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(54) **Compressor for vehicle air-conditioners**

Verdichter für Fahrzeugklimaanlagen

Compresseur pour des climatiseurs de voiture

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Description

Background of the invention

[0001] The present invention relates to a compressor, in particular to the technical field of compressors used for vehicle air-conditioners.

[0002] In terms of its construction the present invention relates to a compressor comprising a transmitting means and pistons mechanically coupled by means of a shaft and a swash plate; a housing including a front housing disposed on the side of the transmitting means and a rear housing disposed on the opposite side of the transmitting means and first mounting means attached to the front housing and second mounting means attached to the rear housing for securing the housing on an engine block. A compressor of this kind is known, for example, from the Applicant's pre-published patent application EP 1 605 160 A1.

[0003] Typically, compressors of the aforementioned kind are mounted on an engine block and driven by the engine by means of a belt that is stretched between a drive pulley of the engine and the transmitting means of the compressor. The transmitting means, e.g. a compressor pulley, transmits rotational torque received from the vehicle engine to a shaft that extends through the compressor. The shaft mechanically couples the transmitting means to pistons through a swash plate, transforming the rotational torque applied to the transmitting means and the shaft respectively, into a linear movement of the pistons inside the compressor.

[0004] A further compressor of this kind is known from EP 1 113 172 A2. Said compressor comprises a pulley connected to a shaft which is supported by the front housing through a radial bearing. A lug plate connected to the swash plate rotates with the shaft and is supported by the housing through a thrust bearing. Usually needle bearings are used for the radial bearing which are composed of a plurality of needles, a retainer and a case as well as for the thrust bearing which are composed of a pair of thrust races and plurality of needles which are arranged in a retainer in a spoke-like configuration. Owing to the belt being stretched with some tension between the engine pulley and the compressor pulley or, respectively, the transmitting means, the front housing that usually supports the pulley through the radial bearing receives a radial force that is directed substantially towards the engine pulley. The radial force resulting from the belt tension acts on the front housing so as to bend the compressor and, in particular, the compressor front housing. Thus, the bending force applied to the compressor leads to internal stress or deformation of the compressor that results in an acoustically discernible vibration of the compressor. In the context of the present disclosure, "internal stress" designates the stress caused in the deformed part and is therefore understood to be a result of deformation.

[0005] The deformation of the front housing is partic-

ularly detrimental in a compressor comprising radial and thrust bearings for supporting the shaft and the lug plate as disclosed in EP 1 113 172 A2. Owing to the deformation of the front housing the lug plate and the shaft are not stably supported by the plurality of needles of the thrust and radial bearings thereby generating vibrations when rotating in the deformed front housing.

[0006] A further cause of unintended compressor vibration, is caused by thermal deformation of the compressor housing. In operation, the temperature of the compressor housing, which is usually built of a lightweight material, e.g. an aluminium alloy, rises, thus resulting in an axial expansion of the compressor housing. The axial expansion of the compressor housing acts against the mounts of the compressor that fix the compressor housing to the engine block, thereby also causing internal stress or deformation of the compressor.

[0007] Production tolerances can also lead to acoustically discernible vibration. For example, the front housing may deform by non-negligible differences between the mounting positions, thus adversely affecting the stable support of the lug plate and the shaft which generates vibrations as explained above in connection with the radial and thrust bearings of the compressor,.

[0008] This problem is addressed by EP 1 605 160 A1, mentioned above, which discloses mounting parts for securing the housing of the compressor to an engine block. The mounting parts form deformable crush zones that prevent a deformation of the housing, if the compressor is installed on the engine block. To this end, EP 1 605 160 A1 suggests providing protecting portions having a lower level of rigidity than the connection portions of the mounting part. In particular, the upper and lower axial ends of the mounting part are formed of rubber portions. In the mounted state, the rubber portions, which compensate production tolerances of the mounting positions, receive a compression force due to the tightening of a screw extending through the rubber portions and fastening the compressor housing to the engine block. Thus, the known compressor provides a mounting that lends good service strength for the compressor. However, damping of vibrations at low frequencies is problematic which can be transmitted to the engine block through the mounting parts, thereby generating an undesired noise emission.

[0009] EP 1 113 172 A2 likewise aims to prevent a deformation of the compressor upon assembly. To this end, EP 1 113 172 A2 suggests mechanically decoupling the bolt which is screwed into the engine block from the housing of the compressor. This can be done, for example, by using a bushing arranged between the mounting eye of the housing and the head of the screw; in this way, the fastening force is not applied to the compressor. However, a deformation of the compressor housing is not avoided by the mounting concept according to EP 1 113 172 A2. In particular, an axial expansion of the compressor housing will not be accommodated. Thus, the compressor housing receives internal stress and vibration.

Further, the bushing arranged between the mounting eye of the housing and the head of the screw is disadvantageous in view of the service strength.

[0010] Document EP 0 264 833 A2 discloses a compressor having mounting means with a portion being able to bend in an axial direction.

Summary of the invention

[0011] It is an object of the present invention to provide a compressor, particularly a compressor used for a vehicle air-conditioner, especially driven by a vehicle engine through a belt transmission, which offers improved service strength and provides a reduction of acoustically discernible vibration.

[0012] According to the invention, this object is solved by the features of present claim 1.

[0013] The present invention is based on the idea of providing a compressor comprising a transmitting means and pistons mechanically coupled by means of a shaft and a swash plate; a housing including a front housing disposed on the side of the transmitting means and a rear housing disposed on the opposite side of the transmitting means; first mounting means attached to the front housing and second mounting means attached to the rear housing for securing the housing on an engine block, wherein the second mounting means include a mounting portion and a deflecting portion disposed between the mounting portion and the engine block. The deflecting portion is positioned at a distance from an axial rear surface of the rear housing and the mounting portion is attached to said rear surface in a position at a distance from the engine block, to allow a deflecting movement of the deflection portion in an axial direction of the housing for absorbing and/or avoiding a deformation of the housing. The deflecting portion is adapted to transmit axial forces to provide for a fixation of the housing.

