

ATTACHMENT ARRANGEMENT BETWEEN SEGMENTED STATOR OF
ELECTRIC MOTOR IN FLUID COMPRESSOR BLOCK

Field of the Invention

The present invention refers to an attachment arrangement between an electric
5 motor stator in a fluid compressor block.

Particularly, the referred to electric motor stator of the present arrangement is directed to a segmented stator, and the compressor block refers to a component connecting, from functional viewpoint, said electric motor to a compression mechanism of the fluid compressor.

10 Background of the Invention

As already known by those skilled in the art, electric motors comprise machines capable of transforming electric energy into mechanical energy.

Generally speaking, and according to specialized academic publications, electric motors are composed of fixed inductive cores and movable inductive cores, and have their
15 functional principle based on electromagnetic induction, wherein magnetic fields generated by fixed inductive cores are capable of generating movement in the movable inductive cores. In this sense, those skilled in the art also know that fixed inductive cores are disposed at the motor stator while movable inductive cores are disposed at the motor rotor.

Further, those skilled in the art also know that electric motors whose stators are
20 segmented, which are formed from a plurality of substantially individual segments, wherein each segment defines a fixed inductive core, are disclosed in the state of the art. The main benefits of a segmented stator over other types of integral stators are particularly observed under the manufacturing viewpoint.

Documents US 7821175 and CN 201008100 disclose in turn segments made from
25 physical association of stator segments. From both documents it is also commonly observed that the physical association of stator segments provides for the use of outer structures, such as, for example, ring-shaped structures.

Although the above-mentioned documents only illustrate examples of embodiments pertaining to the state of the art, it is clearly noted that most of the already known segmented
30 stators disclose basic aspects shown in said examples. From this finding, it is easy to note the main drawbacks concerning such examples and, consequently, those of the most already known segmented stators.

A great drawback is presented in the assembling and/or construction of a stator since it can be verified that assembling of the stator requires using outer structures, which
35 aggregates dimensions to said stator. This aspect is highly harmful in the case of motor to be used in fluid compressors because the inner space of hermetical compressor housings is usually tiny.

In this sense, and in accordance with the teachings of the state of the art, it is further observed that there is a high tendency to reduce the size of fluid compressors without altering their capacity.

5 In this context, reference should be made to BR document PI0905651-3, which refers to several construction alterations effectively capable of reducing the size of fluid compressors without altering the capacity and/or efficiency thereof.

One of exhaustively aspects addressed in this BR document PI0905651-3 refers to optimization of compressor blocks. With regard to this optimization, said compressor block will comprise specially effective bearings, in addition to providing means allowing for the
10 electric motor rotor (that constitutes the compressor) to integrate the compressor block itself.

Nevertheless, said BR document PI0905651-3 does not teach any optimization referring to the electric motor stator that constitutes the compressor.

As far as this aspect is concerned, a person skilled in the art knows that conventional electric motors used in fluid compressors have their stator attached (by different
15 ways) to the hermetic housings of said fluid compressors. A segmented stator is usually secured to the block, either in a compressor or for any other purpose, by a tubular body externally assembled on the stator. Examples of this topology can be found in US documents 635935(???) and 6487769.

Rotary and Scroll compressors used this type of fixation (interfering external body)
20 in segmented or not segmented stators.

A main disadvantage of these cases resides in that how to ensure alignment between block and stator by means of said outer body since the process does not permit adjustments, wherein alignment is the result of manufacture accuracy of all elements involved in the process (block, stator, and housing).

25 Based on this scenario outlined above and in order to further optimize the teachings of BR patent document PI 0905651-3, the present invention was developed.

Objects of the Invention

By this way, and based on the specific objects of the invention, an attachment arrangement between a motor electric stator in a fluid compressor block whose components
30 when grouped are directly attached to specific regions of the compressor block is disclosed.

In this connection, an object of the present invention is to provide for fixing elements being disposed in such a position that renders the electric motor stator more rigid in the direction where radial vibrations having more amplitude occur.

