

"COMPRESSOR BLOCK".

Field of the Invention

The present invention relates to a compressor block, in particular, a reciprocating compressor block (preferably employed in cooling systems).

5 The compressor block in question was developed with the aim of providing a rigid and resistant structure using a fewer amount of raw materials for its manufacture.

Background of Invention

10 Reciprocating compressors, in particular those employed in cooling systems are composed essentially by an electric motor and by means to promote compression of a working fluid (coolant fluid). In general, the means to promote the compression of a working fluid comprise at least one piston-cylinder assembly, wherein the piston is able to be reciprocally moved within the cylinder (where the working fluid can be compressed).

15 In this sense, the movement of the piston is conventionally related (directly or indirectly) to the movement provided by the electric motor. Typically, the coupling between these elements is performed by a connecting rod, which is capable of transferring and / or transform the movement of the motor (motor rotor) to the piston.

 The arrangement of components of a reciprocating compressor, as described above is typically provided by associating them into a single block, which is associated with the compressor housing.

20 An example of a compressor block embraced by the state of the art is illustrated in Figure 1. In this figure, it is noticed that said compressor block 11 comprises a plate 16 for mounting a valve assembly (not shown) associated with the piston guide 13 (not shown) to a housing 12 for the rotor of the motor (not shown), and extensions 14 to support the block 11 in the compressor housing (not shown). While these elements have been modularly cited, it should be also stated that the compressor block 11 it is a one-section, integral body, and these elements are interconnected by means of plates 17 which (despite comprising some points of reduction of material 15) require a high amount of raw material for its production.

 It was also observed that the current state of the art includes models of compressor blocks designed to reduce the demand of raw material for its production.

30 A first example of this type of construction is described in US 4,115,035, where it is possible to notice a block for reciprocating compressor of refrigerator whose objective is to minimize the amount of material required for its manufacture. This block comprises a geometry formed by a substantially triangular shaped plate, joining the operating regions of the block (opening for mounting the motor shaft; shirt jacket and two pressure damping chambers). This solution, despite employing a relatively low amount of material in its manufacture, has the disadvantage of concentrating all tensions resulting from operational efforts of the compressor in a single region of the block: the substantially triangular shaped

plate. In addition, it results in excessive acoustic transmissibility because it is a flat plate.

A second example can be found in the document US 3,666,380 which also discloses a block for reciprocating compressor of refrigerators, with a greatly simplified embodiment, apparently reducing the amount of material, provided with a similar geometry to the object described in US 4,115,035. However, in a more simplified embodiment, not comprising the pressure damping chambers and comprising an extension from the opening for mounting the drive axle, extending to the compressor housing where it is associated with a vibration damping element. The compressor block obtained from this embodiment, although apparently requiring less material to be manufactured, requires the use of reinforcements to ensure its rigidity. Such reinforcements tend to increase the weight of the block and, consequently, the amount of material used in making the same.

It is noted, therefore, that the current state of the art lacks a reciprocating compressor block, using a small amount of material in its manufacture, providing a high mechanical resistance to the efforts derived by the operation and which provides also a good capacity to dissipate the heat resulting from the operation of the compressor.

Objectives of the Invention

Thus, it is one of the objectives of the present invention to provide a reciprocating compressor block that uses a low amount of raw material in its manufacture.

It is another objective of the present invention to disclose a reciprocating compressor block having low weight and high mechanical strength.

It is also another objective of the present invention to disclose a reciprocating compressor block with a low acoustic transmission through the elimination of the conventional flat plates.

It is yet another objective of the present invention to provide a reciprocating compressor block capable of providing a good dissipation of heat absorbed during the operation of the compressor.

Summary of the Invention

The objectives of the present invention are achieved by the compressor block now revealed, which comprises at least one opening of driving member, at least one front support extension and at least one portion (for mounting the plate of valves). The compressor block disclosed herein provides at least one first means of structural connection between the portion (for mounting the plate of valves) and the frontal extensions of the support defined by at least one structural wall, and at least one second means of structural connection between the portion (for mounting the plate of valves) and the frontal extensions of the support defined by at least one structural wall.