[0014] In this respect, it is to be noted that the relationship between the engine block and the compressor is described in present claim 1, only to enhance the comprehensibility of the invention. As a matter of course, the present application claims a compressor without being fastened to an engine block. In other words, the compressor is adapted to be secured to an engine block, as described in claim 1 and as comprehensible by a person skilled in the art of compressors, particularly air conditioning compressors for vehicles. The present application also claims a combination of a compressor and an engine block. Furthermore, the present application discloses and claims a vehicle comprising a compressor according to claim 1, as well as an arrangement of a compressor according to claim 1 together with an engine block.

[0015] Generally, the present invention is based on the idea of compensating deformation forces applied to the compressor, by a deflection or bending movement of the deflecting portion in an axial direction of the compressor housing. In other words, the basic idea of the present disclosure comprises providing flexibility of a mounting

point on the housing, particularly rear housing, of the compressor, especially flexibility toward an axial direction, in parallel with the longitudinal axis of the compressor housing. This has the advantage that the mounting portion, the deflecting portion and the engine block can be fixedly connected in an axial direction of the deflecting portion, particularly in a tangential orientation to the compressor housing, while allowing a movement of the housing in an axial direction, namely coaxially with the shaft. Thanks to the mounting portion being arranged apart from the engine block, it absorbs deformation and expansion of the axial length of the compressor particularly well. Therefore, both a vibrational decoupling of the compressor and the engine block, as well as a good service strength, are achieved. Due to the vibrational decoupling, the noise emission is reduced.

[0016] In a preferred embodiment, the second mounting means are attached to the axial end of the rear housing. In particular, the second mounting means are attached to a rear surface of the rear housing opposite to the transmitting means. The rear surface to which the second mounting means are attached, can be oriented rectangular to a longitudinal axis of the compressor which in turn is defined by the longitudinal extension of the shaft.

The deflecting portion of the second mounting means can be oriented in parallel with the axial end or, respectively, the rear surface of the rear housing. By arranging the second mounting means on the axial end of the rear housing, a notably improved compensation of compressor deformation in an axial direction is achieved.

[0017] In a further preferred embodiment, the mounting portion is positioned at a distance from the engine block in a range of $\pm 50\%$ of the distance between the central line of the housing and the engine block referred to the centre line. It turns out that arranging the mounting portion in a position within the abovementioned range, enhances the compensation or accommodation of a compressor deformation. Moreover, fixing the mounting portion within this range to the rear housing, simultaneously provides for an improved service strength. Altogether, arranging the mounting portion within the positioning range specified above, leads to a balanced relationship between good service strength and efficient vibrational decoupling of the compressor.

[0018] Preferably, the mounting portion is disposed at a central portion of the rear housing. This symmetrical arrangement of the mounting portion on the rear housing, improves a uniform transmission of forces and bending moments into the deflecting portion and, hence, the engine block. Thus, the durability of the second mounting means, particularly the deflecting portion, is enhanced.

[0019] In a further preferred embodiment of the compressor according to the invention, the axial length of the mounting portion is shorter than the axial length of the deflecting portion. This specific length ratio for the mounting portion and the length of the deflecting portion, ensures that the deflecting portion compensates a deformation of the compressor housing in a wide range. Since

the degree of deflection of the deflecting portion reduces with the length of the deflecting portion, the durability of the deflecting portion is enhanced by the specified aspect ratio between the deflecting portion and the mounting portion.

[0020] More preferably, the deflecting portion is inelastic in an axial direction and allows a deflection upon application of a bending moment. Within the context of the present invention, "deflection" designates bending as well as tilting of the deflecting portion. For example upon deformation of the compressor housing, the deflecting portion is bent and/or tilted to compensate the compressor deformation, thus accommodating vibration of the compressor. In this embodiment, the deflecting portion is inelastic in an axial direction, meaning that the deflecting portion is not allowed to deform along a centre line of its own, particularly between the mounting portion and the engine block. However, a deformation, namely a deflection, in a direction perpendicular to the longitudinal axis of the deflecting portion, especially in a direction in parallel with the longitudinal axis of the compressor housing, is allowed.

[0021] In a further preferred embodiment of the present invention, the deflecting portion comprises a stud bolt. The stud bolt provides for a simple and cost efficient coupling of the compressor to an engine block, whilst allowing the necessary deflection to reduce acoustically discernible vibration. Alternatively the deflecting portion comprises a hollow tube. The tube likewise allows the necessary deflection to reduce acoustically discernible vibration.

[0022] Preferably, the deflecting portion and the mounting portion are connected by means of a fixation element that is inserted in the mounting portion and is engaged with the deflecting portion or is engaged in a mounted state with an engine block, wherein first compensation means are disposed between the fixation element and an axial end of the mounting portion and/or second compensation means are disposed between an opposite axial end of the mounting portion and the deflecting portion. Through this arrangement, the deformation of the compressor housing is compensated, or accommodated, not only by the deflecting portion, but also by the compensation means. Thus, the vibrational decoupling of the compressor housing to the engine block is improved. In addition, the service strength is enhanced by means of the fixation element, which fastens the deflecting portion to the mounting portion. The first option to engage the fixation means with the deflecting portion is preferably suitable for an embodiment comprising the stud bolt as deflecting portion. The second option to engage the fixation means in a mounted state with an engine block is preferably suitable for an embodiment comprising the hollow tube as deflecting portion.

[0023] The first and/or second compensation means can comprise a compressible washer that is made of a damping material. The first and/or second compensation means can also comprise a pair of washers shaped to

allow a relative angular movement. More particularly, a first washer of the pair of washers can be a convex spherical washer, and a second washer of the pair of washers can be a concave spherical washer or a conical washer.

