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- (71) Applicant: **ARCELIK ANONIM SIRKETI** [TR/TR]; E5
Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).
- (72) Inventors: **KOC, Yusuf**; E5 Ankara Asfalti Uzeri, Tuzla,
34950 Istanbul (TR). **HACIOGLU, Bilgin**; E5 Ankara As-
falti Uzeri, Tuzla, 34950 Istanbul (TR). **EYYUBOGLU,**
Nazim Arda; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istan-
bul (TR). **YAROGLU, Tolga**; E5 Ankara Asfalti Uzeri,
Tuzla, 34950 Istanbul (TR).
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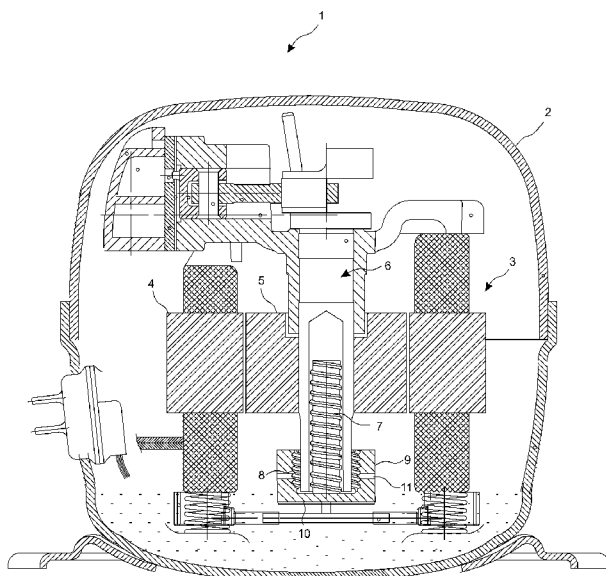
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- (54) Title: A COMPRESSOR WITH IMPROVED LUBRICATION EFFECTIVENESS

Figure 1



(57) Abstract: In household appliances, preferably in cooling devices, the circulation of the refrigerant used for refrigeration is provided by a reciprocating hermetic compressor (1). The present invention relates to increasing the effectiveness of lubrication in the compressors (1) of this type, in order to decrease the friction losses in the movable components of the compressor (1) during operation, to prevent abrasion and to remove the heat resulting from friction.

Description**A COMPRESSOR WITH IMPROVED LUBRICATION EFFECTIVENESS**

- [0001] The present invention relates to a compressor the lubrication performance of which is increased.
- [0002] The hermetic compressors used preferably in refrigerators provide the circulation of the refrigerant used for refrigeration. In the compressors of this type, lubrication is performed for decreasing the friction losses of the movable components of the compressor during operation, preventing abrasion and removing the heat resulting from friction. The lubricant is delivered to the movable components and the bearings by means of an oil sucking member. The lubricant situated at the base of the compressor casing at a certain level is sucked by means of the oil sucking member and delivered to the bearings and the compressor components that need to be lubricated. The oil sucked from the orifice at the lower side of the oil sucking member that is situated at the end of the crankshaft moves forward on the inner surfaces of the oil sucking member with the effect of centrifugal force as a result of the rotating crankshaft. When the compressor is operated particularly at low speeds, the crank also rotates at low speed and a sufficient amount of lubricant cannot be sucked as the centrifugal force decreases. Problems such as heating, abrasion may arise due to insufficient oil suction. Moreover, even in normal operational speeds, in the case oil suction is not performed at the desired flow rate, problems may arise in lubricating the piston rod-crankpin and the piston-cylinder bearings.
- [0003] In the state of the art International Patent Application no WO2006085163, a compressor is explained, comprising a guide fixed on the casing, enabling the lubricant to reach the oil suction pipe and the vortices created during suction of oil to be delivered upwards.
- [0004] The aim of the present invention is the realization of a compressor wherein the effectiveness of lubrication is increased particularly at low speeds.
- [0005] The compressor realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a guiding member that has at least one groove on the surface thereof facing

the oil sucking member and wherein the end portion of the oil sucking member enters without any contact. By creating at least partially closed region around the oil sucking member, the guiding member enables the lubricant level to rise towards the side walls of the oil sucking member.

- [0006] In a derivative of this embodiment, the guiding member surrounds the end of the oil sucking member uninterrupted, at least for a complete round.
- [0007] In a derivative of this embodiment, the guiding member is in form of a hollow cylinder. The guiding member surrounds the oil sucking member so that a gap remains therebetween. By means of the gap, the lubricant reaches the inlet of the oil sucking member without its flow rate decreasing. Thus, the heat occurring due to the operation of the compressor is more easily discharged by accelerating the circulation of the lubricant in the compressor.
- [0008] In an embodiment of the present invention, the grooves are located consecutively on the inner wall of the guiding member. Thus, the lubricant is enabled to be pushed over an even flow surface towards the end of the oil sucking member and the lubricant level is prevented from going beyond the inlet of the oil sucking member.
- [0009] In a derivative of this embodiment, more than one groove forms a flow surface inclined downwards on the guiding member. Thanks to its inclination, the guiding member accelerates the downward flow of the lubricant and the lubricant pushed downward by the movement of the crankshaft is prevented from moving upward. Consequently, a forced lubricant flow is created, enabling the lubricant to be guided toward the inlet of the oil sucking member in a single direction.
- [0010] In an embodiment of the present invention, the helical channels and the spiral grooves situated on the oil sucking member rotate in opposite directions. The grooves guide the lubricant towards the end of the oil sucking member facing the casing base and facilitates the suction of the lubricant. Thus, an increased amount of lubricant is delivered to the channels extending upwards as a result of the rotation of the crankshaft.
- [0011] In an embodiment of the present invention, the compressor comprises a lid covering the end, facing the casing base, of the guiding member and more

than one hole arranged on the guiding member. Thus, the guiding member creates a little pool around the oil sucking member and raises the lubricant level towards the oil sucking member. By means of the holes arranged on the side walls of the guiding member and almost at the same level with the inlet of the oil sucking member, the lubricant accumulates in the guiding member without going beyond the inlet of the oil sucking member.

[0012] A compressor realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0013] