention provides that the mounting section and the fixing section of the supporting base plates are offset in the height direction by an inclined connection section. Due to the inclination of the inclined section the overall height can be reduced, when the offset is in the positive height direction, i.e. that the mounting section is positioned above the fixing section in a front view. Accordingly the overall height can be increase, when the offset is in the negative height direction, i.e. that the mounting section is positioned below the fixing section in a front view.

[0024] The assembly and the installation can be further simplified in a further embodiment variant of the invention when the mounting section and the fixing section are aligned in parallel to the horizontal plane.

[0025] As discussed above, the mounting pins are preferably positioned in support areas, which have an essentially flat surface. As for the welding-on of the fixing section of the supporting base plates also a flat surface is preferable, a further embodiment variant of the invention provides that welding areas of the fixing section are aligned with support areas for the mounting pins in the horizontal plane.

[0026] The invention further relates to an encapsulated refrigerant compressor having

- a compressor shell, wherein a discharge pipe, a suction pipe and a maintenance pipe enter the compressor shell, wherein an electric pass through element is inserted into the compressor shell;

- a pump unit comprising:

- a cranktrain having a crankshaft, a crank pin, a connecting rod and a piston;
- an electric drive unit having an inner harness, a stator and a rotor, the rotor being fixed to the crankshaft, wherein the inner harness is connecting the electric pass through element and the stator;

- a crankcase with a cylinder housing,
 - wherein a cylinder for reciprocating movement of the piston is located in the cylinder housing, wherein the crankshaft is rotatably mounted in the crankcase,
 - wherein the stator is attached to the cylinder crankcase;
- a cylinder head assembly mounted to the cylinder housing of the crankcase, the cylinder head assembly comprising a valve plate, a suction valve spring, a discharge valve spring, a suction muffler and a discharge muffler, wherein the discharge muffler has a discharge connection tube being connected to the discharge pipe;
- a plurality of support spring assemblies for supporting the compressor body in the compressor shell, wherein the compressor shell is configured according to the invention described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The invention will now be explained in more detail below with reference to a exemplary embodiment. The drawings are provided by way of example and are intended to explain the concept of the invention, but shall in no way restrict it or even render it conclusively, wherein:

- Fig. 1 shows a three dimensional view of a refrigerant compressor from the outside;
- Fig. 2 shows an exploded view of the refrigerant compressor;
- Fig. 3 shows a three dimensional view of an assembled pump unit of the refrigerant compressor;
- Fig. 4 shows a three dimensional view of the refrigerant compressor from the outside from a viewing direction offset by 90° compared to Fig. 1;
- Fig. 5 shows a side view of the refrigerant compressor from the outside;
- Fig. 6 shows a three dimensional view of supporting base plates of the refrigerant compressor;
- Fig. 7 shows a three dimensional view of the refrigerant compressor from the outside from diagonal below;
- Fig. 8 shows a top view of the interior of an upper shell part of a compressor shell of the refrigerant compressor;
- Fig. 9 shows a top view of the interior of a lower shell part of the compressor shell of the refrigerant compressor;
- Fig. 10 shows a sectional view of the refrigerant compressor according to the sectional line C-C in-

dicated in Fig. 5;

- Fig. 11 shows a sectional view of the refrigerant compressor according to the sectional line A-A indicated in Fig. 5;
- Fig. 12 shows a sectional view of the refrigerant compressor according to the sectional line B-B indicated in Fig. 11.

DETAILED DESCRIPTION

[0028] Fig. 1 shows an outside view of an, in particular hermetically, encapsulated refrigerant compressor 1 which extends along a length direction x, a width direction y and a height direction z. Length direction x, width direction y and height direction z form an orthogonal reference system. In general the length dimension of the refrigerant compressor measured along the length direction x is greater than the width dimension measured along the width direction y.

[0029] In the following reference will occasionally be made to a (usually gaseous) refrigerant, which flows through the refrigerant compressor 1. It is self evident that these remarks refer to an operating state of the refrigerant compressor 1, but that usually no refrigerant is present in the refrigerant compressor 1 when the refrigerant compressor 1 is produced or sold as a stand-alone product.

[0030] The refrigerant compressor 1 comprises a compressor shell 100, which in this embodiment consists of a lower shell part 110 and an upper shell part 120. The upper shell part 120 and the lower shell part 110 are welded together. On both sides of the lower shell part 110, which extend mainly in the length direction x, a supporting base plate 160 is fixed to the compressor shell 100. Each supporting base plate 160 has two openings 164 for mounting support damper assemblies 90 (see Fig. 2).

[0031] A suction pipe 30, which is connectable to a low pressure side of a refrigerant appliance, enters the upper shell part 120 on a lateral side of the refrigerant compressor 1. During operation refrigerant is sucked into the refrigerant compressor 1 through the suction pipe 30, mainly during a suction cycle of a pump unit 10 (see Fig. 3) of the refrigerant compressor 1. Therefore, in an operating state, the suction pipe 30 is connected directly or indirectly, e.g. through piping of the low pressure side of the refrigerant appliance, to an evaporator of the refrigerant appliance. With regard to the compressor shell 100, the suction pipe 30 enters the upper shell part 110 through a second connector element 80, which second connector element 80 is hermetically connected to the upper shell part 120 on the one hand and to the suction pipe 30 on the other hand, for example by welding and/or soldering.

[0032] A discharge pipe 20 as well as a maintenance pipe 40 enters the lower shell part 110 on a front side of the refrigerant compressor 1. The discharge pipe 20 enters the lower shell part 110 through a first connector

element 70, which first connector element 70 is hermetically connected to the lower shell part 110 on the one hand and to the discharge pipe 20 or maintenance pipe 40 respectively on the other hand, for example by welding and/or soldering. During operation, refrigerant compressed by the pump unit 10 can escape the refrigerant compressor 1 through the discharge pipe 20, mainly during a compression and discharge cycle of the pump unit 10. Therefore, the discharge pipe 20 is connectable to a high pressure side of the refrigerant appliance to allow compressed refrigerant to be fed to a high pressure side of the refrigerant appliance. In the operation state the discharge pipe 20 is connected directly or indirectly, e.g. through piping of the high pressure side of the refrigerant appliance, to a condenser of the refrigerant appliance.

[0033] The maintenance pipe 40 can be used to insert lubrication oil and/or refrigerant into the refrigerant compressor 1 during assembly of the refrigerant application or during maintenance operations. The maintenance pipe 40 is, similar to the suction pipe 30, connected to the lower shell part 110 by a second connector element 80, which is hermetically connected to the lower shell part 110 on the one hand and to the maintenance pipe 40 on the other hand, for example by welding and/or soldering.

[0034] With regard to Fig. 2 all main components of the refrigerant compressor 1 as well as their functions will be briefly described. The refrigerant compressor 1 comprises the shell 100, an electronic control unit 800, which is detachably mounted to the compressor shell 100, and the pump unit 10 (see Fig. 3), which is located inside the compressor shell 100 and supported by four support spring assemblies 60. The refrigerant compressor 1 is mounted on four support damper assemblies 90, which are connected to the respective openings of the two supporting base plates 160. Each support damper assembly 90 includes a damper pin 92, an outer dampening element 91, a lining disk 93 and a securing element 94.

[0035] As can be seen in Fig. 2, the suction pipe 30 enters the upper shell part 120 through a second connection opening 102, whereas the maintenance pipe 20 enters the lower shell part 110 through a third connection opening 103. Even though not visible in Fig. 2, the discharge pipe 20 enters the lower shell part 110 through a first connection opening 101.

[0036] The pump unit 10 comprises an electric drive unit 400, a cranktrain 200, a crankcase 300 and a cylinder head assembly 500, which includes a suction muffler 600 and a discharge muffler 700.

[0037] Each support spring assembly 60 comprises a mounting pin 140, which is fixed, preferably welded, to the lower shell part 110, a lower spring pin 61, which is mounted on the respective mounting pin 140, and a support spring 62, which is supported on the lower spring pin 61.

[0038] The electric drive unit 400 comprises a stator 420, a rotor 410 and an inner harness 430. The stator

420 has a lower end element 421 made of plastic, which lower end element 421 comprises four upper spring holders 63 for the respective support springs 62. The stator 420 is fixed to the crankcase 300 via two stator mounting screws 340. The inner harness 430 connects the stator 420 with an electric pass through element 50, which is located in the compressor shell 100. On the outside of the compressor 1 the electronic control unit 800 is connected to the electric pass through element 50 via an outer harness 801, in order to control the rotation speed of the pump unit 10.

[0039] The cranktrain 200 comprises a piston 240 and a crankshaft 210, which is rotatably mounted inside a main bearing section 302 of the crankcase 300 on the one hand and axially supported on the crankcase 300 by a ball bearing 201. The crankshaft 210 has a crank pin 220 on which a connecting rod 230 is mounted, which connecting rod 230 connects the crank pin 220 with a piston pin 243 of the piston 240. The piston pin 243 is fixed to the piston 240 via a clamping sleeve 244 that is inserted into a matching axial opening in the piston 240 and the piston pin 243. On a lower end of the crankshaft 210, opposite the end with the crankpin 220, the rotor 410 is mounted to the crankshaft 210, preferably via press fitting. Further an oil pickup 250 for conveying lubricant from a lubricant sump formed in the lower shell part 110 during operation into a lubricant conveying system of the cranktrain 200 is mounted to the rotor 410 via three mounting rivets 251.

[0040] The crankcase 300 includes a cylinder housing 310, in which a cylinder 320 is formed. The piston 240 reciprocates within the cylinder 320 during operation of the refrigerant compressor 1 in order to suck refrigerant into the cylinder 320 during a suction cycle and to compress and discharge the compressed refrigerant during a compression and discharge cycle. On the crankcase 300 a set of two first protrusions 301 is located on the side opposite of the cylinder housing 310 and a set of two second protrusions 311 is located on the cylinder housing 310 itself. Inner dampening elements 330 are attached to each of the first protrusions 301 and second protrusions 311, which inner dampening elements 330 interact with respective regions of an inner surface of the upper housing part 120 in order to dampen vibrations of the pump unit 10 during operation and to prevent damages during transport.

[0041] In order to establish a suction path and a discharge path for the refrigerant from the suction pipe 30 via the cylinder 320 to the discharge pipe 20, the cylinder head assembly 500 is mounted onto a cylinder head section of the cylinder housing 310. The cylinder head assembly 500 comprises a cylinder gasket 510, a suction valve spring 520, a valve plate 530 and a discharge valve spring 540, wherein the valve plate 530 has a suction opening and a discharge opening. The cylinder gasket 510 and the suction valve spring 520 are located on a suction side of the valve plate 530, which suction side faces towards the piston 240. The discharge valve spring

540 is located on a discharge side of the valve plate 530, which faces in the opposite direction of the piston 240. When assembled, the valve plate 530, the suction valve spring 520 and the cylinder gasket 510 are pressed into a valve plate seat 312 of the cylinder housing 310, as will be described below in detail.

[0042] A suction connector head 640 of the suction muffler 600 and a discharge connector head 730 of the discharge muffler 700 are pressed onto the discharge side of the valve plate 530, wherein a first sealing element 550 is placed between the valve plate 530 and the suction connector head 640 as well as the discharge connector head 730 respectively.

[0043] During the suction cycle of the pump unit 10, the piston 240 inside the cylinder 320 moves away from the valve plate 530, so that a negative pressure builds up in the cylinder 320, because the suction valve spring 520 keeps the suction opening of the valve plate 530 closed due to its spring force, while the discharge valve spring 540 closes the discharge opening 532 of the valve plate 530. When the negative pressure exceeds a certain threshold, the suction valve spring 520, which at least has a section configured as a reed valve, opens the suction opening to allow refrigerant to flow from the suction pipe 30 through the suction muffler 600 into the cylinder 320.