5 Altogether, by means of washers or generally compensation means, a further enhanced vibrational decoupling of the compressor and the engine block is achieved.

[0024] The invention will now be described in detail by way of example with reference to the accompanying drawings in which:

Fig. 1: a side view of a compressor according to the present invention in a preferred embodiment.

15 Fig. 2: a side view of a compressor according to the present invention in a further preferred embodiment.

20 Fig. 3: a side view of a compressor according to the present invention in a further preferred embodiment.

Description of the Figures

25 **[0025]** Figure 1 shows a compressor according to a preferred embodiment of the invention mounted on an engine block 100. The compressor comprises a compressor housing 13 including a front housing 14 and a rear housing 15. On the side of the front housing 14, a transmitting means 10 in the form of a compressor pulley is disposed and connected to a shaft 12 which extends along the longitudinal axis of the compressor housing. The shaft 12 is pivotally supported in the compressor housing by means of radial bearings (not shown) disposed in the front housing 14 and the rear housing 15. The radial bearings are preferably needle bearings which transmit the radial forces of the transmitting means 10 by the belt tension to the housing. The coupling between the shaft 12 and the pistons (not shown) inside the housing 13, particularly inside a cylinder block which can be part of or arranged inside the compressor housing 13, can be achieved by means of a swash plate (not shown); this swash plate transforms the rotational torque applied by the transmitting means 10 to the shaft 12 into a reciprocating movement of the pistons. The swash plate can be connected to a lug plate (not shown) that rotates with the shaft 12 and is supported by the front housing through a thrust bearing, in particular a thrust needle bearing.

35 **[0026]** The compressor housing 13 may be mounted or fastened to the engine block 100 by means of first mounting means 16 attached to the front housing 14, and second mounting means 17 attached to the rear housing 15. The first mounting means 16 can comprise two mounting eyes 26, which may be fixed to, or integrally formed with, the front housing 14. The mounting eyes 26 can be arranged on a side surface, particularly a circumferential surface, of the front housing 14. As shown in Figure 1, the first mounting means 16 can comprise an

upper mounting eye 26a located at a height equal to the height of the shaft 12 and a lower mounting eye 26b located near a lower surface of the front housing 14, which faces the engine block 100. The mounting eyes 26 may each include a bore that extends perpendicularly with respect to a mounting surface 101 of the engine block 100. In other words, the bores in the mounting eyes 26 of the first mounting means 16 can extend substantially tangentially to the circumference, or circumferential surface, of the front housing 14. A screw 27 can extend through the bores in the upper mounting eye 26a and the lower mounting eye 26b and engage the engine block 100 to secure the front housing 14 to the engine block 100. Typically, two first mounting means 16 can be disposed on both sides, particularly longitudinal sides, of the front housing 14. The invention is not restricted to two first mounting means 16.

[0027] A second mounting means 17 may be attached to the rear housing 15; preferably, a single second mounting means 17 can be arranged at the rear housing 15. Two or more second mounting means 17 can be provided. The second mounting means 17 may comprise a mounting portion 18, preferably formed as a mounting eye 26, which is attached to an axial end surface of the rear housing 15. Preferably, the mounting portion 18 can be integrally formed with the rear housing 15. According to Figure 1, the mounting portion 18 can be positioned coaxially to the shaft 12; other positions of the mounting portion 18 are possible. In preferred embodiments, the mounting portion 18 is located at a distance from the engine block 100 within a range of $\pm 50\%$, preferably $\pm 40\%$, preferably $\pm 30\%$, preferably $\pm 20\%$, most preferably $\pm 10\%$, as related to the distance between the centre line of the housing 13 and the engine block 100 when compared to the centre line or, respectively, longitudinal axis.

[0028] In the same manner as the first mounting means 16, the mounting portion 18 of the second mounting means 17 may comprise a bore, which extends perpendicularly to the mounting surface 101 of the engine block 100. The bore of the mounting portion 18 of the second mounting means 17 thus extends in parallel with an axial rear surface 15a of the rear housing 15 and, hence, perpendicular to the longitudinal axis of the housing 13 defined by the longitudinal extension of the shaft 12.

[0029] The second mounting means 17 can further comprise a deflecting portion 19 that extends in projection of the bore inside the mounting portion 18 towards the mounting surface 101 of the engine block 100. In the mounted state of the compressor according to this embodiment, the deflecting portion 19 may be disposed between the mounting portion 18 and the engine block 100, particularly the mounting surface 101. Since the deflecting portion 19 can extend coaxially to the bore in the mounting portion 18, it would extend perpendicularly to the mounting surface 101 and, at least in a non-operational state of the compressor, parallel with the axial rear surface 15a of the rear housing 15.

[0030] Several constructional variations of the deflecting portion 19, such as a bar with thread holes on both axial ends of a cylindrical pipe in which a fix bolt can be inserted through its centre, are possible within the scope of the invention. For example, the deflecting portion can be formed as a long tube with a hole inside. The hole, particularly a clearance hole or through bore, is preferably oriented coaxially to the longitudinal axis of the long tube and extends through the entire tube. In this arrangement, the long tube may be fixed to the engine block 100 by a fixation element 20, particularly a screw, which extends through the hole or through bore and engages the engine block 100 directly. The long tube thereby serves as a spacer between the mounting portion 18 and the engine block 100, and is adapted to allow a deflecting movement upon an axial elongation of the compressor housing 13.

