~~"ADAPTING DEVICE FOR LINEAR COMPRESSOR, AND COMPRESSOR PROVIDED WITH SUCH DEVICE".~~

LINEAR COMPRESSOR COMPRISING AN ADAPTER DEVICE

Field of the Invention

The present invention relates to an adapter device for compressors, more specifically designed to attach the magnetic ring to the resonant spring of a linear compressor, which may or may not allow the simultaneous accommodation of such parts, of a spring or a flat leaf spring.

Background of the Invention

As it is known in the art, the linear compressor equipment is provided with a piston axially movable within a compression chamber in order to raise the pressure of a given volume of fluid to a value necessary for the proper operation of a system - which generally, it a cooling system. Therefore, such compressors comprise a housing, a cylinder attached to the housing defining a compression chamber, a piston, a linear electric motor, and actuator means coupling the motor to the piston via a resilient means which usually constitutes a resonant spring.

It happens, however, that the electric actuator - which is usually constituted by a magnetic body - is typically coupled rigidly (gluing, welding, etc.) to the resilient element, which makes difficult possible part maintenance and replacement procedures. Moreover, the resilient element (or resonant spring), for being metallic, may possibly impair the proper magnetic flux of the actuator causing unwanted losses and, in addition, a disruption of the magnetic body during operation of the compressor can permit the passage of electric current from the motor to the resilient element, causing many troubles.

Document PI0601645-BR 6 can be recited as an example of the current state of the art that besides illustrating the embodiment above mentioned, and still discloses the presence of a base portion for interconnecting with the resilient member, which requires the use of large amount of material for its manufacture and, consequently, an increase in involved manufacturing costs.

It is also recited that such rigid coupling makes it difficult any maintenance procedures and interfere with the proper movement / action of the elastic medium.

It should also be noticed that many compressors operating with flat springs, or combinations of flat springs arranged at the ends of the resilient medium to act as fastening elements for fastening the assembly to the compressor housing- elements that also absorb working stresses and, therefore, are critically important for the proper operation and minimization of the level of noise emitted during operation of the compressor. Thus, the rigid coupling between the resilient element and the actuator means also complicates the installation and positioning of flat springs - which often also become rigidly attached to both parts, incurring the same drawbacks mentioned above.

Objects of the Invention

Therefore, it is one of the objects of the present invention an appropriate means - and electrically insulated - for the coupling between the resilient member of a compressor and its linear magnetic actuator.

Another among the objects of the present invention is to provide an adapter capable of interconnecting the magnetic actuator and the resonant spring by interference - and not so rigidly as it happens to the similar known ones.

It is a further object of the present invention to disclose an adapter for resonant springs whose coupling form between the parts allows a significant reduction in the dimensions of the same - in particular, the magnetic actuator - resulting in a more compact equipment, and possibly more economical one.

Summary of the Invention

The present invention achieves the above objects through an adapter device for linear compressor comprising a resilient member, a magnetic actuator and a reciprocating piston coupled to the resilient member by means of a rod or connecting rod, the compressor being capable of operating using flat springs, said adapter device comprising: at least one support member cooperating with a resilient element, said support member comprising a substantially cylindrical part equipped with intermediate ~~perimeter salient portion~~perimetrical projection, and at least one fastening ring cooperating with the support member and the magnetic actuator.

Briefly, the adapter device for linear compressor object of the present invention comprises means for enabling interconnection between a magnetic actuator and a resilient member – or resonant spring - of a linear compressor in a detachable, electrical and magnetically isolated manner.

According to a preferred embodiment of the present invention, the fastening element is made of electrically insulating and non-magnetic material - preferably of ceramic.

Also according to a preferred embodiment of the present invention, the support member couples to the resilient member by interference coupling, more specifically by male type fitting, preferably in such a manner that the support member couples to the distal inner region of the perimeter resilient member.

In one of the possible embodiments of the present invention, the distal edge of the fastening ring is coated with an adhesive element to allow any attachment to the magnetic actuator, and preferably the distal edge of fastening ring has ~~splitter~~ divider elements for ensuring that the adhesive layer keeps constant.