[0044] During the compression cycle of the pump unit 10, the piston 240 inside the cylinder 320 moves in the direction of the valve plate 530, so that the refrigerant in the cylinder 320 is compressed, because the discharge valve spring 540 keeps the discharge opening of the valve plate 530 closed due to its spring force, while the suction valve spring 520 keeps the suction opening of the valve plate 530 closed. Once the pressure of the compressed refrigerant exceeds a predefined threshold, the discharge valve spring 540, which is configured as a reed valve, opens the discharge opening of the valve plate 530 to allow refrigerant to flow from the cylinder 320 through the discharge muffler 700 to the discharge tube 20.

[0045] The suction muffler 600 includes a lower housing part 610, an upper housing part 620 and an inner housing element 630, which is inserted into a suction muffler volume defined by the lower housing part 610 and the upper housing part 620 of the suction muffler 600. Refrigerant is sucked into the suction muffler 600 via an inlet opening 621 located in the upper housing part 620 mainly during the suction cycle of the pump unit 10. The suction muffler 600 dampens sound based on the well-known Helmholtz principle when refrigerant flows through it, i.e. by chambers formed within the suction muffler 600 which act as resonators that absorb sound. The refrigerant escapes the suction muffler 600 through the suction connector head 640, which is placed above the suction opening of the valve plate 530 and is located on the upper housing part 620 of the suction muffler 600.

[0046] The discharge muffler 700 includes a lower housing part 710, an upper housing part 720 and the

discharge connector head 730, which is connected to the upper housing part 720 of the discharge muffler 700. During the discharge cycle of the pump unit 10, compressed refrigerant coming from the discharge opening of the valve plate 530 enters the discharge muffler 700 through the discharge connector head 730. The discharge muffler 700 dampens sound based on the well-known Helmholtz principle when refrigerant flows through it, i.e. by chambers formed within the discharge muffler 700 which chambers act as resonators that absorb sound and or by pulsation filtering. The compressed refrigerant escapes the discharge muffler 700 through a discharge connection tube 750, which is connected to the discharge tube 20 via connection sleeve 760 and an O-ring seal 762.

[0047] The mounting of the cylinder head assembly 500 to the cylinder housing 310 is facilitated by a mounting assembly 580 (see Fig. 3), which comprises a clamping element 560 for clamping the valve plate 530 to the valve plate seat 312 and a fixing element 570, which presses the suction connector head 640 and the discharge connector head 730 onto the valve plate 530. The fixing element 570 is latched onto the clamping element 560. The clamping element 560 further comprises two positioning pins 565 (see Fig. 2), which are used for aligning the discharge connector head 730 with the discharge opening and the suction connector head 640 with the suction opening respectively.

[0048] Fig. 3 shows the pump unit 10 of the refrigerant compressor 1 in an assembled state. The suction muffler 600 and the discharge muffler 700 are fixed to the cylinder housing 310 via the clamping element 560 and the fixing element 570 of the mounting assembly 580, while the crankshaft 210 is inserted into the crankcase 300 and the stator 420 is surrounding the rotor 410.

[0049] Fig. 4 shows a three dimensional view of the refrigerant compressor 1 from the outside from a viewing direction offset by 90° compared to Fig. 1. Both the lower shell part 110 and the upper shell part 120 of the compressor shell 100 as well as the two supporting base plates 160 are visible.

[0050] The lower shell part 110 comprises a bottom wall 111 and a lower circumferential wall 112, while the upper shell part 120 comprises a top wall 121 and an upper circumferential wall 122 (see Fig. 5). The top wall 121 forms a top surface of the upper shell part 120 and the upper circumferential wall 122 is acting as a lateral surface of the upper shell part 120. Analogously the bottom wall 111 forms a bottom surface of the lower shell part 110 and the lower circumferential wall 112 is acting as a lateral surface of the lower shell part 110.

[0051] The two supporting base plates 160 are welded to an outer surface 111b of a bottom wall 111 of the lower shell part 110 (compare Fig. 5 and Fig. 7). Each supporting base plate 160 has a fixing section 161 and a mounting section 162, wherein the fixing section 161 comprises welding areas 165, in which the fixing section 161 is welded to the bottom wall 111 - see also Fig. 5, which shows a side view of the refrigerant compressor 1 from the out-

side - and the mounting section 162 has two openings 164 for receiving outer dampening elements 91, wherein the openings 164 are spaced apart in the length direction x. In other words the support damper assemblies 90 are connected to the supporting base plates 160 via the openings 164. The mounting section 162 and the fixing section 161 are offset in the height direction z by an inclined connection section 163. A three dimensional view of the supporting base plates 160 without the compressor shell 100 is visible in Fig. 6, while in Fig. 7, which shows a three dimensional view of the refrigerant compressor 1 from the outside from diagonally below, the mounting of the supporting base plates 160 on the lower shell part 110 of the compressor shell 100 is visible.

[0052] Fig. 8 shows a top view of the interior of the upper shell part 120 of the compressor shell 100 of the refrigerant compressor 1 and Fig. 9 shows a top view of the interior of the corresponding lower shell part 110 of the compressor shell 100 of the refrigerant compressor 1. In both Figures the pump unit 10 is not shown, but it is clearly perceptible that the compressor shell 100 consisting of upper shell part 120 and lower shell part 110 encloses an inner containing space 130 for housing the pump unit 10.

[0053] Four mounting pins 140 are extending from the bottom wall 111 into the containing space 130 (see Fig. 2), wherein the pins 140 are arranged in a rectangular shape, which is aligned with the length direction x and with the width direction y. A first centre point C_1 of the pins 140 in a horizontal plane h is offset in the direction x with regard to a second centre point C_2 of an outline of the compressor shell 100 in the horizontal plane h. A curved section 111a of the bottom wall 111 is spherically curved in order to form an oil pocket 104, which lowest point, seen in the height direction z, is aligned with the first centre point C_1 in the horizontal plane h (see Fig. 9). On each mounting pin 140 a lower spring pin 61 is mounted (compare Fig. 2), which lower spring pin 61 is a part of one of the four support spring assemblies 60, on which the pump unit 10 is mounted within the compressor shell 100. In Figs. 9 and 10 the lower spring pins 61 and the support springs 62 are already mounted on the mounting pins 140, therefore the mounting pins 140 are invisible. However as the mounting pins 140 and the lower spring pins 61 are aligned, the positioning of the mounting pins 140 can easily be derived from the shown positioning of the lower spring pins 61.

[0054] The curved section 111a extends from the lower circumferential wall 112 inward, wherein the curved section 111a of the bottom wall 111 is interrupted by four support areas 113. Each of the four mounting pins 140 is located on one of the support areas 113 (see Fig. 9), wherein the support areas 113 are designed as plateaus within the curved section 111a of the bottom wall 111. The mounting pins 140 are welded to the respective support areas 113 in order to define the position of the support spring assemblies 60 and thereby fix the lower spring pins 61 of the support spring assemblies 60 relative to

the compressor shell 100 during operation and transportation. As can be seen in Figs. 11 and 12, an oil sump forms within the oil pocket 104 during operation of the refrigerant compressor 1, which oil sump is also bounded by a lower end of the lower circumferential wall 112 which forms the transition between lower circumferential wall 112 and bottom wall 111.

[0055] A connection shield 150 is welded to an outer surface 112a of the lower circumferential wall 112, wherein the connection shield 150 has a shield base plate 151 with an opening 152 for the electric pass through element 50 of the compressor 1, and wherein two support arms 153 extend from the shield base plate 151 and the opening 152 of the base plate 151 (see Fig. 4). The connection shield 150 is usually formed as an integral metal part so that the support arms 153 can be produced by bending two opposite ends of the connection shield 150. The support arms 153 are slightly bent inwards towards each other, which makes it easier to slide clips 806,807 of the electronic control unit 800 onto the support arms 153, so that the support arms 153 are situated between the clips 806,807 in the mounted state of the refrigerant compressor 1. This can be seen in Fig. 9 as well as in Fig. 10, wherein Fig. 10 shows a sectional view of the refrigerant compressor 1 without the pump unit 10 according to the sectional line C-C indicated in Fig. 5. I.e. the sectional line in Fig. 10 runs through the lower circumferential wall 112 of the lower shell part 110 as well as through the electric pass through element 50, the connection shield 150 and the electronic control unit 800, wherein the electronic control unit 800 is not visible in Fig. 5.

[0056] The upper shell part 120 comprises two sets of contacting regions 123 for limiting the movement of inner dampening elements 330 mounted on the pump unit 10. These regions 123 and/or corresponding dampening elements 330 are visible in Figs. 8, 11 and 12, wherein Fig. 11 shows a sectional view of the refrigerant compressor 1 according to the sectional line A-A indicated in Fig. 5 and Fig. 12 shows a sectional view of the refrigerant compressor 1 according to the sectional line B-B indicated in Fig. 11. Each set of contacting regions 123 contains two contacting regions 123, wherein each contacting region 123 has

- a first contact area being essentially aligned to the horizontal plane h,
- a second contact area being essentially aligned with a first vertical plane v_1 and
- a third contact area being essentially aligned with a second vertical plane v_2 .

[0057] The first vertical plane v_1 is defined by the length direction x as well as the height direction z and the second vertical plane v_2 is defined by the width direction y and the height direction z (compare Fig. 4).

[0058] It is self evident that even though each contact area is essentially aligned with one of the planes, the

contact areas do not have to be mathematically precise. In fact each contact area may be slightly curved in order to facilitate easy production and there are curved transition areas connecting the contact areas of one contact region 123.

[0059] The inner dampening elements 330 prevent the pump unit 10 from making contact with the top wall 121 of the upper shell part 120, since every movement or deflection of the pump unit 10 brings about a corresponding deflection of the inner dampening elements 330.

[0060] Referring to Fig. 8, the interaction of the inner dampening element 330, which is located in the upper left contacting region 123 and the respective contacting region 123 is intended to limit the movement of the pump unit 10 along the positive height direction z, along the negative length direction x as well as along the negative width direction y.

[0061] The interaction of the inner dampening element 330, which is located in the lower left contacting region 123 (see Fig. 8), and the respective contacting region 123 is intended to limit the movement of the pump unit 10 along the positive height direction z, along the negative length direction x as well as along the positive width direction y.

[0062] The interaction of the inner dampening element 330, which is located in the upper right contacting region 123 (see Fig. 8), and the respective contacting region 123 is intended to limit the movement of the pump unit 10 along the positive height direction z, along the positive length direction x as well as along the positive width direction y.

[0063] The interaction of the inner dampening element 330, which is located in the lower right contacting region 123 (see Fig. 8), and the respective contacting region 123 is intended to limit the movement of the pump unit 10 along the positive height direction z, along the positive length direction x as well as along the negative width direction y.

[0064] All four inner dampening elements 330 together with their respective contact areas 123 limit the movement of the pump unit 10 in the positive height direction z, in positive and negative length direction x as well as in positive and negative width direction y.

[0065] Figs. 11 and 12 show the refrigerant compressor 1 in an operating condition, where the pump unit 10 is located inside the compressor shell 100 and mounted on the support spring assemblies 60, wherein each support spring assembly 60 is mounted on one of the mounting pins 140. In detail for each support spring assembly 60 the lower spring pin 61 is mounted onto the respective mounting pin 140 and the support spring 61 connects the lower spring pin 61 with the upper spring holder 63 of the pump unit 10. Further oil is in the oil pocket 104 and the support damper assembly 90 is mounted on the supporting base plates 160. The oil pocket 104 is essentially formed by the lower curved section 111a of the bottom wall 111 and the bottom wall 111. The advantage of this design is that - even if the refrigerant compressor 1 is

inclined, as shown in Fig. 11 - the oil pick-up 250 mounted to the lower end of the crankshaft 210 is still submerged in the oil sump thanks to the curvature of the curved section 111a of the bottom wall 111.