[0031] Alternatively, the deflecting portion 19 can comprise a stud bolt 19a. The stud bolt 19a, or generally the deflecting portion 19 of the second mounting means 17, can be fixed or fastened to the mounting portion 18 by a fixation element 20. The fixation element 20 can comprise a screw 27. The deflecting portion 19 or stud bolt 19a may further be connected to the engine block 100 by a threaded pin 19b, which can be integrally formed with the stud bolt 19. Alternatively, the stud bolt 19 can comprise a threaded hole having a longitudinal axis which is oriented substantially perpendicular to the mounting surface 101 of the engine block 100, in which a separate threaded pin 19b is screwed to fix the stud bolt 19 to the engine block 100. The threaded pin 19b may extend beyond the length of the stud bolt 19a, or in general the deflecting portion 19, to be inserted and fixed within the engine block 100. It is also possible that the fixation element 20 comprises a screw 27, which extends through the mounting portion 18 and the deflecting portion 19 and directly engages the engine block.

[0032] As further shown in Figure 1, as well as in Figures 2 and 3, the mounting portion 18 can be adapted to allow the deflecting portion 19 to be positioned at a distance from the axial rear surface 15a. The distance between the rear housing 15 and the deflecting portion 19 in turn allows the deflecting portion 19 to deflect, particularly to bend or tilt, upon axial expansion of the compressor housing 13. Thus, the distance between the rear housing and the deflecting portion 19 avoids contact between the rear housing 15 and the deflecting portion 19.

[0033] The mounting means 16, 17 can additionally be equipped with compensation means 21, 22. The compensation means 21, 22 can comprise compressible washers 23 and/or a pair of washers 24, 25, wherein the pair of washers 24, 25 is shaped to allow a sliding movement of the mounting means 16, 17.

[0034] As shown in Figure 2, the second mounting means 17 may comprise a first compensation means 21, namely washers 23, 24, 25 located between the fixation element 20 and the mounting portion 18, namely between the screw 27 and the mounting eye 26 of the second

mounting means 17. The first compensation means 21 can be made of rubber to form a rubber washer. In general, the first compensation means 21 may comprise a compressible washer 23 made of an elastic material or, respectively, a damping material.

[0035] The second mounting means 17 can further comprise a second compensation means 22 arranged between the mounting eye 26 or the mounting portion 18 of the second mounting means 17 and the deflecting portion 19 or, respectively, the stud bolt 19a. In the embodiment according to Figure 2, the second compensation means 22 may also comprise a compressible washer that can be made of the same or a different material, when compared with the compressible washer 23 of the first compensation 21. Typically, the first and second compensation means 21, 22, in particular the washers, may be ring-shaped and surround the fixation element 20, particularly the screw fixing the deflecting portion 19 to the mounting portion 18.

[0036] As described above, the first mounting means 16 can also be equipped with compensation means 21, 22. In particular, the first mounting means 16 may comprise a pair of washers 24, 25 that are arranged between the mounting surface 101 of the engine block 100 and the lower mounting eye 26b. The pair of washers 24, 25 can incorporate a first washer 24, which is positioned at the compressor side, and a second washer 25, which is positioned at the side of the engine block 100. The first washer 24 and the second washer 25 can contact each other, wherein the second washer 25 may have an upper conical surface 25a that engages a lower concave surface of the first washer 24. The lower concave surface 24a and the upper conical surface 25a could be adapted to allow a sliding movement of the first and second washers 24, 25 along the lower concave surface 24a or the upper conical surface 25a. The upper surface 25a and the lower surface 24a are of a corresponding form, in order to present sliding surfaces upon which the first washer 24 and the second washer 25 can move against each other in a curved direction. The first and second washer 24, 25 may each comprise a hole in a common rotational axis, which is arranged coaxially to the screw 27, which fixes the front housing 24 to the engine block 100.

[0037] The first mounting means 16 according to Figure 2, may further comprise a bedstop 28 arranged between the screw head of the screw 27 and the upper mounting eye 26a. The bedstop 28 is preferably made of an inelastic material. The bedstop 28 can further be ring-shaped and surrounds the screw 28. The same applies for the pair of washers 24, 25, each of which may also be ring-shaped and surrounds the screw 28. The first and second washers 24, 25 can be made of metal. Preferably, at least one of the washers 24, 25 is made of steel or bronze. The bedstop 28 functions as a spacer defining the axial compression (along the longitudinal axis of the screw 27) of rubber washers, or the first compensation means 21 on the rear housing 15.

[0038] The construction according to Figure 3 is similar to the compressor shown in Figure 2, in which the compressible washer 23 of the first compensation means 21 is replaced by a pair of washers 24, 25 according to the pair of washers 24, 25 located at the first mounting means 16. The pair of washers 24, 25 on the rear mounting point of the compressor, can be formed in the same manner as the pair of washers 24, 25 that is disposed between the engine block 100 and the lower mounting eye 26b of the first mounting means 16. For example, the first washer 24 can comprise a lower concave surface 24a, which faces an upper conical surface 25a of a second washer 25, and both the first and second washers 24, 25 may be ring-shaped and located between the fixation element 20 and the mounting portion 18 of the second mounting means 17.

[0039] In general, the compressor according to the invention can be mounted on the engine block 100 by means of a three-point mounting. The first two mounting points may be defined by the first mounting means 16, each being located on opposite sides of the front housing 14. The third mounting point may be provided by the second mounting means 17, which are arranged at an axial rear surface 15a of the rear housing 15. It is also possible that the third mounting point, namely the second mounting means 17, be arranged on a side of the rear housing 15. Particularly, the second mounting means 17, in particular the mounting portion 18, can be attached to the circumferential surface of the rear housing 15. Whilst a three-point mounting is preferred, it is not excluded that a four- or more-point mounting of the compressor housing 13 is provided. For example, two second mounting means 17 can be attached to the rear housing 15.