A further object of the present invention is that the motor electric stator does not
35 physically contact the (hermetic or not hermetic) housing of said fluid compressor, thereby increasing the likelihood of solutions to develop elements to reduce noise and vibration of a compressor.

Another object of the invention is to allow for and/or facilitate and/or improve the (concentric and perpendicular) alignment between the stator and compressor block in the assembling process.

5 A yet object of the invention is to allow for the assembling of the stator itself (joining of segments to one another to form the stator in its final form) to be carried out during the assembling process in the block.

Summary of the Invention

These and other objects of the present invention are entirely achieved by means of the presently disclosed attachment arrangement between the motor electric stator in fluid
10 compressor block. It is then important to mention that, in general terms, said compressor block comprises at least an axial projection and said electric motor stator comprises at least two segments (that is, it refers to a segmented stator), wherein said compressor block and said motor are both disposed within a compressor housing.

The attachment arrangement in accordance with the present invention differs from
5 similar arrangements known in the art in that the (stator) segments are directly attached to the block by means of at least one fixing means.

According to the basic concepts of the present invention, said segments are directly or individually attached to the block by means of at least one fixing means. Optionally and to obtain the same results, it should be observed that at least a group of at least two segments
10 can be directly secured to the block by at least one fixing means. More particularly, attention should be drawn to the fact that segments are attached to at least one of the axial projections of the compressor block.

Preferably and in accordance with a preferred embodiment of the attachment arrangement of the present invention, the fixing means comprises a bolt, and more
15 specifically a bolt that is capable of fully passing through a segment and at least partially passing through an axial projection. Additionally, said bolt has also the ability to centrally pass through a segment and an axial projection.

Optionally, the fixing means may comprise a rivet, or a projection of the material from which the block is made, or also a fixing element of polymeric material, which is
20 injected, over-injected or a glutinous resin (more particularly, a glutinous resin), disposed between a segment and an axial projection.

Brief Description of the Drawings

The present invention will be described in detail below based on figures listed above, wherein:

5 Fig. 1 is an isometric perspective view of the attachment arrangement between the electric motor stator in fluid compressor block, in accordance with the invention;

Fig. 2 is an exploded perspective view of the attachment arrangement between the

motor electric stator in fluid compressor block, in accordance with the invention;

Fig. 3 is a top view of the arrangements of segments to form the electric motor stator.

Detailed Description of the Invention

5 As formerly mentioned, a fluid compressor essentially comprises a compression mechanism (that can be based on alternative mechanisms, or also spiral-type mechanisms); an electric motor (associated with at least a normally eccentric rotary axis); and a compressor block (that can or cannot provide suspension means or means for fixation to the hermetic housing).

10 Said alternative and spiral-type compression mechanisms are not directly related to the object of the present invention, nevertheless, it should be pointed out that said mechanisms are already widely known from documents pertaining to the state of the art.

With regard to the present invention and more specifically concerning the preferred embodiment of the present invention, it can be noted that same differs from the teachings
15 pertaining to the state of the art in that it provides for an attachment arrangement between a segmented stator of electric motor in fluid compressor block. Hence, from Figs. 1, 2, and 3, it can be inferred that said attachment arrangement between the segmented stator of electric motor in fluid compressor block generally provides the joining between a block 1 and an electric motor stator 2.

20 Block 1 is essentially composed of a monoblock structure. From one of its faces (lower face) it is projected a cylindrical structure 12 for receiving the (not shown) axis derived from the electric motor and from its other face (upper face) it is projected a contact interface for bushing the rotary elements of the (not shown) compression element.

The monoblock structure that defines said block 1 also comprises axial portions 11
25 for receiving the electric motor stator 2 and, more particularly, same is intended to receive segments 3 which when assembled and duly "coiled" define said electric motor stator 2.

According to the preferred embodiment of the present invention, the electric motor stator 2 comprises six segments 3.

30 Due to the fact said stator 2 is divided into segments 3, same is more susceptible to vibration (compared to a conventional undivided stator).

Preferably, each segment 3 comprises a plurality of laminar segments vertically aligned one over the other.