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Reference Numerals

[0066]

10	1	Refrigerant Compressor
	10	Pump Unit
	20	Discharge Pipe
	30	Suction Pipe
	40	Maintenance Pipe
15	50	Electric Pass Through Element
	60	Support Spring Assembly
	61	Lower Spring Pin
	62	Support Spring
	63	Upper Spring Holder
20	70	First Connector Element
	80	Second Connector Element
	90	Support Damper Assembly
	91	Outer Dampening Element
	92	Damper Pin
25	93	Lining Disk
	94	Securing Element
	100	Compressor Shell
	101	First Connection Opening
	102	Second Connection Opening
30	103	Third Connection Opening
	104	Oil Pocket
	110	Lower Shell Part
	111	Bottom Wall
	111a	Curved Section of the Bottom Wall
35	111b	Outer Surface of the Bottom Wall
	112	Lower Circumferential Wall
	112a	Outer Surface of the Lower Circumferential Wall
	113	Support Area
	120	Upper Shell Part
40	121	Top Wall
	122	Upper Circumferential Wall
	123	Contacting Region
	130	Inner Containing Space
	140	Mounting Pin
45	150	Connection Shield
	151	Shield Base Plate
	152	Opening of the Connection Shield
	153	Support Arm
	160	Supporting Base Plate
50	161	Fixing Section of the Supporting Base Plate
	162	Mounting Section of the Supporting Base Plate
	163	Connection Section of the Supporting Base Plate
	164	Opening of the Supporting Base Plate
55	165	Welding area of the fixing section
	200	Cranktrain
	201	Ball Bearing
	210	Crankshaft

220	Crankpin	
230	Connecting Rod	
240	Piston	
243	Piston Pin	
244	Clamping Sleeve	5
250	Oil Pickup	
251	Mounting Rivet	
300	Crankcase	
301	First Protrusion	
302	Main Bearing	10
310	Cylinder Housing	
311	Second Protrusion	
312	Valve Plate Seat	
320	Cylinder	
330	Inner Dampening Elements	15
340	Stator Mounting Screw	
400	Electric Drive Unit	
410	Rotor	
420	Stator	
421	Lower End Element	20
430	Inner Harness	
500	Cylinder Head Assembly	
510	Cylinder Gasket	
520	Suction Valve Spring	
530	Valve Plate	25
540	Discharge Valve Spring	
550	First Sealing Element	
560	Clamping Element	
565	Positioning Pins	
570	Fixing Element	30
580	Mounting Assembly	
600	Suction Muffler	
610	Lower Housing Part of the Suction Muffler	
620	Upper Housing Part of the Suction Muffler	
621	Inlet Opening	35
630	Inner Housing Element	
640	Suction Connector Head	
700	Discharge Muffler	
710	Lower Housing Part of the Discharge Muffler	
720	Upper Housing Part of the Discharge Muffler	40
730	Discharge Connector Head	
750	Discharge Connection Tube	
760	Connection Sleeve	
800	Electronic Control Unit	
x	Length Direction	45
y	Width Direction	
z	Height Direction	
h	Horizontal Plane	
v ₁	First Vertical Plane	
v ₂	Second Vertical Plane	50
C ₁	First Centre Point	
C ₂	Second Centre Point	

Claims

1. A compressor shell (100) for a refrigerant compressor (1) comprising a lower shell part (110) and an

upper shell part (120);

wherein the compressor shell (100) encloses an inner containing space (130) for housing a pump unit (10) of the refrigerant compressor (1); wherein the compressor shell (100) extends along a length direction (x), a width direction (y) and a height direction (z), wherein the length direction (x) and the width direction (y) define a horizontal plane (h); wherein the lower shell part (110) comprises a bottom wall (111) and a lower circumferential wall (112); wherein the upper shell part (120) comprises a top wall (121) and an upper circumferential wall (122); wherein four mounting pins (140) are extending from the bottom wall (111) into the containing space (130), wherein each mounting pin (140) is configured to mount a support spring assembly (60) for supporting the pump unit (10), wherein the four mounting pins (140) are arranged in a rectangular shape being aligned with the length direction (x) and the width direction (y),

characterized in that

a first centre point (C₁) of the four mounting pins (140) in the horizontal plane (h) is offset in the length direction (x) with regard to a second centre point (C₂) of an outline of the compressor shell (100) in the horizontal plane (h)

and that

a curved section (111a) of the bottom wall (111) is convexly curved in order to form an oil pocket (104), wherein a lowest point of the oil pocket (104), seen in the height direction (z), is aligned with the first centre point (C₁) in the horizontal plane (h).

2. The compressor shell (100) according to claim 1, **characterized in that** the curved section (111a) of the bottom wall (111) extends from the lower circumferential walls (112) inward, wherein the curved section (111a) of the bottom wall (111) is interrupted by four support areas (113), wherein each mounting pin (140) is located in one of the support areas (113).
3. The compressor shell (100) according to claim 2, **characterized in that** the curved section (111a) of the bottom wall (111) is shaped spherically.
4. The compressor shell (100) according to any one of claims 1 to 3, **characterized in that** a discharge pipe (20) and a maintenance pipe (40) are located in the lower circumferential wall (112) and a suction pipe (30) is located in the upper circumferential wall (122).
5. The compressor shell (100) according to any one of claims 1 to 4, **characterized in that** an electric pass through element (50) is located in the lower circum-

ferential wall (112) .

6. The compressor shell (100) according to claim 5, **characterized in that** a connection shield (150) for supporting an electronic control unit (800) of the refrigerant compressor (1) is welded to an outer surface (112a) of the lower circumferential wall (112), wherein the connection shield (150) has a shield base plate (151) with an opening (152) and two support arms (153) extending from the base plate (151), wherein the opening (152) of the base plate (151) surrounds the electric pass through element (50).

7. The compressor shell (100) according to any one of claims 1 to 6, **characterized in that** the upper shell part (120) has two sets of contacting regions (123) for limiting the movement of inner dampening elements (330) mounted on the pump unit (10),

wherein each set contains two contacting regions (123), wherein each contacting region (123) has a first contact area being essentially aligned to the horizontal plane (h), a second contact area being essentially aligned with a first vertical plane (v_1) and a third contact area being essentially aligned with a second vertical plane (v_2),

wherein the first vertical plane (v_1) is defined by the length direction (x) and the height direction (z) and the second vertical plane (v_2) is defined by the width direction (y) and the height direction (z).

8. The compressor shell (100) according to any one of claims 1 to 7, **characterized in that** two supporting base plates (160) are welded to an outer surface (111b) of the bottom wall (111), wherein each support base plate (160) has a fixing section (161) and a mounting section (162), wherein the fixing section (161) is welded to the bottom wall (111) and the mounting section (162) has two openings (164) for receiving outer dampening elements (91), wherein the openings (164) are spaced apart in the length direction (x).

9. The compressor shell (100) according to claim 8, **characterized in that** the mounting section (162) and the fixing section (161) of the supporting base plates (160) are offset in the height direction (z) by an inclined connection section (163).

10. The compressor shell (100) according to claim 8 or 9, **characterized in that** the mounting section (162) and the fixing section (161) are aligned in parallel to the horizontal plane (h).

11. The compressor shell (100) according to any one of claims 8 to 10, **characterized in that** welding areas

(165) of the fixing section (161) are aligned with support areas (113) for the mounting pins (140) in the horizontal plane (h).

12. An encapsulated refrigerant compressor (1) having

- a compressor shell (100), wherein a discharge pipe (20), a suction pipe (30) and a maintenance pipe (40) enter the compressor shell (100), wherein an electric pass through element (50) is inserted into the compressor shell (100);
- a pump unit (10) comprising:

-- a cranktrain (200) having a crankshaft (210), a crank pin (220), a connecting rod (230) and a piston (240);

-- an electric drive unit (400) having an inner harness (430), a stator (420) and a rotor (410), the rotor (410) being fixed to the crankshaft (210), wherein the inner harness (430) is connecting the electric pass through element (50) and the stator (420);

-- a crankcase (300) with a cylinder housing (310),

wherein a cylinder (320) for reciprocating movement of the piston (240) is located in the cylinder housing (310), wherein the crankshaft (210) is rotatably mounted in the crankcase (300), wherein the stator (420) is attached to the crankcase (300) ;

-- a cylinder head assembly (500) mounted to the cylinder housing (310) of the crankcase (300), the cylinder head assembly (500) comprising a valve plate (530), a suction valve spring (520), a discharge valve spring (540), a suction muffler (600) and a discharge muffler (700), wherein the discharge muffler (700) has a discharge connection tube (750) being connected to the discharge pipe (20);

- a plurality of support spring assemblies (60) for supporting the pump unit (10) in the compressor shell (100),

wherein the compressor shell (100) is configured according to any one of claims 1 to 11.

Patentansprüche

1. Verdichtergehäuse (100) für einen Kältemittelverdichter (1), umfassend ein unteres Gehäuseeteil (110) und ein oberes Gehäuseeteil (120);

- wobei das Verdichtergehäuse (100) einen inneren Aufnahmeraum (130) zum Aufnehmen einer Pumpeneinheit (10) des Kältemittelverdichters (1) umschließt;
- wobei sich das Verdichtergehäuse (100) entlang einer Längenrichtung (x), einer Breitenrichtung (y) und einer Höhenrichtung (z) erstreckt, wobei die Längenrichtung (x) und die Breitenrichtung (y) eine horizontale Ebene (h) definieren;
- wobei das untere Gehäuseteil (110) eine untere Wand (111) und eine untere Umfangswand (112) umfasst;
- wobei das obere Gehäuseteil (120) eine obere Wand (121) und eine obere Umfangswand (122) umfasst;
- wobei sich vier Montagestifte (140) von der unteren Wand (111) in den Aufnahmeraum (130) erstrecken,
- wobei jeder Montagestift (140) dazu eingerichtet ist, eine Stützfederanordnung (60) zum Stützen der Pumpeneinheit (10) zu befestigen,
- wobei die vier Montagestifte (140) in einer Rechteckform angeordnet sind, welche Rechteckform zur Längenrichtung (x) und Breitenrichtung (y) ausgerichtet ist,
- dadurch gekennzeichnet, dass**
- ein erster Mittelpunkt (C_1) der vier Montagestifte (140) in der horizontalen Ebene (h) in Bezug auf einen zweiten Mittelpunkt (C_2) eines Umrisses des Verdichtergehäuses (100) in der horizontalen Ebene (h) in der Längenrichtung (x) versetzt ist,
- und dass**
- ein gewölbter Abschnitt (111a) der unteren Wand (111) konvex gewölbt ist, um eine Öltasche (104) zu bilden, wobei ein in Höhenrichtung gesehen unterster Punkt der Öltasche (104) in der horizontalen Ebene (h) bündig zum ersten Mittelpunkt (C_1) ausgerichtet ist.
2. Verdichtergehäuse (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** sich der gewölbte Abschnitt (111a) der unteren Wand (111) von den unteren Umfangswänden (112) nach innen erstreckt, wobei der gewölbte Abschnitt (111a) der unteren Wand (111) durch vier Stützbereiche (113) unterbrochen ist, wobei sich jeder Montagestift (140) in einem der Stützbereiche (113) befindet.
 3. Verdichtergehäuse (100) nach Anspruch 2, **dadurch gekennzeichnet, dass** der gewölbte Abschnitt (111a) der unteren Wand (111) sphärisch geformt ist.
 4. Verdichtergehäuse (100) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** sich in der unteren Umfangswand (112) eine Auslassleitung (20) und eine Wartungsleitung (40) befinden und sich in der oberen Umfangswand (122) eine Saugleitung (30) befindet.
 5. Verdichtergehäuse (100) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** sich in der unteren Umfangswand (112) ein elektrisches Durchgangselement (50) befindet.
 6. Verdichtergehäuse (100) nach Anspruch 5, **dadurch gekennzeichnet, dass** an eine Außenfläche (112a) der unteren Umfangswand (112) ein Verbindungsschild (150) zum Stützen einer elektronischen Steuereinheit (800) des Kältemittelverdichters (1) angeschweißt ist, wobei das Verbindungsschild (150) eine Schildbasisplatte (151) mit einer Öffnung (152) und zwei sich von der Basisplatte (151) erstreckenden Stützarmen (153) aufweist, wobei die Öffnung (152) der Basisplatte (151) das elektrische Durchgangselement (50) umgibt.
 7. Verdichtergehäuse (100) nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das obere Gehäuseteil (120) zwei an der Pumpeneinheit (10) montierte Sätze von Kontaktregionen (123) zum Begrenzen der Bewegung innerer Dämpfungselemente (330) aufweist, wobei jeder Satz zwei Kontaktregionen (123) umfasst, wobei jede Kontaktregion (123) einen im Wesentlichen auf die horizontale Ebene (h) ausgerichteten ersten Kontaktbereich, einen im Wesentlichen auf eine erste vertikale Ebene (v_1) ausgerichteten zweiten Kontaktbereich und einen im Wesentlichen auf eine zweite vertikale Ebene (v_2) ausgerichteten dritten Kontaktbereich aufweist, wobei die erste vertikale Ebene (v_1) durch die Längenrichtung (x) und die Höhenrichtung (z) definiert ist und die zweite vertikale Ebene (v_2) durch die Breitenrichtung (y) und die Höhenrichtung (z) definiert ist.
 8. Verdichtergehäuse (100) nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** an eine Außenfläche (111b) der unteren Wand (111) zwei Stützbasisplatten (160) geschweißt sind, wobei jede Stützbasisplatte (160) einen Befestigungsabschnitt (161) und einen Montageabschnitt (162) aufweist, wobei der Befestigungsabschnitt (161) an die untere Wand (111) geschweißt ist und der Montageabschnitt (162) zwei Öffnungen (164) zum Aufnehmen äußerer Dämpfungselemente (91) aufweist, wobei die Öffnungen (164) in der Längenrichtung (x) beabstandet sind.