[0040] The invention functions as follows:

Owing to the deflecting portion 19 of the second mounting means 17, bending and/or expansion forces of the compressor or the compressor housing 13 can be accommodated. Due to the belt tension, the transmitting means 10 or compressor pulley receives a radial force, which is directed towards the engine block 100 and leads to a deformation of the housing 13, in particular the front housing 14. The deflecting portion 19 allows a compensation or accommodation of compressor deformation by deflecting, under influence of the deformation forces acting on the compressor housing 13. The deflection of the deflecting portion 19 is achieved by bending the deflecting portion 19, or by tilting the deflecting portion 19. Bending and tilting can also occur simultaneously. Thereby the generation of vibrations and the emission of noise can be reduced.

[0041] A further cause for internal stress or deformation of the compressor housing 13 arises from thermal deformation, which occurs in operation of the compressor. Due to internal frictional forces, the compressor is heated during operation and hence the compressor

housing 13 expands in an axial direction. The deflecting portion 19 is adapted to deflect and thus to follow the axial expansion of the compressor housing 13, therefore avoiding internal stress and vibration.

[0042] In the case mentioned above, the deflecting portion 19 receives different forces. Particularly, the bending moment applied to the compressor by means of the belt 11, causes a tensile force to act on the deflecting portion 19. Thereby, the deflecting portion 19 bends or tilts towards the rear housing 14. On the other hand, in the case of axial expansion of the compressor housing 13 upon increasing operating temperature, the deflecting portion 19 receives a compressive force or a bending force, which provides for a deflection of the deflecting portion in an opposite direction, from the rear housing 14. To meet both functions, the second mounting means 17, particularly the deflecting portion 19, is constructed so as to be rigid enough to transmit the tensile force caused by the belt tension and flexible enough to bend due to the bending force for compensating the axial thermal deformation.

[0043] The deflecting portion 19 further avoids noise and vibration by reducing internal stress and deformation of the compressor, in case of non-negligible differences between the location of the mounting eyes 26 or the holes in the mounting means 16, 17 and the corresponding holes inside the engine block 100. In other words, the deflection portion 19 provides for compensation of production tolerances. By means of the pair of washers 24, 25, the reduction of vibration is further enhanced since the spherical/conical formed washers 24, 25 avoid blocking of the deflecting portion 19 to the mounting portion 18 or the fixation element 20 upon deflection.

[0044] Alternatively, the deflecting portion 19, is in direct contact with the engine block 100 and the mounting portion 18 thus providing a stiff construction. Further, the deflecting portion 19, particularly the long tube or stud bolt 19a, is preferably made from a metal, thus providing for an enhanced durability.

[0045] The deflecting functionality of the deflection portion 19 is supported by the distance between the axial rear surface 15a of the rear housing 15 and the deflecting portion 19. Particularly, the distance between the rear housing 15 and the deflecting portion 19 is dimensioned such that the rear housing 15 and deflecting portion 19 do not contact each other upon expansion or deformation of the compressor housing 13. To allow a sufficient deflection of the deflection portion 19, the mounting portion 18 can be fixed or attached to the rear housing 15 by a single point fixation. Substantially, the mounting portion 18 can be fixed to, or formed integrally with, the rear housing 15 in almost the same manner as a spot bonding.

Reference List

[0046]

10 Transmitting means

11	Belt
12	Shaft
5 13	Housing
14	Front housing
15	Rear housing
10 15a	Axial rear surface
16	First mounting means
15 17	Second mounting means
18	Mounting portion
19	Deflecting portion
20 19a	Stud bolt
19b	Threaded pin
25 20	Fixation element
21	First compensation means
22	Second compensation means
30 23	Compressible washer
24	First washer
35 24a	Lower concave surface
25	Second washer
25a	Upper conical surface
40 26	Mounting eye
26a	Upper mounting eye
45 26b	Lower mounting eye
27	Screw
28	Bedstop
50 100	Engine block
101	Mounting surface

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Claims

1. A compressor comprising:

- a transmitting means (10) and pistons mechanically coupled by means of a shaft (12) and a swash plate;
- a housing (13) including a front housing (14) disposed on the side of the transmitting means (10) and a rear housing (15) disposed on the opposite side of the transmitting means (10); and
- first mounting means (16) attached to the front housing (14) and second mounting means (17) attached to the rear housing (15) for securing the housing (13) on an engine block,

characterised in that:

- the second mounting means (17) include a mounting portion (18) and a deflecting portion (19) disposed between the mounting portion (18) and the engine block wherein the deflecting portion (19) is positioned at a distance from an axial rear surface (15a) of the rear housing (15) and the mounting portion (18) is attached to said axial rear surface (15a) in a position at a distance from the engine block to allow a deflecting movement of the deflecting portion (19) in an axial direction of the housing (13) for absorbing and/or avoiding a deformation of the housing (13), wherein the deflecting portion (19) is adapted to transmit axial forces to provide for a fixation of the housing (13).
2. A compressor according to claim 1, **characterised in that** the mounting portion (18) is positioned at a distance from the engine block in a range of $\pm 50\%$ of the distance between the centre line of the housing (13) and the engine block (100) referred to the centre line.
 3. A compressor according to claim 2, **characterised in that** the mounting portion (18) is disposed at a central position of the rear housing (15).
 4. A compressor according to any of claims 1 to 3, **characterised in that** the axial length of the mounting portion (18) is shorter than the axial length of the deflecting portion (19).
 5. A compressor according to any of claims 1 to 4, **characterised in that** the deflecting portion (19) is inelastic in an axial direction and allows a deflection upon application of a bending moment.
 6. A compressor according to any of claims 1 to 5, **characterised in that** the deflecting portion (19) comprises a stud bolt (19a).
 7. A compressor according to any of claims 1 to 5, **characterised in that** the deflecting portion (19) com-

prises a hollow tube.