The support member of the adapter object of the present invention is also provided with a ~~perimeter intermediate salient portion~~ intermediate perimetrical projection that sets a stop for the coupling, by fitting, of at least one flat spring between said ~~perimeter salient portion~~ intermediate perimetrical projection and the distal end of the intermediate resilient member.

The present invention further comprises a linear compressor comprising a resilient member, a magnetic actuator and a reciprocating piston coupled to the resilient member by means of a rod or connecting rod, the compressor being capable of operating using flat springs, characterized in that it comprises an adapter device defined by at least one support member cooperating with the resilient member, said support member comprising a substantially cylindrical part equipped with intermediate ~~perimeter salient portion~~perimetrical projection; and at least one fastening ring cooperating with the support member and the magnetic actuator, said fastening ring being produced from an electric and non-magnetic insulating material.

Brief Description of the Drawings

The figures show:

Figure 1 - shows a longitudinal sectional view of a linear compressor which is used in preferred embodiments of the adapter device object of the present invention;

Figure 2 - shows a perspective view of the adapter object of the present invention and the magnetic actuator of the compressor that will couple to the same;

Figure 3 - shows a view in perspective of objects shown in Figure 2 fully assembled;

Figure 4 - shows a perspective view of the adapter of the present invention allowing to be noticed, stressed, the ~~splitters~~ dividers designed to aid the homogeneity of the adhesive layer employed to join the adapter and magnetic actuator of the linear compressor;

Figure 5.1 - shows an exploded perspective view of the resilient member and the adapter, taken separately;

Figure 5.2 - shows a perspective view of the adapter object of the present invention suitably coupled to the resilient element of a linear compressor.

Detailed Description of the Invention

As can be seen in the drawings listed herein above, the adapter device for a linear compressor built in accordance with a preferred embodiment of the present invention comprises, as illustrated in Figures 2 to 4, a support member 6 cooperating with a resilient element 1 – that, in the examples, is a resonant spring -and a fastening ring or element 7 which is coupled, by gluing or similar technique, the magnetic actuator 2 (in this case represented by a magnetic ring having cylindrical conformation) of the equipment motor of the compressor.

Figures 1 and 5 allow to notice that the support member 6 is defined by a substantially cylindrical part equipped with ~~perimeter~~ intermediate ~~salient portion~~ perimetrical projection 61, which ~~salient portion~~ subdivides this part into two regions: a proximal (relative to a resilient member 1) which is coupled, along its outer perimeter, the fastening ring 7 which is effectively attached to the magnetic actuator 2 of the system motor (not shown).

Such a ~~perimeter salient portion~~ intermediate perimetrical projection 61 presents a step-shaped profile so as to allow the positioning of a flat spring 5 - or possibly a leaf flat springs 5 – together with the resilient

member 1.In this respect, it is clear that the system can operate with or without the presence of flat springs without thereby going beyond the scope of the claimed protection. If the system does not use flat springs, the ~~perimeter salient portion~~ intermediate perimetrical projection 61 of the support member 6 is in direct contact with the distal end of the resilient member 1.

Also from Figures 1, 5.1 and 5.2, it is possible to see that the coupling (fitting) of the resilient member to the adapter device 1 is made by interference, since the proximal region of the support member 6 sets a "male" type part that is inserted into the inner diameter of the resilient member, which acts as a "female" type part for the assembling of the set. Thus, the coupling between the two parts maintains the support member 6 together with the inner perimeter of the distal perimeter region of the resilient member 1, without this assembly requiring the use of adhesives materials, welding or any other fastening means – which is a common embodiment in the present state of the art.

It is important to notice that this form of construction and assembling greatly facilitates any component maintenance and replacement procedures.

In turn, the fastening of the magnetic actuator 2 and the fastening ring 7 is carried out by using any adhesive material applied to the distal edge 71 of the fastening ring, and to ensure that the adhesive layer is kept constant in order to provide adequate fastening of the components, it is provided, as better seen in Figure 4, ~~splitters~~ dividers 72 (which may be counterbore or salient portions) of approximately 0.1 mm wide on the distal edge 71 of the ring 7.