9. Verdichtergehäuse (100) nach Anspruch 8, **dadurch gekennzeichnet, dass** der Montageabschnitt (162) und der Befestigungsabschnitt (161) der Stützbasisplatten (160) in der Höhenrichtung (z) durch einen geneigten Verbindungsabschnitt (163) versetzt sind. 5
10. Verdichtergehäuse (100) nach Anspruch 8 oder 9, **dadurch gekennzeichnet, dass** der Montageabschnitt (162) und der Befestigungsabschnitt (161) parallel zur horizontalen Ebene (h) ausgerichtet sind. 10
11. Verdichtergehäuse (100) nach einem der Ansprüche 8 bis 10, **dadurch gekennzeichnet, dass** in der horizontalen Ebene (h) Schweißbereiche (165) des Befestigungsabschnitts (161) bündig mit den Stützbereichen (113) für die Montagestifte (140) angeordnet sind. 20
12. Gekapselter Kältemittelverdichter (1), aufweisend:
- ein Verdichtergehäuse (100), wobei in das Verdichtergehäuse (100) eine Auslassleitung (20), eine Saugleitung (30) und eine Wartungsleitung (40) eintreten, wobei in das Verdichtergehäuse (100) ein elektrisches Durchgangselement (50) eingesetzt ist; 25
 - eine Pumpeneinheit (10), umfassend:
 - - einen Kurbeltrieb (200) mit einer Kurbelwelle (210), einem Pleuelzapfen (220), einem Pleuel (230) und einem Pleuelbolzen (240); 30
 - - eine elektrische Antriebseinheit (400) mit einem inneren Kabelstrang (430), einem Stator (420) und einem Rotor (410), wobei der Rotor (410) an der Kurbelwelle (210) befestigt ist, wobei der innere Kabelstrang (430) das elektrische Durchgangselement (50) und den Stator (420) verbindet; 35
 - - ein Pleuellagergehäuse (300) mit einem Pleuellagergehäuse (310), wobei ein Pleuellager (320) für eine Hubbewegung des Pleuels (240) im Pleuellagergehäuse (310) angeordnet ist, wobei die Pleuelwelle (210) drehbar im Pleuellagergehäuse (300) gelagert ist, wobei der Stator (420) am Pleuellagergehäuse (300) befestigt ist; 40
 - - eine Pleuellagerkopfmontage (500), montiert am Pleuellagergehäuse (310) des Pleuellagergehäuses (300), wobei die Pleuellagerkopfmontage (500) eine Pleuellagerplatte (530), eine Pleuellagerfedernfeder (520), eine Pleuellagerfedernfeder (540), einen Pleuellagerfedernschalldämpfer (600) und einen Pleuellagerfedernschalldämpfer (700) umfasst, wobei der Pleuellagerfedernschalldämpfer (700) ein mit der Pleuellagerleitung (20) verbundenes Pleuellagerverbindungsrohr 45

(750) aufweist;

- eine Vielzahl von Stützfederanordnungen (60) zum Stützen der Pumpeneinheit (10) im Verdichtergehäuse (100),

wobei das Verdichtergehäuse (100) nach einem der Ansprüche 1 bis 11 ausgebildet ist.

Revendications

1. Coque de compresseur (100) pour un compresseur frigorifique (1) comprenant une pièce de coque inférieure (110) et une pièce de coque supérieure (120) ;

dans laquelle la coque de compresseur (100) renferme un espace contenant intérieur (130) pour accueillir une unité de pompe (10) du compresseur frigorifique (1) ;

dans laquelle la coque de compresseur (100) s'étend le long d'une direction de la longueur (x), d'une direction de la largeur (y) et d'une direction de la hauteur (z), dans laquelle la direction de la longueur (x) et la direction de la largeur (y) définissent un plan horizontal (h) ;

dans laquelle la pièce de coque inférieure (110) comprend une paroi inférieure (111) et une paroi circonférentielle inférieure (112) ; dans laquelle la pièce de coque supérieure (120) comprend une paroi supérieure (121) et une paroi circonférentielle supérieure (122) ;

dans laquelle quatre ergots de montage (140) s'étendent depuis la paroi inférieure (111) dans l'espace contenant (130), dans laquelle chaque ergot de montage (140) est conçu pour monter un ensemble de ressort de soutien (60) pour soutenir l'unité de pompe (10), dans laquelle les quatre ergots de montage (140) sont agencés en une forme rectangulaire qui est alignée sur la direction de la longueur (x) et la direction de la largeur (y),

caractérisée en ce que

un premier point central (C_1) des quatre ergots de montage (140) dans le plan horizontal (h) est décalé dans la direction de la longueur (x) par rapport à un second point central (C_2) d'un contour de la coque de compresseur (100) dans le plan horizontal (h)

et en ce que

une section incurvée (111a) de la paroi inférieure (111) est incurvée de manière convexe afin de former une poche d'huile (104), dans laquelle un point le plus bas de la poche d'huile (104), observé dans la direction de la hauteur (z), est aligné avec le premier point central (C_1) dans le plan horizontal (h).

2. Coque de compresseur (100) selon la revendication 1, **caractérisée en ce que** la section incurvée (111a) de la paroi inférieure (111) s'étend depuis les parois circonférentielles inférieures (112) vers l'intérieur, dans laquelle la section incurvée (111a) de la paroi inférieure (111) est interrompue par quatre zones de soutien (113), dans laquelle chaque ergot de montage (140) est situé dans l'une des zones de soutien (113).
3. Coque de compresseur (100) selon la revendication 2, **caractérisée en ce que** la section incurvée (111a) de la paroi inférieure (111) est de forme sphérique.
4. Coque de compresseur (100) selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** un tuyau d'évacuation (20) et un tuyau d'entretien (40) sont situés dans la paroi circonférentielle inférieure (112) et un tuyau d'aspiration (30) est situé dans la paroi circonférentielle supérieure (122).
5. Coque de compresseur (100) selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** un élément de passage électrique (50) est situé dans la paroi circonférentielle inférieure (112).
6. Coque de compresseur (100) selon la revendication 5, **caractérisée en ce que** un écran de liaison (150) pour soutenir une unité de commande électronique (800) du compresseur frigorifique (1) est soudé à une surface extérieure (112a) de la paroi circonférentielle inférieure (112), dans laquelle l'écran de liaison (150) a une plaque d'embase d'écran (151) avec une ouverture (152) et deux bras de soutien (153) s'étendant depuis la plaque d'embase (151), dans laquelle l'ouverture (152) de la plaque d'embase (151) entoure l'élément de passage électrique (50).
7. Coque de compresseur (100) selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** la pièce de coque supérieure (120) a deux jeux de régions de contact (123) pour limiter le mouvement d'éléments amortisseurs intérieurs (330) montés sur l'unité de pompe (10),

dans laquelle chaque jeu contient deux régions de contact (123), dans laquelle chaque région de contact (123) a une première zone de contact essentiellement alignée avec le plan horizontal (h), une deuxième zone de contact essentiellement alignée avec un premier plan vertical (v_1) et une troisième zone de contact essentiellement alignée avec un second plan vertical (v_2), dans laquelle le premier plan vertical (v_1) est défini par la direction de la longueur (x) et la direction de la hauteur (z) et le second plan vertical (v_2) est défini par la direction de la largeur

(y) et la direction de la hauteur (z).

8. Coque de compresseur (100) selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** deux plaques d'embase de soutien (160) sont soudées à une surface extérieure (111b) de la paroi inférieure (111), dans laquelle chaque plaque d'embase de soutien (160) a une section de fixation (161) et une section de montage (162), dans laquelle la section de fixation (161) est soudée à la paroi inférieure (111) et la section de montage (162) a deux ouvertures (164) pour recevoir des éléments amortisseurs extérieurs (91), dans laquelle les ouvertures (164) sont espacées l'une de l'autre dans la direction de la longueur (x).
9. Coque de compresseur (100) selon la revendication 8, **caractérisée en ce que** la section de montage (162) et la section de fixation (161) des plaques d'embase de soutien (160) sont décalées dans la direction de la hauteur (z) par une section de liaison inclinée (163).
10. Coque de compresseur (100) selon la revendication 8 ou 9, **caractérisée en ce que** la section de montage (162) et la section de fixation (161) sont alignées en parallèle du plan horizontal (h).
11. Coque de compresseur (100) selon l'une quelconque des revendications 8 à 10, **caractérisée en ce que** les zones de soudage (165) de la section de fixation (161) sont alignées avec des zones de soutien (113) pour les ergots de montage (140) dans le plan horizontal (h).
12. Compresseur frigorifique encapsulé (1) ayant
- une coque de compresseur (100), dans lequel un tuyau d'évacuation (20), un tuyau d'aspiration (30) et un tuyau d'entretien (40) entrent dans la coque de compresseur (100), dans lequel un élément de passage électrique (50) est inséré dans la coque de compresseur (100) ;
 - une unité de pompe (10) comprenant :

- un train de vilebrequin (200) ayant un vilebrequin (210), un maneton (220), une tige de liaison (230) et un piston (240) ;
- une unité d'entraînement électrique (400) ayant un faisceau intérieur (430), un stator (420) et un rotor (410), le rotor (410) étant fixé au vilebrequin (210), dans lequel le faisceau intérieur (430) est relié à l'élément de passage électrique (50) et au stator (420) ;
- un carter (300) avec un carter-cylindre (310), dans lequel un cylindre (320) pour le mouvement alternatif du piston (240) est si-

tué dans le carter-cylindre (310), dans lequel le vilebrequin (210) est monté en rotation dans le carter (300), dans lequel le stator (420) est attaché au carter (300) ; 5