8. A compressor according to any of claims 1 to 7, **characterised in that** the deflecting portion (19) and the mounting portion (18) are connected by means of a fixation element (20) that is inserted in the mounting portion (18) and is engaged with the deflecting portion (19) or is engaged in a mounted state with an engine block (100), wherein first compensation means (21) are disposed between the fixation element (20) and an axial end of the mounting portion (18) and/or second compensation means (22) are disposed between an opposite axial end of the mounting portion (18) and the deflecting portion (19).
9. A compressor according to claim 8, **characterised in that** the first and/or second compensation means (21, 22) comprise a compressible washer (23) which is made of a damping material.
10. A compressor according to claim 8 or 9, **characterised in that** the first and/or second compensation means (21, 22) comprise a pair of washers (24, 25) that are shaped to allow an angular relative movement.
11. A compressor according to claim 10, **characterised in that** a first washer (24) of the pair of washers (24, 25) is a convex spherical washer and a second washer (25) of the pair of washers (24, 25) is a concave spherical washer or a conical washer.

Patentansprüche

1. Verdichter, welcher enthält:

ein Überführungselement (10) und Kolben, welche mittels einer Welle (12) und eines Gleittrings mechanisch gekoppelt sind;
 ein Gehäuse (13), welches ein vorderes Gehäuse (14), welches seitens des Überführungselements (10) angeordnet ist, und ein hinteres Gehäuse (15), welches auf der gegenüberliegenden Seite des Überführungselements (10) angeordnet ist, umfasst; und
 ein erstes Befestigungselement (16), welches am vorderen Gehäuse (14) angebracht ist, und ein zweites Befestigungselement (17), welches am hinteren Gehäuse (15) angebracht ist, zum Befestigen des Gehäuses (13) an einem Motorblock,

dadurch gekennzeichnet, dass:

das zweite Befestigungselement (17) einen Befestigungsabschnitt (18) und einen Auslenkabschnitt (19) umfasst, welcher zwischen dem Befestigungsabschnitt (18) und

- dem Motorblock angeordnet ist, wobei der Auslenkabschnitt (19) von einer axialen Rückfläche (15a) des hinteren Gehäuses (15) beabstandet positioniert ist, und der Befestigungsabschnitt (18) an der axialen Rückfläche (15a) an einer Position bei einer derartigen Distanz zum Motorblock angebracht ist, bei welcher eine Auslenkbewegung des Auslenkabschnitts (19) in einer axialen Richtung des Gehäuses (13) ermöglicht ist, um eine Verformung des Gehäuses (13) zu absorbieren und/oder zu vermeiden, wobei der Auslenkabschnitt (19) dazu ausgelegt ist, Axialkräfte zur Bereitstellung für eine Befestigung des Gehäuses (13) zu überführen.
2. Verdichter nach Anspruch 1, **dadurch gekennzeichnet, dass** der Befestigungsabschnitt (18) bei einer Distanz zum Motorblock in einem Bereich von $\pm 50\%$ der Distanz zwischen der Mittellinie des Gehäuses (13) und dem Motorblock (100), bezogen auf die Mittellinie, positioniert ist.
 3. Verdichter nach Anspruch 2, **dadurch gekennzeichnet, dass** der Befestigungsabschnitt (18) an einer Mittenposition des hinteren Gehäuses (15) angeordnet ist.
 4. Verdichter nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Axiallänge des Befestigungsabschnitts (18) kürzer ist als die Axiallänge des Auslenkabschnitts (19).
 5. Verdichter nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Auslenkabschnitt (19) in einer Axialrichtung unelastisch ist und eine Auslenkung bei einem Anlegen eines Biegemoments ermöglicht.
 6. Verdichter nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** der Auslenkabschnitt (19) einen Gewindebolzen (19a) umfasst.
 7. Verdichter nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** der Auslenkabschnitt (19) eine Hohlrohre umfasst.
 8. Verdichter nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** der Auslenkabschnitt (19) und der Befestigungsabschnitt (18) mittels eines Fixierungselements (20) verbunden sind, welches in den Befestigungsabschnitt (18) eingesetzt ist und mit dem Auslenkabschnitt (19) in Eingriff steht oder in einem befestigten Zustand mit einem Motorblock (100) in Eingriff steht,

wobei erste Kompensationselemente (21) zwischen dem Fixierungselement (20) und einem Axialende des Befestigungsabschnitts (18) angeordnet sind und/oder zweite Kompensationselemente (22) zwischen einem gegenüberliegenden Axialende des Befestigungsabschnitts (18) und dem Auslenkabschnitt (19) angeordnet sind.

9. Verdichter nach Anspruch 8, **dadurch gekennzeichnet, dass** die ersten und/oder zweiten Kompensationselemente (21, 22) einen komprimierbaren Dichtungsring (23) umfassen, welcher aus einem Dämpfungsmaterial erstellt ist.
10. Verdichter nach Anspruch 8 oder 9, **dadurch gekennzeichnet, dass** die ersten und/oder zweiten Kompensationselemente (21, 22) ein Paar von Distanzscheiben (24, 25) umfassen, welche derart geformt sind, um eine winkelmäßig relative Bewegung zu ermöglichen.
11. Verdichter nach Anspruch 10, **dadurch gekennzeichnet, dass** eine erste Distanzscheibe (24) des Paares von Distanzscheiben (24, 25) eine konvex kugelförmige Distanzscheibe ist, und eine zweite Distanzscheibe (25) des Paares von Distanzscheiben (24, 25) eine konkav kugelförmige Distanzscheibe oder eine konische Distanzscheibe ist.