According to the present invention, the walls comprising at least one section of physical association between each other and define the main perimeter of the compressor

block. Preferably, the walls are fundamentally symmetrical.

Still preferably, the walls are comprised of fundamentally curvilinear sections.

Preferably, the compressor block disclosed herein comprises at least one reinforcement disposed between frontal extensions of the support.

5 Optionally, the structural walls can define the area of operation of the connecting rod.

Brief Description of Figures

The present invention will be described in detail based on the figures listed below, including:

10 Figure 1 illustrates a block compressor belonging to the current state of the art, seen in isometric perspective;

Figure 2 illustrates the compressor block now disclosed, in isometric perspective;

Figure 3 illustrates the compressor block now disclosed, seen in top view, and

15 Figure 4 illustrates, schematically, a preferred assembly of the compressor block now disclosed.

Detailed Description of the Invention

According to the main concept of the present invention, there is shown a block compressor that does not use a horizontal plate for the junction of the functional parts of the block (as done by prior art), consisting, however, of a structure of low weight, high rigidity
20 and requiring a small amount of raw materials for their manufacture.

The preferred embodiment proposed by the present invention is disclosed in details in Figures 2 to 4, which shows the compressor block 21, object of the present invention.

The compressor block 21 comprises at least one passage opening of the driving member 22 capable of allowing the passage of a piston actuator means 32, wherein such
25 piston actuator means 32 preferably is an eccentric shaft coupled to the motor shaft 31 acting as a crankshaft. It should be noted, however, that any other equivalent means of actuating the piston 32 equivalent can be used without alteration of the scope of the invention.

In the preferred embodiment the block 21, at least one piston jacket 23 is disposed
30 in a position that is substantially perpendicular to the passage opening of the driving member 22, and said piston jacket 23 is capable of housing the piston of the compressor 34. The piston jacket 23 is designed to accommodate and allow the piston 34 to perform oscillating sliding movements inside itself so that it, in order to move in the direction of the passage opening of the driving member 22, admits the refrigerant gas and compresses the same
35 when they move in the opposite direction.

Thus, it is extremely important that the inner surface of the piston jacket 23 is provided with a high dimensional accuracy (so as to ensure an ideal gap 34 with the piston,

ensuring tightness) and an appropriate surface roughness (in order to minimize the friction between the piston 34 and piston jacket 23, thereby reducing power loss and heating of both components).

Both the admission to the compression process and the distribution of the refrigerant gas already compressed are managed from a block of valves (not shown) which is mounted on portion 26 disposed along with the piston jacket 23.

Said block of valves defines the geometry of the portion 26, and preferably, but not necessarily, comprises a valve assembly of the "bypass" type to enable the flow of gas only in the desired direction, however, that block valves may be replaced by equivalent means, without thereby affecting the scope of the present invention.

Said block 21 also comprises at least one, but preferably four support extensions 24 arranged at the ends of the block, the extensions being subdivided into two frontal support extensions 24a and two rear support extensions 24b. These extensions support 24 are intended to allow the block 21 to be mounted on the compressor housing.

The block 21, illustrated in the figures 2 to 4, comprises at least one structural wall 28a defining at least one first means of structural connection, joining the portion 26 and the frontal extensions of support 24a and at least one structural wall 28b defining at least one second means of structural connection, joining the portion 26 and the frontal extensions of support 24a. In a preferred embodiment, the walls 28a and 28b comprise at least one section of physical association with each other.

In a preferred embodiment, the block 21 comprises two fundamentally symmetrical structural walls 28a.

Also in a preferred embodiment, the block 21 comprises two fundamentally symmetrical structural walls 28b.

Thus, the walls 28a and 28b are preferably provided with fundamentally curvilinear sections and define the perimeter of the main block 21 being defined by two pairs of walls, each pair being comprised by a structural wall 28a and a structural wall 28b arranged symmetrically and physically associated to each other.

Additionally, there is provided the use of a reinforcement 24c joining the two frontal extensions of support 24a. In a preferred embodiment, said reinforcement 24c is provided with a curvilinear geometry.