-- un ensemble de culasse de cylindre (500) monté sur le carter-cylindre (310) du carter (300), l'ensemble de culasse de cylindre (500) comprenant un plateau de distribution (530), un ressort de soupape d'aspiration (520), un ressort de soupape d'évacuation (540), un atténuateur d'aspiration (600) et un atténuateur d'évacuation (700), dans lequel l'atténuateur d'évacuation (700) a un tube de liaison d'évacuation (750) relié au tuyau d'évacuation (20) ; 10 15

- une pluralité d'ensembles de ressort de soutien (60) pour soutenir l'unité de pompe (10) dans la coque de compresseur (100), dans lequel la coque de compresseur (100) est conçue selon l'une quelconque des revendications 1 à 11. 20

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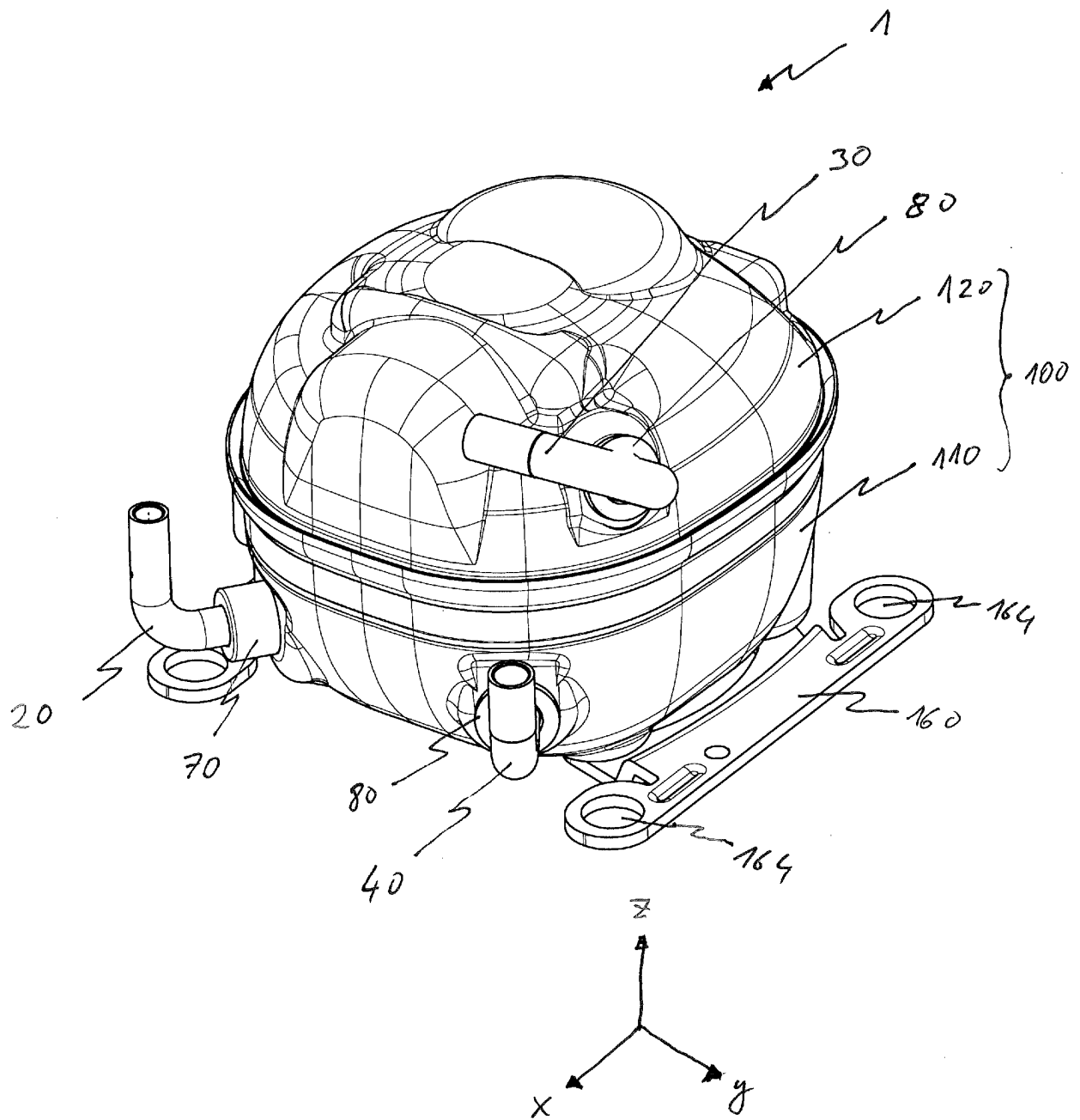