Revendications

1. Compresseur comprenant :

- des moyens de transmission (10) et des pistons couplés mécaniquement au moyen d'un arbre (12) et d'un plateau oscillant ;
- un logement (13) comprenant un logement avant (14) disposé du côté des moyens de transmission (10) et un logement arrière (15) disposé du côté opposé aux moyens de transmission (10) ; et
- des premiers moyens de montage (16) fixés sur le logement avant (14) et des seconds moyens de montage (17) fixés sur le logement arrière (15) pour attacher le logement (13) sur un bloc moteur ;

caractérisé en ce que :

les seconds moyens de montage (17) comprennent une partie montage (18) et une partie déviation (19) disposée entre la partie montage (18) et le bloc moteur, dans lequel la partie déviation (19) est positionnée à une distance à partir d'une surface arrière axiale (15a) du logement

- carrière (15) et la partie montage (18) est fixée sur ladite surface arrière axiale (15a) dans une position à une distance à partir du bloc moteur pour permettre un mouvement de déviation de la partie déviation (19) dans une direction axiale du logement (13) afin d'absorber et/ou d'éviter une déformation du logement (13), dans lequel la partie déviation (19) est adaptée pour transmettre des forces axiales de manière à prévoir une fixation du logement (13).
- 5
2. Compresseur selon la revendication 1, **caractérisé en ce que** :
- la partie montage (18) est positionnée à une distance à partir du bloc moteur dans une plage égale à $\pm 50\%$ de la distance entre la ligne centrale du logement (13) et le bloc moteur (100) par rapport à la ligne centrale.
- 15
3. Compresseur selon la revendication 2, **caractérisé en ce que** :
- la partie montage (18) est disposée au niveau d'une position centrale du logement arrière (15).
- 25
4. Compresseur selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** :
- la longueur axiale de la partie montage (18) est plus courte que la longueur axiale de la partie déviation (19).
- 30
5. Compresseur selon l'une quelconque des revendications 1 à 4, **caractérisé en ce que** :
- la partie déviation (19) n'est pas élastique dans une direction axiale et permet une déviation lors de l'application d'un moment de flexion.
- 40
6. Compresseur selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** :
- la partie déviation (19) comprend un goujon (19a).
- 45
7. Compresseur selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** :
- la partie déviation (19) comprend un tube creux.
- 50
8. Compresseur selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** :
- la partie déviation (19) et la partie montage (18) sont raccordées au moyen d'un élément de fixation (20) qui est inséré dans la partie montage (18) et mis en prise avec la partie déviation (19)
- 55
- ou mis en prise dans un état monté avec un bloc moteur (100), dans lequel des premiers moyens de compensation (21) sont disposés entre l'élément de fixation (20) et une extrémité axiale de la partie montage (18) et/ou des seconds moyens de compensation (22) sont disposés entre une extrémité axiale opposée de la partie montage (18) et la partie déviation (19).
9. Compresseur selon la revendication 8, **caractérisé en ce que** :
- les premiers et/ou seconds moyens de compensation (21, 22) comprennent une rondelle compressible (23) qui est réalisée dans un matériau amortisseur.
10. Compresseur selon la revendication 8 ou 9, **caractérisé en ce que** :
- les premiers et/ou seconds moyens de compensation (21, 22) comprennent une paire de rondelles (24, 25) qui sont formées de façon à permettre un mouvement relatif angulaire.
11. Compresseur selon la revendication 10, **caractérisé en ce que** :
- une première rondelle (24) de la paire de rondelles (24, 25) est une rondelle sphérique convexe et une seconde rondelle (25) de la paire de rondelles (24, 25) est une rondelle sphérique concave ou une rondelle conique.