Also preferably and as illustrated in Fig. 3, each segment 3 is geometrically analogous to letter T, wherein the horizontal part of the letter T defines the "crown" of stator
35 2, and the vertical part of the letter T defines a "tooth" of stator 2.

As known by those skilled in the art, the "tooth" of each segment 3 is specifically intended to receive electric conductors which when duly coiled define coils 4.

According to the principles and concepts of the present invention, each of segments 3 is secured onto one of axial projections 11 of block 1, and this fixation occurs with the aid of fixing means 5.

As shown in Figs 1 and 2, said fixing means 5 comprise bolts capable of entirely passing through segments 3 (more specifically the longitudinal through-holes 31 disposed in said segments 3) and partially passing through the respective axial projections 11 of block 1.

Further as can be seen from Figs. 1 and 2, each segment 3 is individually attached to its respective axial projection 11 of block 1.

From Figure 3, it can be noted that said hole 31 of each segment 3 is disposed in a position aligned with a tooth 6 and, consequently, it is radially aligned with the center of stator 2 which is the direction at which dynamic forces having more intensity for this motor topology occurs, wherein said forces are the main motor vibration sources. As the fixing elements are aligned with the direction of force propagation, it acts to minimize motor vibration.

In a (not shown) optional form, said segments 3 may also be arranged in a group (of two segments, for example), thereby continuing to be capable of being fixed to block 1 by one or more fixing means 5. Flaps 71 and 72 (schematically shown in Figure 3) can aid eventual groups of this type; they may contain many different forms or not even exist.

Also in an optional form, each segment 3 can be individually attached to its axial projection 11 of block 1 by application of glutinous resin (glues and the like). In this sense, it is preferred that said glutinous resin is applied between segment 3 and its respective axial projection 11.

As formerly mentioned, the now proposed solution resides in the fact that said fixing elements are disposed in a such position that it renders the electric motor stator more rigid in the direction where radial vibrations of higher amplitude occur. To this effect, the radial forces intrinsic to the functioning of a motor are contained by the rigid fixation and, therefore, they are not converted into elevated vibration of the stator segments.

It is further verified that the compressor block itself is the aligning/fixing device of the stator segments, thus simplifying the assembling process because intermediate elements/devices/processes will not be required.

After describing the preferred and optional embodiments of the attachment arrangement between the electric motor stator in fluid compressor block, it should be understood that the scope of the present invention also contemplates other possible variations, which are solely limited by the contents of the set of claims, including possible equivalent means.

CLAIMS

1. Attachment arrangement between segmented stator of electric motor in fluid compressor block, comprising at least one block (1) provided with at least one axial projection (11) and at least one electric motor stator (2) integrated by, at least, two segments (3); wherein said block (1) and stator (2) are disposed within a compressor housing;

said arrangement being particularly CHARACTERIZED in that said segments (3) are directly attached to the block (1) by at least one fixing means (4).

2. Attachment arrangement, in accordance with claim 1, CHARACTERIZED in that said segments (3) are directly and individually attached to the block (1) by at least one fixing means (4).

3. Attachment arrangement, in accordance with claim 1, CHARACTERIZED in that at least one group of at least two segments (3) is directly attached to the block (1) by at least one fixing means (5).

4. Attachment arrangement, in accordance with any of claims 1 to 3, CHARACTERIZED in that said segments (3) are attached over at least one of axial projections (11) of said block (1).

5. Attachment arrangement, in accordance with any of claims 1 to 3, CHARACTERIZED in that said fixing means (5) comprises a bolt.

6. Attachment arrangement, in accordance with claim 5, CHARACTERIZED in that said fixing means (5) comprises a bolt capable of entirely passing through one segment (3) and at least partially passing through one axial projection (11).

7. Attachment arrangement, in accordance with claim 6, CHARACTERIZED in that said fixing means (5) comprises a bolt capable of centrally passing through one segment (3) and one axial projection (11).

8. Attachment arrangement, in accordance with any of claims 1 to 3, CHARACTERIZED in that said fixing means (5) comprises a glutinous resin.