Fig. 1

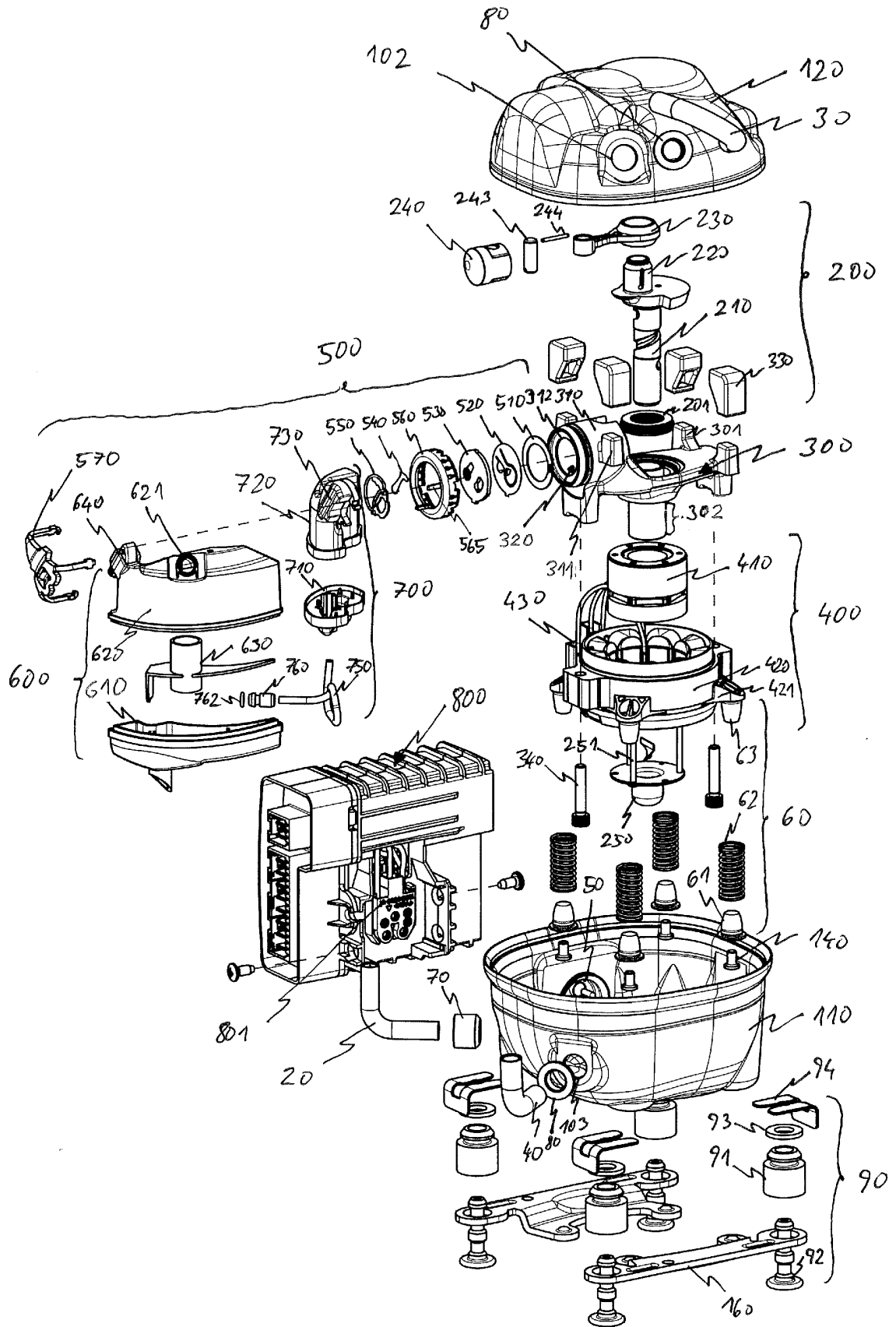


Fig. 2

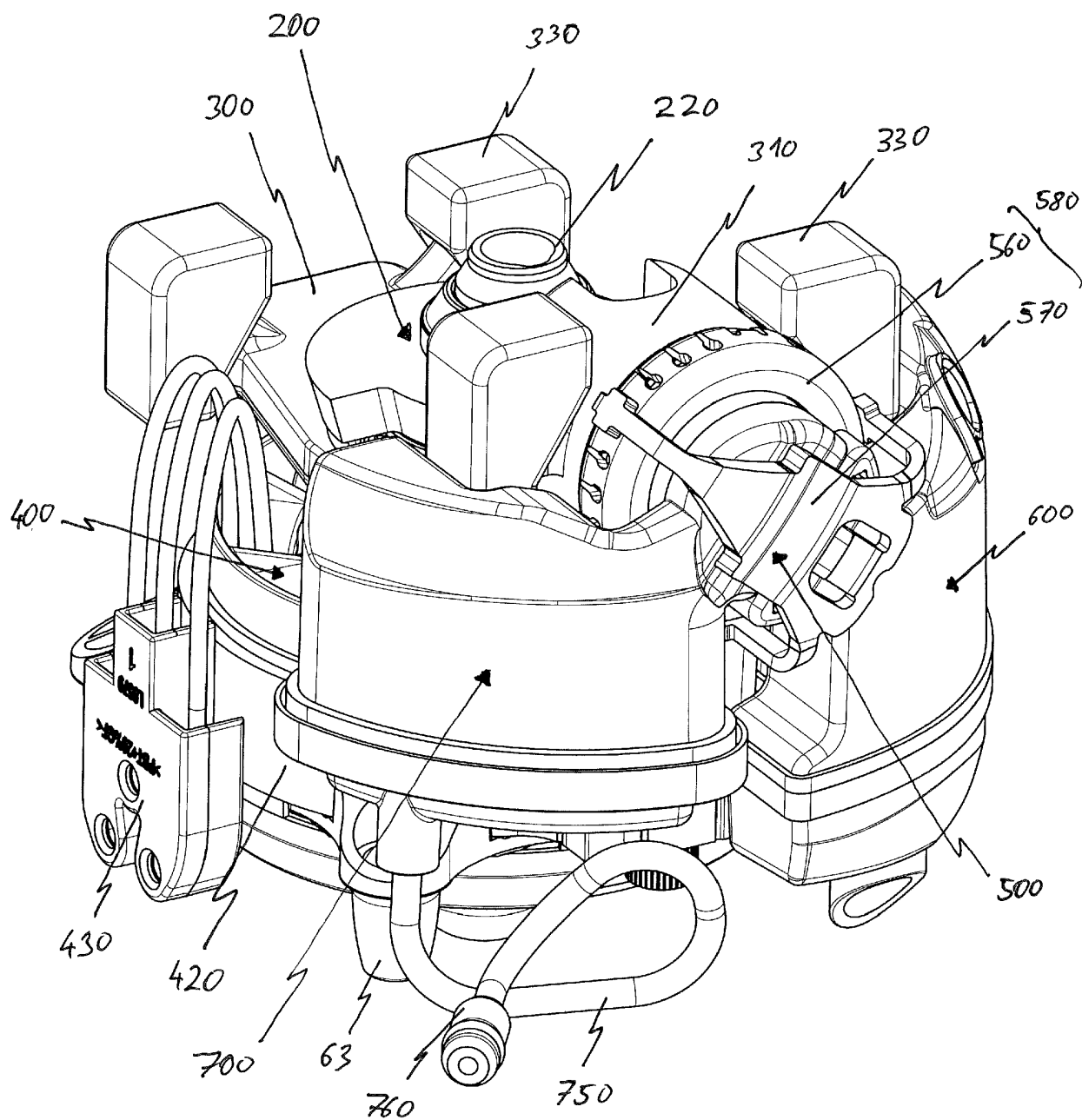


Fig. 3

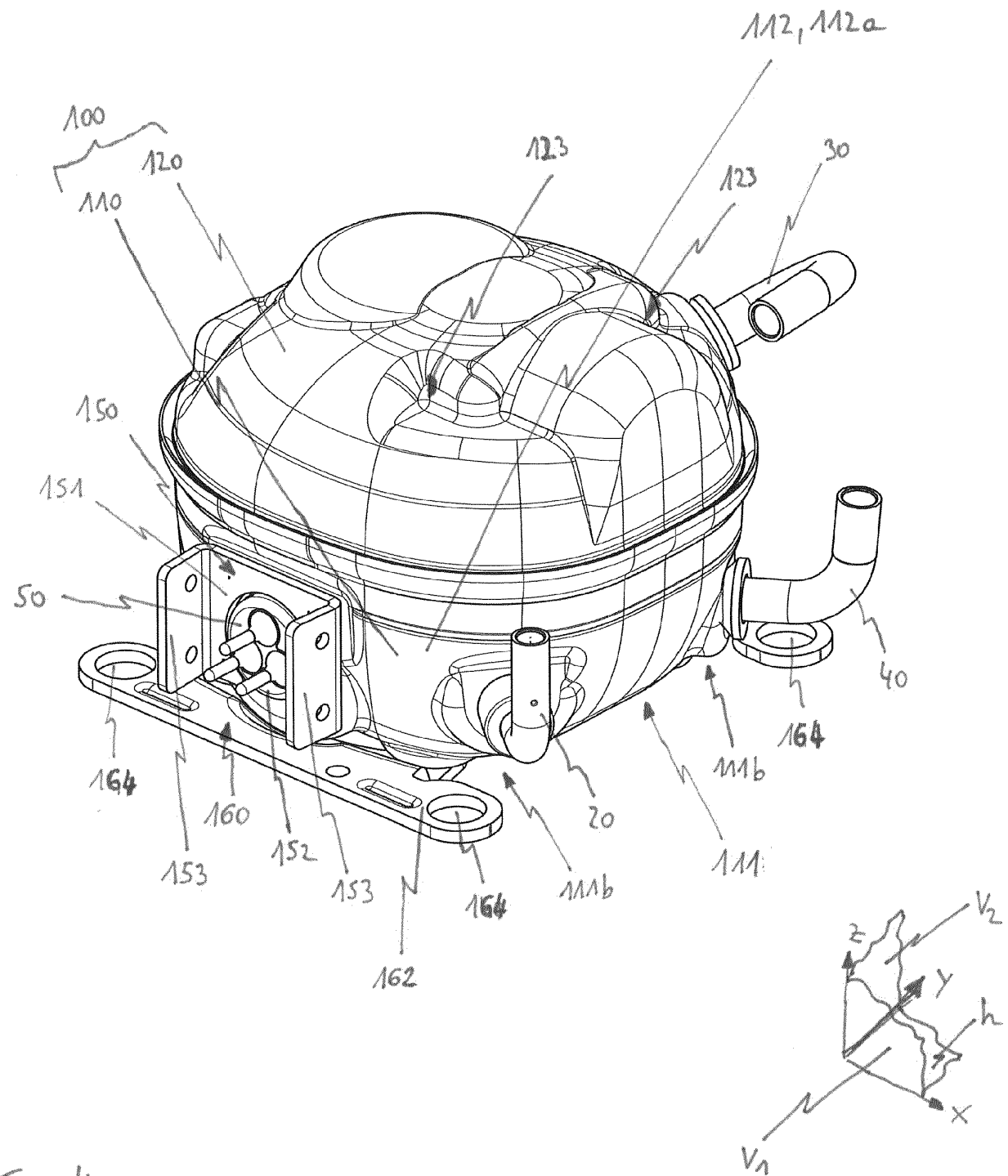


Fig. 4

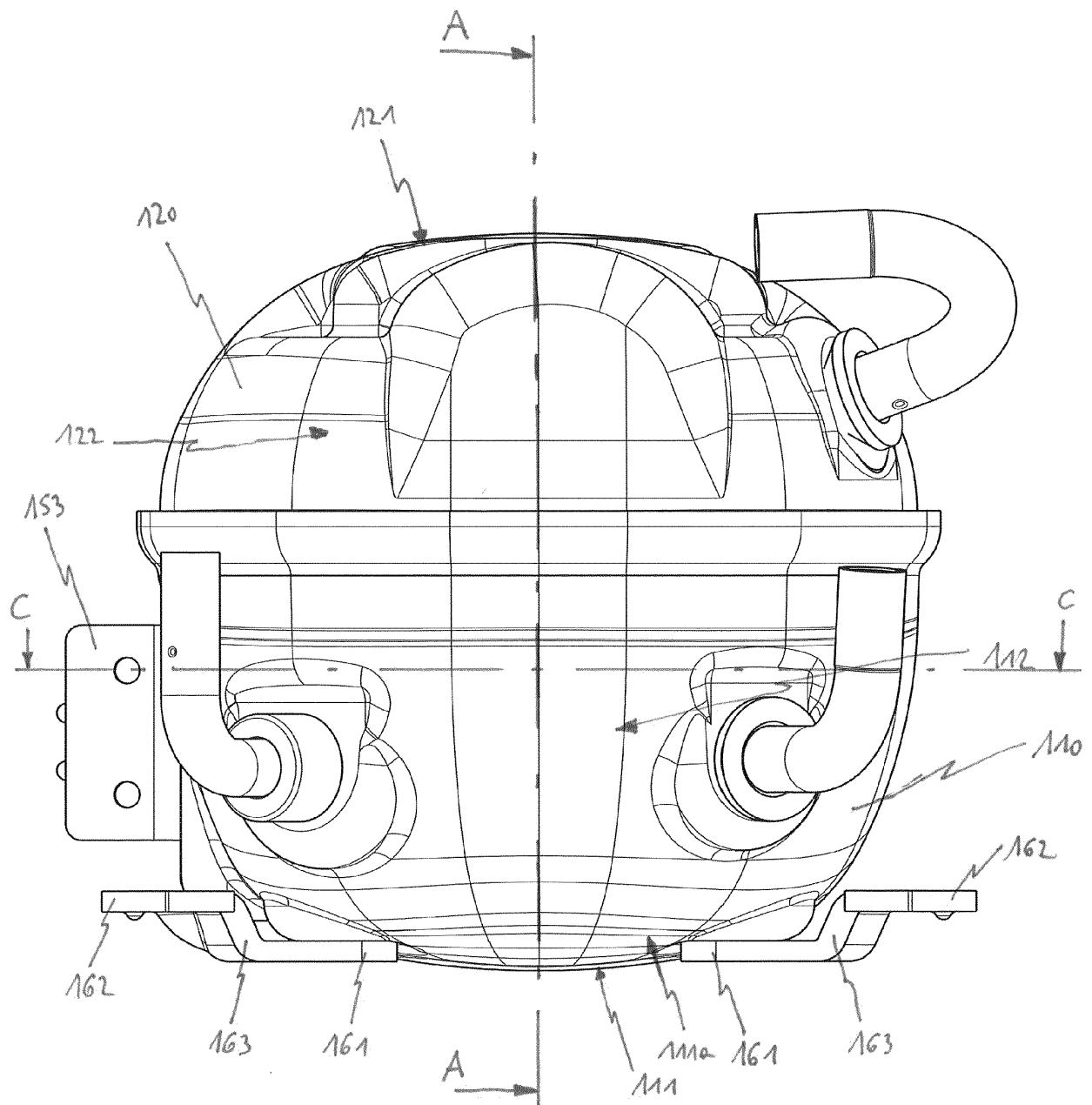