These walls 28a and 28b provide rigidity to the block of the present invention, since they provide mechanical strength on many degrees of freedom, even if they are composed of slim cross sections. Thus, it is noted that the cross sections of the structural walls 28a and 28b are arranged in such a way to support the loads in the direction of their higher moment of inertia, providing a high rigidity with a small amount of required raw material, thus resulting at a block 21 that is more lightweight and economical.

Referring to the passage opening of the driving member 22, it is noted that it is associated with the structure of the block 21 by means of at least one, but preferably four reinforcements 27.

It should be also noticed that in the structure of the block 21, the constructive arrangement formed by rigid or permanent connection of the walls 28a and 28b and of the reinforcements 27 results in a large amount of openings 25 where there is no raw material. Such openings 25 represent a high percentage of the volumetric space defined by the block 21 due to the fact that they are spaces without raw materials, representing a significant percentage of raw material savings, when compared to the compressor blocks of the state of the art.

Due to the existence of such openings 25 it is also obtained a good relation "volume / surface of heat exchange" which provides a considerable improvement in the dissipation of heat by convection, when compared to the compressor block of the state of the art. Once the compressor block 21 is able to dissipate its heat with greater easiness, the result is a lower average temperature of the block 21 representing a higher thermal efficiency of the compressor.

The apertures 25 associated to the structures 28a and 28b also provide low acoustic transmissibility to the block of the event, since they provide thereto the absence of flat plates which vibrate more easily compared to the blocks of the compressor of the state of the art.

Still with reference to the structural walls 28b, it is noted in Figure 4 that they define an area of action of the connecting rod 33, bypassing the movement of the driving member of the piston 32, in the case represented by an eccentric shaft which interconnects an electric motor 31 to a connecting rod 33. At this point, by imposing rotational motion to the motor shaft 31 the eccentric shaft will move on a rotary trajectory under the same center of the motor shaft, but radially displaced, providing an alternate linear movement to the piston 34 associated to the connecting 33.

In a preferred embodiment, the block 21 is formed by a metallic material single piece, thus, the block 21 is preferably made by a casting process that may, both the material and the process of obtaining, be altered without the scope being affected. An example of an alternative embodiment consists, for example, of the adoption of a block 21 being formed of a polymeric material made by a process of plastic injection.

It should be noted that although it was shown a preferred constructive form of the present invention, it is understood that any omissions, substitutions and constructive alterations can be made by a person skilled in the art, without departing from the spirit and scope of the required protection. It is also expressly stated to all combinations of elements that perform the same function in substantially the same way to achieve the same results are within the scope of the invention. Substitutions of elements of a described embodiment by

others are also fully intended and contemplated.

It should also be understood that the description given above on the basis of figures referred to only one of possible embodiments for the object of the present invention, and the actual scope of the object is defined in the appended claims.

CLAIMS

1. Block compressor (21) comprising at least one passage opening of driving member (22), at least one frontal support extension (24a) and at least one portion (26), CHARACTERIZED IN THAT it comprises:

5 at least one first means of structural connection between the portion (26) and the frontal extensions of support (24a) defined by at least one structural wall (28a);

at least one second means of structural connection between the portion (26) and the frontal extensions of support (24a) defined by at least one structural wall (28b);

10 the structural walls (28a, 28b) comprising at least one section of physical association between each other, and

the structural walls (28a, 28b) defining the main perimeter of the compressor block (21).

2. Block compressor (21) according to claim 1, CHARACTERIZED IN THAT it provides two fundamentally symmetrical structural walls (28a).

15 3. Block compressor (21) according to claim 1, CHARACTERIZED IN THAT it provides two fundamentally symmetrical structural walls (28b).

4. Block compressor (21) according to claim 1, CHARACTERIZED IN THAT it comprises at least one reinforcement (24c) arranged between the frontal support extensions (24a).

20 5. Block compressor (21) according to claim 1, CHARACTERIZED IN THAT the structural walls (28a, 28b) are comprised of fundamentally curvilinear portions.

6. Block compressor (21) according to claim 1, CHARACTERIZED IN THAT the structural walls (28b) define the operating area of the connecting rod (33).