9. Attachment arrangement, in accordance with claim 9, CHARACTERIZED in that said attaching means (5) comprises a glutinous resin disposed between a segment (3) and an axial projection (11).

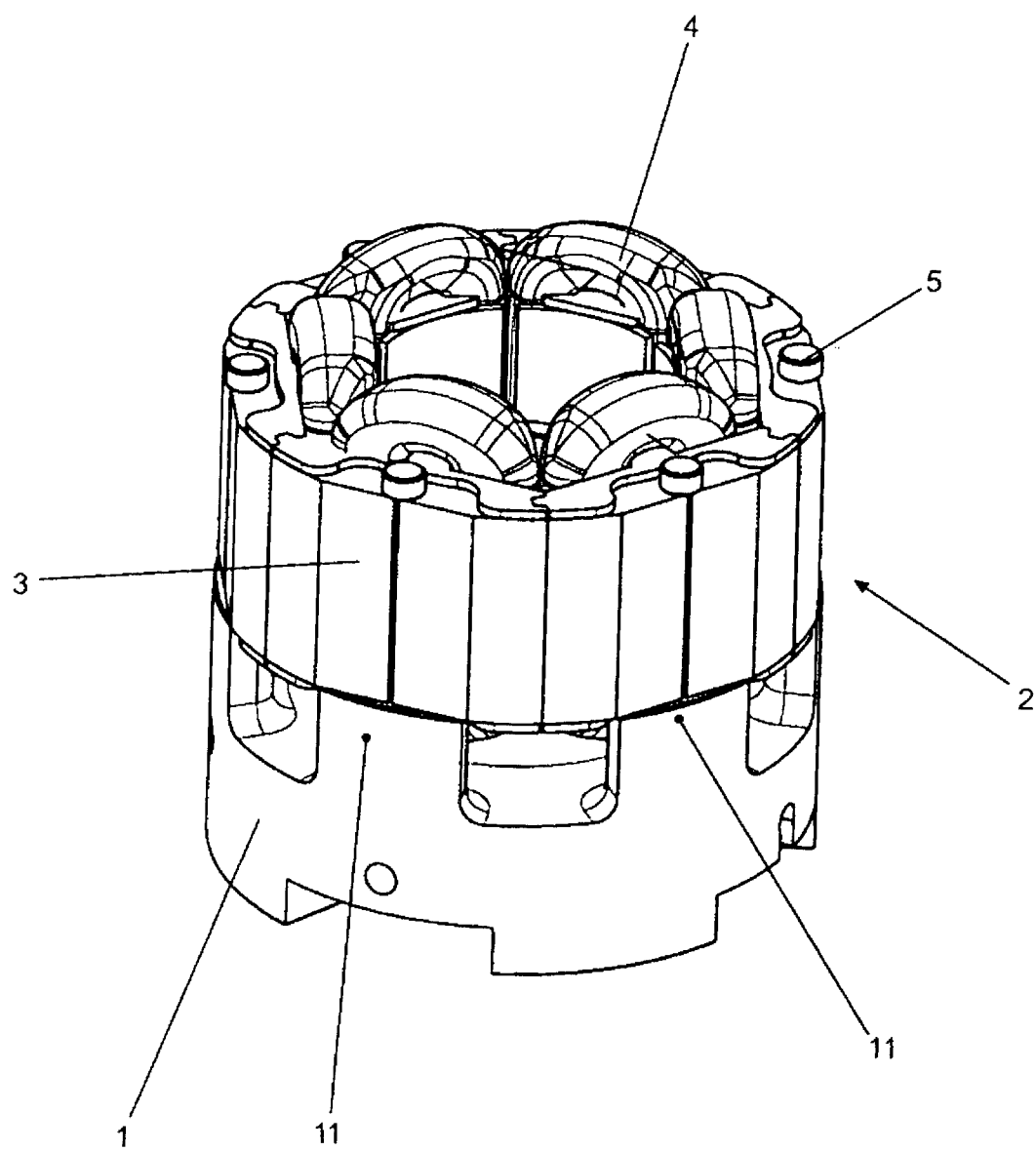


FIG. 1