Fig. 5

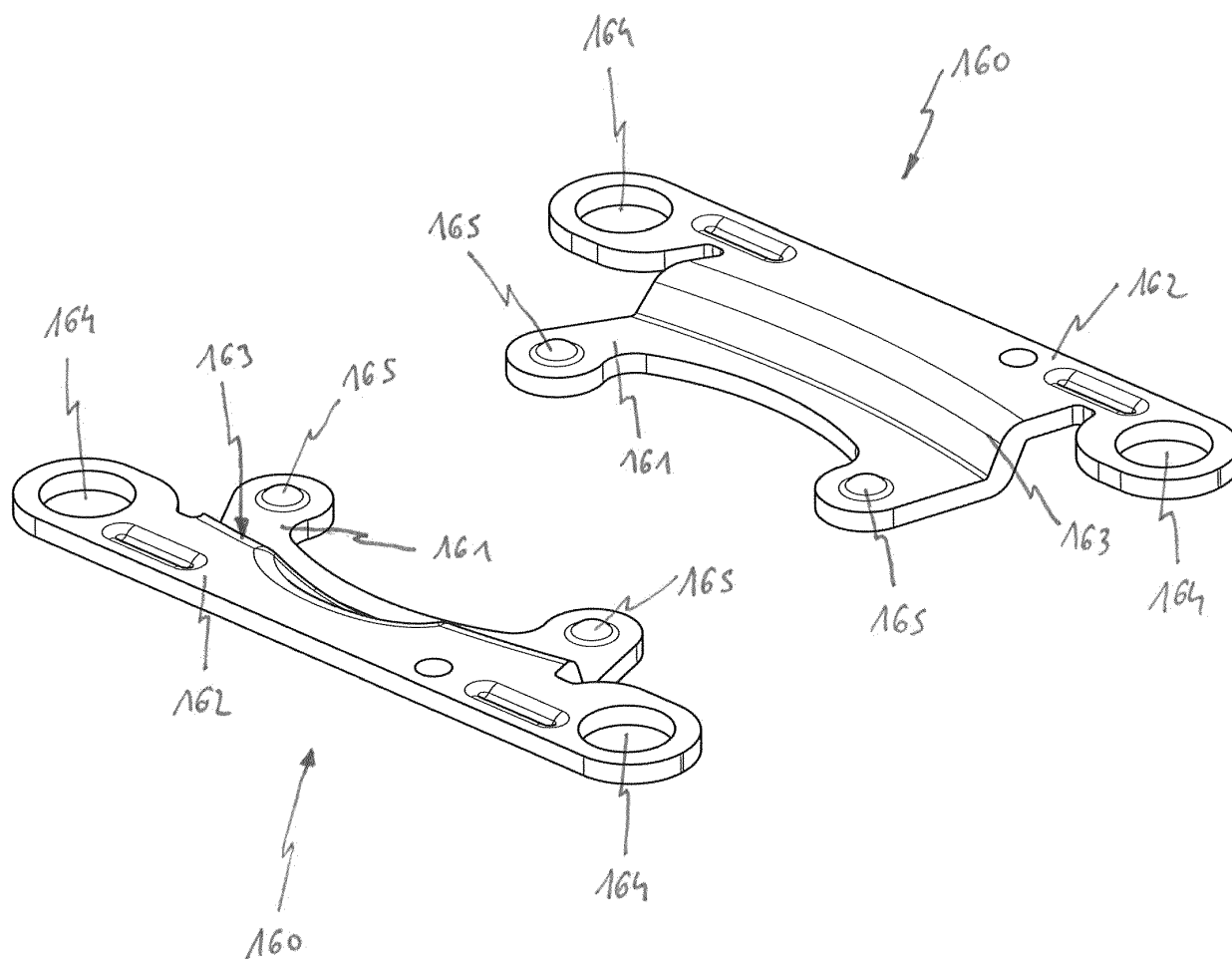


Fig. 6

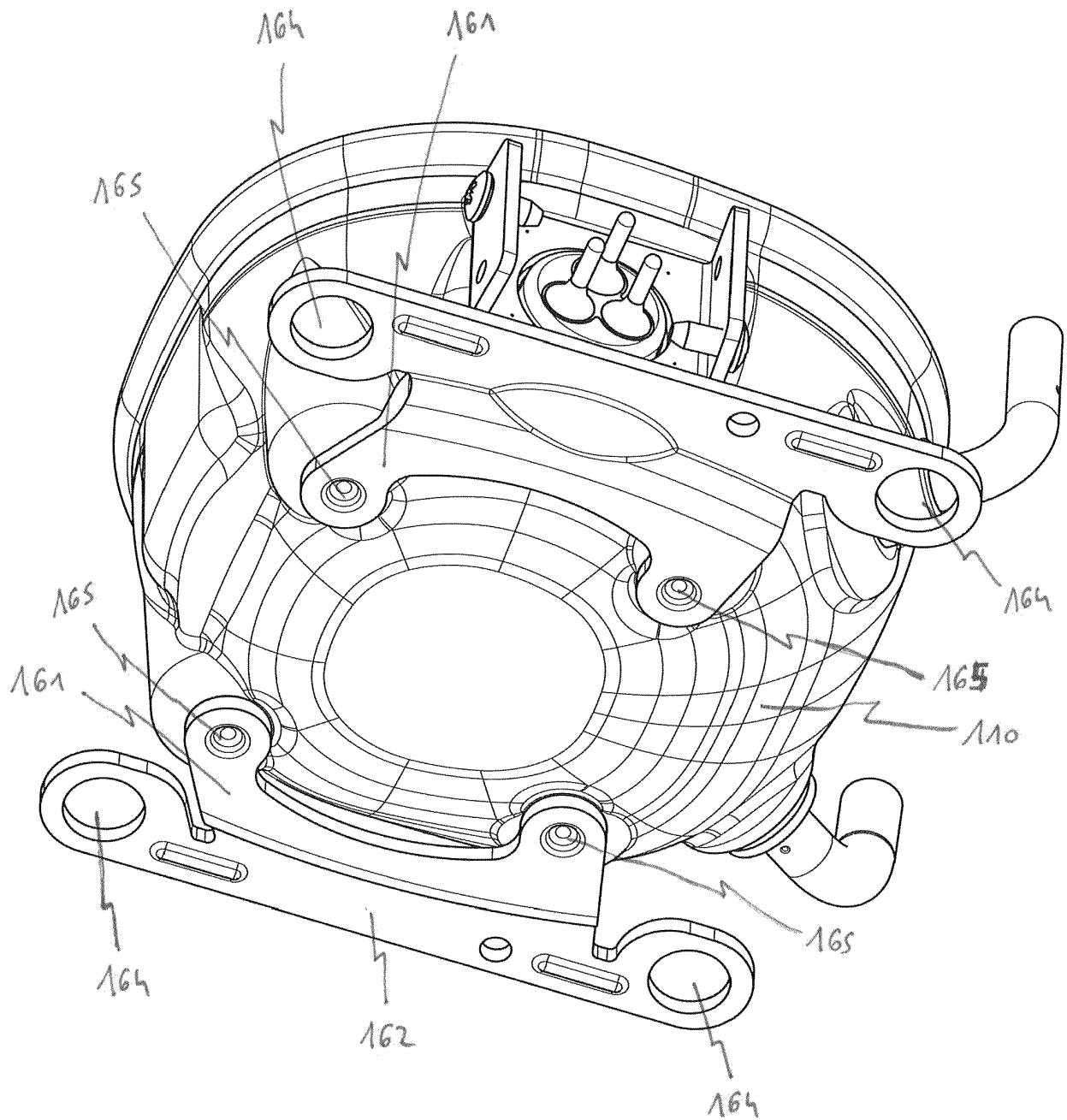


Fig. 7

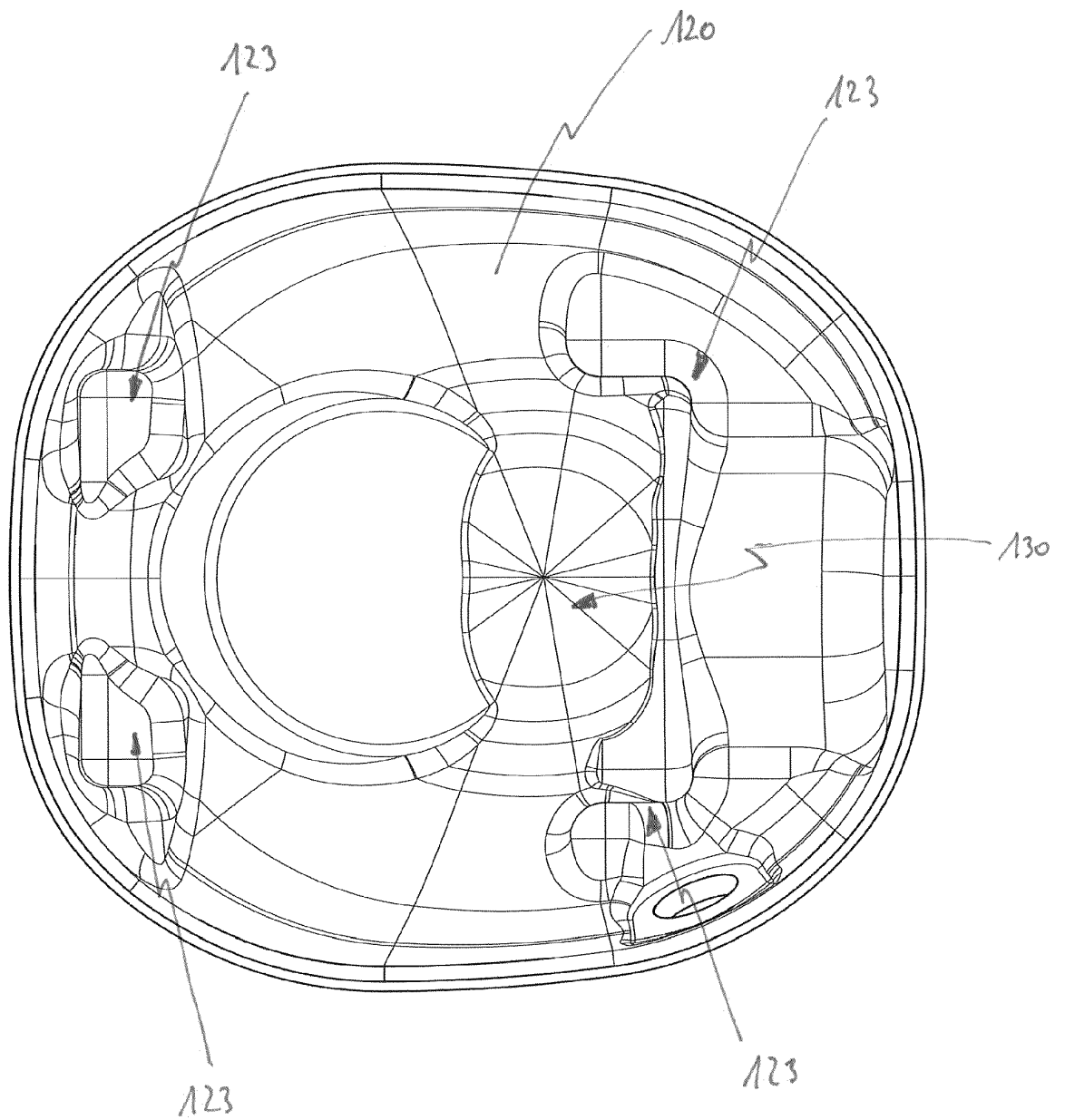
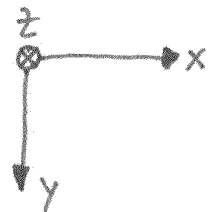