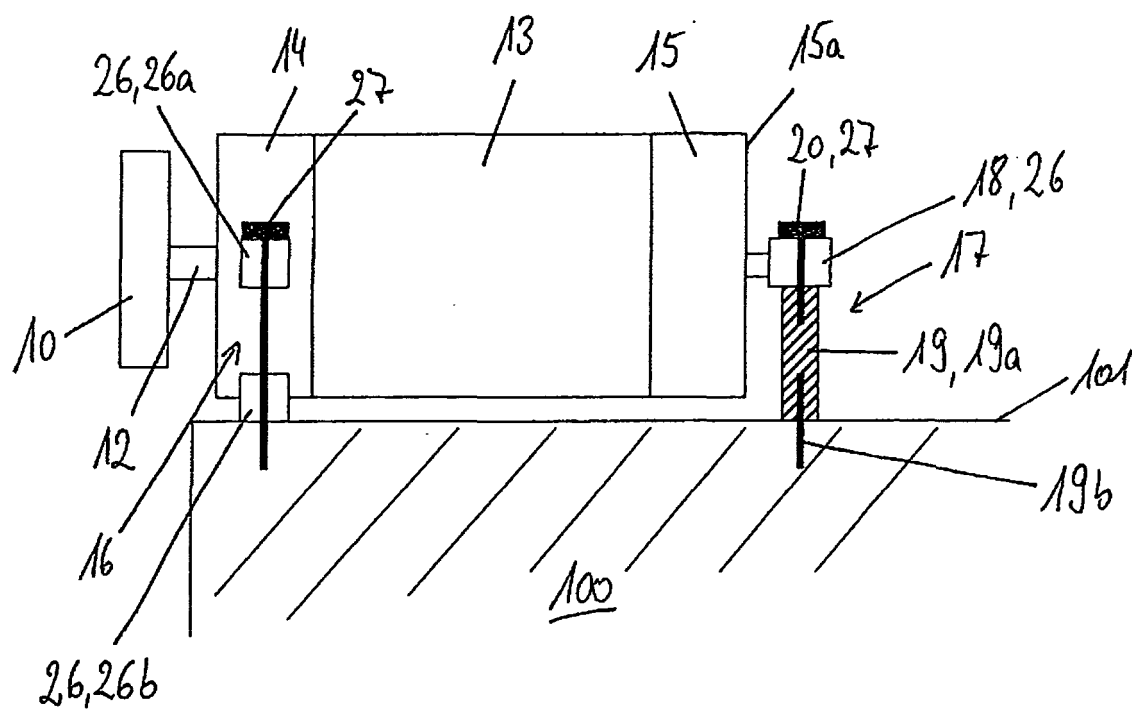


Fig. 1

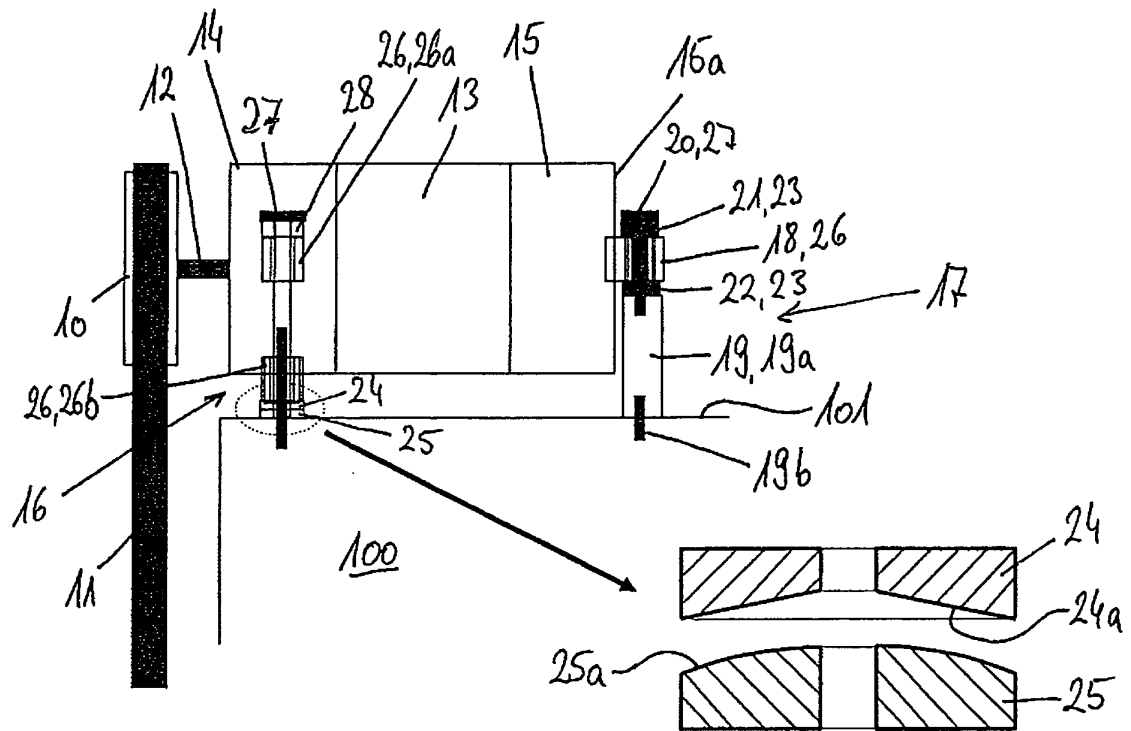


Fig. 2

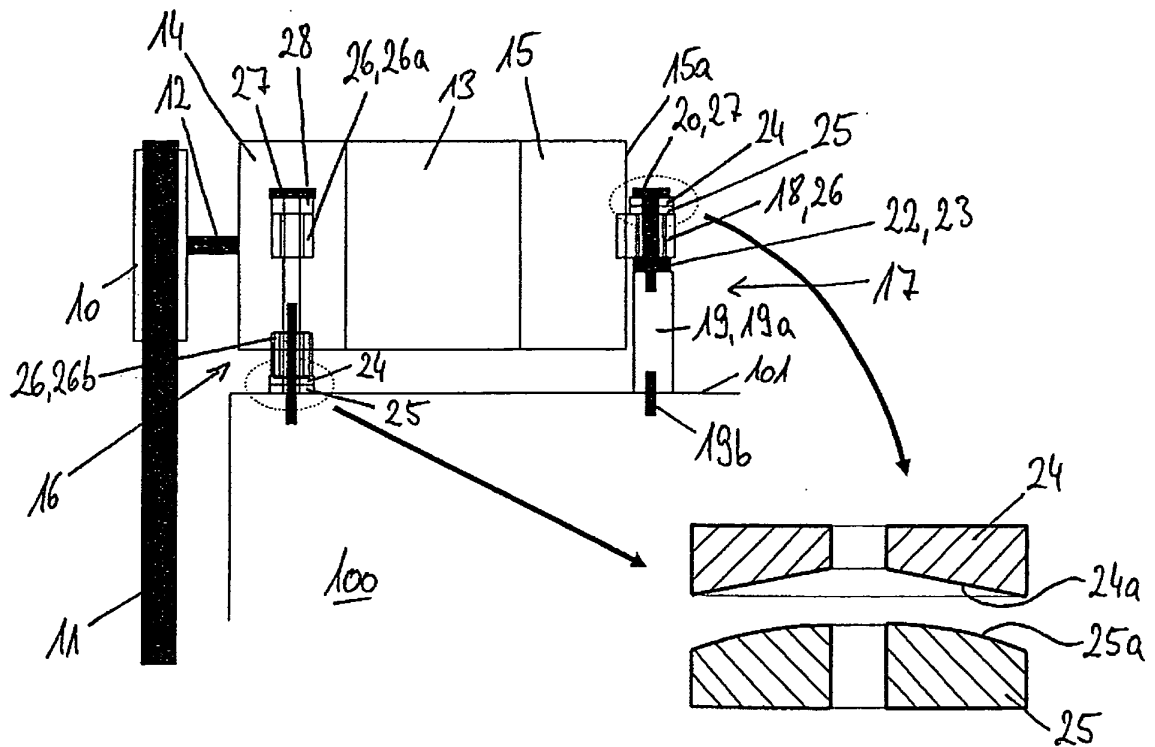


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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