In short, the assembling of the adapter device for linear compressor object of the present invention involves the following steps:

- coupling, by interference, of the support member 8 to the resilient member 1;
- coupling the fastening ring 7 to the support 8 by means of applying an adhesive material to the ~~perimeter~~ intermediate ~~salient portion~~ perimetrical projection 81;
- applying the adhesive on the distal edge 71 of the fastening ring 7; and
- attaching one of the ends of the magnetic actuator 2 on the distal edge 71 of the fastening ring 7.

It is also important to notice that the adapter device object of the present invention can be manufactured in various aesthetic configurations, materials and dimensions, depending on the requirements.

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

CLAIMS

1. Linear compressor comprising an Aadapter device ~~for linear compressor~~ comprising a resilient member ~~(1)~~, a magnetic actuator ~~(2)~~ and a reciprocating piston ~~(3)~~ coupled to the resilient member ~~(1)~~ by means of a rod or connecting rod ~~(4)~~, the compressor being capable of operating with the use of flat springs ~~(5)~~, ~~characterized in that~~ wherein said adapter device comprises:

~~of~~ at least one support member ~~(6)~~ cooperating with a resilient element ~~(1)~~ by interference, said support member ~~(6)~~ comprising a ~~substantially~~ cylindrical part equipped with intermediate ~~perimeter salient portion (61);~~perimetrical projection, wherein said intermediate perimetrical projection configures a stop for the fit coupling of at least one flat spring; and

at least one fastening element ~~(7) cooperating with the support member (8) and the magnetic actuator (2), and~~, said fastening element is being produced by electrically insulating and non-magnetic material and comprising, in its distal edge, several dividers capable of allowing adhesive material coating to provide the attachment between said fastening element and the magnetic actuator.

~~means for enabling interconnection between a magnetic actuator (2) and a resilient element (1) of a linear compressor in a detachable, electrical and magnetically isolated manner.~~

~~2. Device according to claim 1, characterized in that the fastening element (7) is produced by electrically insulating and non-magnetic material.~~

~~3~~2. ~~Device~~ Linear compressor according to claim~~s~~ 1 ~~and 2~~, ~~characterized in that~~ wherein the fastening element ~~(7)~~ is produced of a ceramic material.

~~4~~3. ~~Device~~ Linear compressor according to claim 1, ~~characterized in that~~ wherein the support member ~~(8)~~ is coupled to the resilient member ~~(1)~~ by means of interference coupling.

~~5~~4. ~~Device~~ Linear compressor according to claim~~s~~ 1 ~~and 4~~, ~~characterized in that~~ wherein the support member ~~(8)~~ is coupled to the distal inner perimeter region of the resilient member ~~(1)~~.

~~6~~5. ~~Device~~ Linear compressor according to claim 1, ~~characterized in that~~ wherein the distal edge ~~(71)~~ of the fastening element ~~(7)~~ is coated with an adhesive element for attaching to the magnetic actuator ~~(2)~~.

~~7. Device according to claims 1 and 6, characterized in that the distal edge (71) of the fastening ring (7) has several splitters (72).~~

~~8~~6. ~~Device~~ Linear compressor according to claim 1, ~~characterized in that~~ wherein the intermediate ~~perimeter~~ perimetrical projection ~~(61)~~ configures a stop for the fit coupling of at least one flat spring ~~(5)~~ between said intermediate ~~perimeter salient portion (61)~~ perimetrical projection and the distal end ~~(11)~~ of the resilient member ~~(1)~~.

~~9. Linear compressor comprising a resilient member (1), a magnetic actuator (2) and a reciprocating piston (3) coupled to the resilient member (1) by means of a rod or connecting rod (4), the compressor being capable of operating with the use of flat springs (5), characterized in that it comprises an adapter device defined by at least one support member (6) cooperating with the resilient member (1),said support member (6) comprising a substantially cylindrical part equipped with intermediate perimeter salient portion (61);at least one fastening element (7) cooperating with the support member (6) and the magnetic actuator (2).~~