Fig. 8



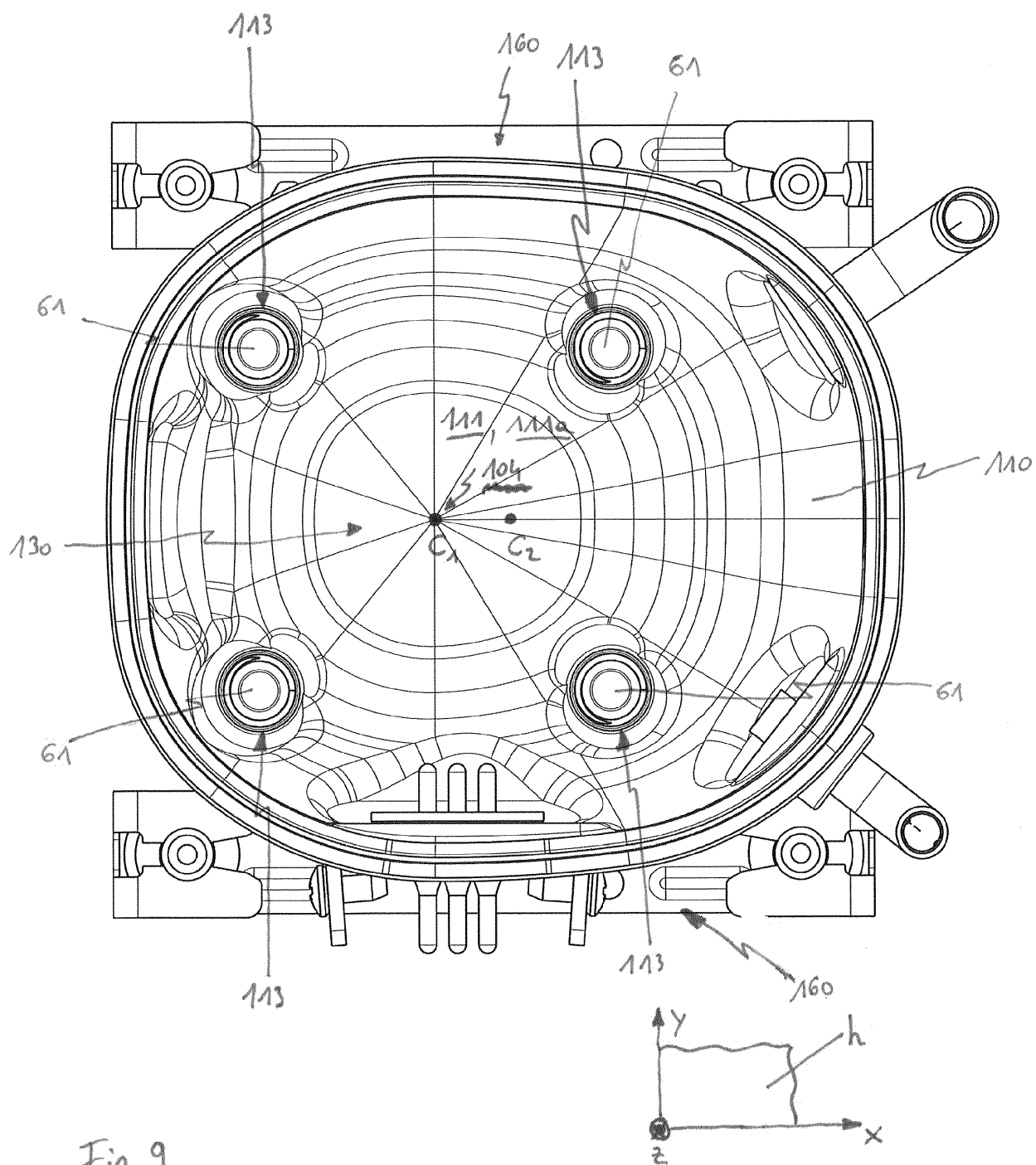


Fig. 9

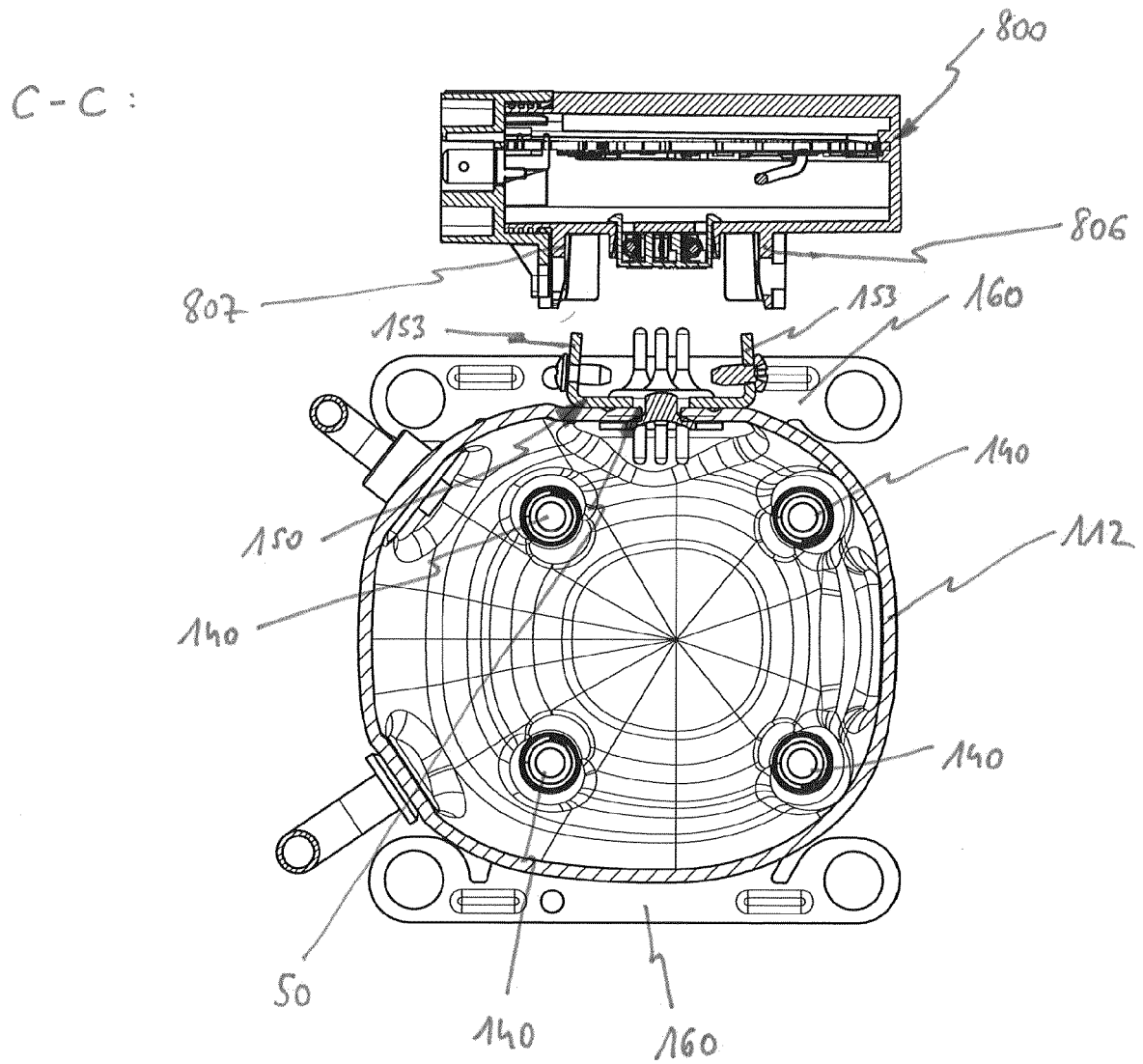


Fig. 10

A-A :

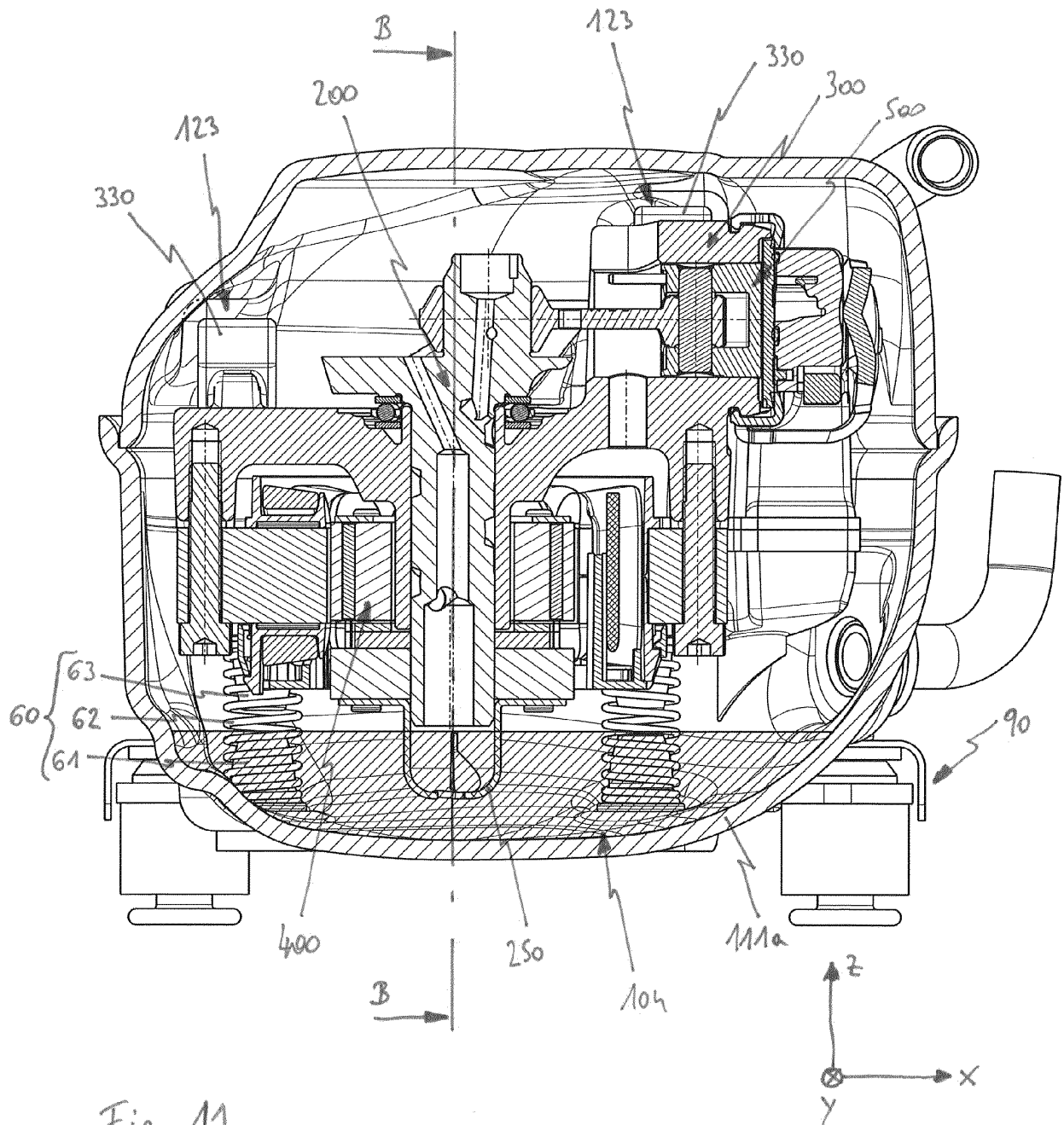


Fig. 11

B-B :

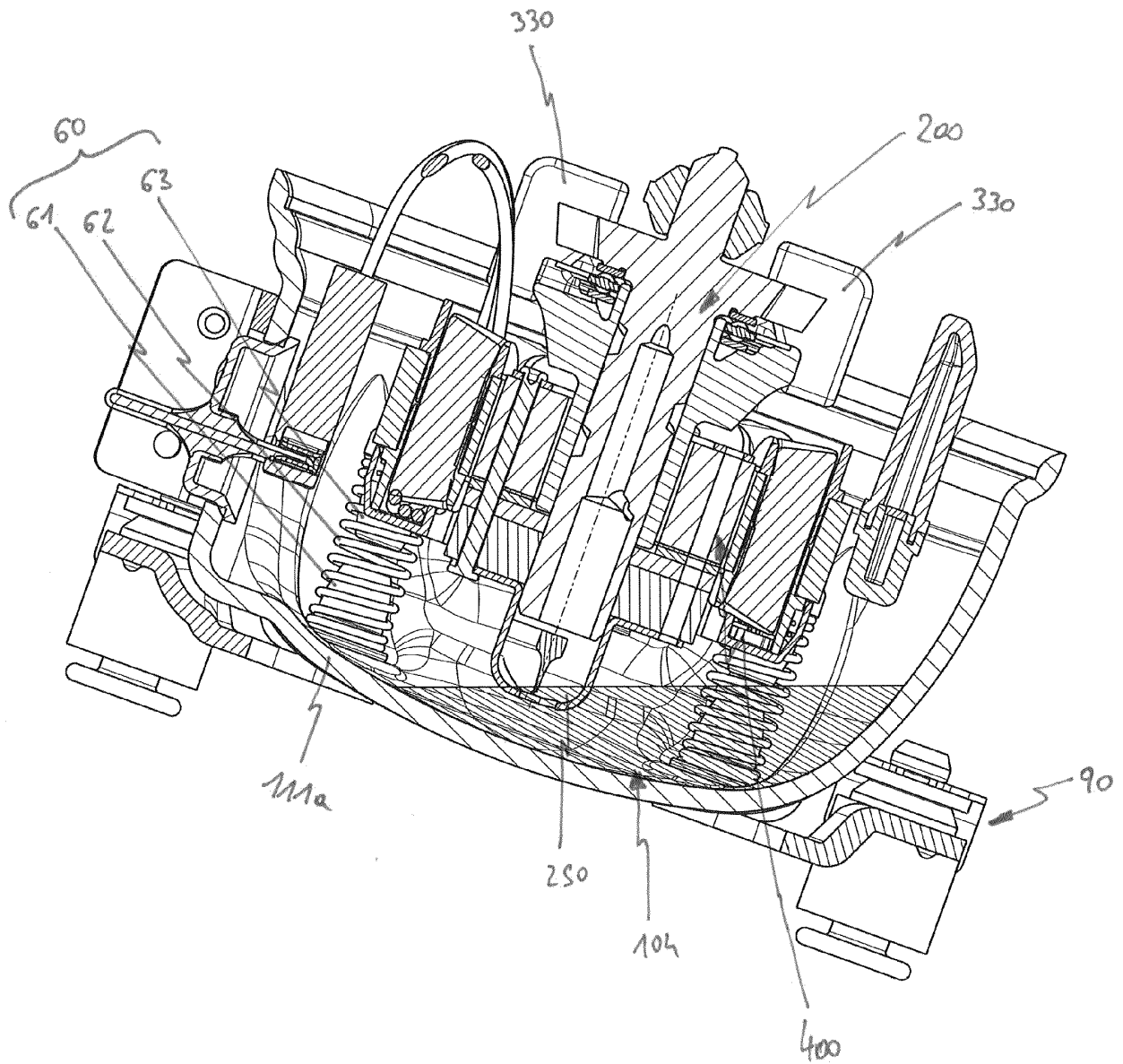


Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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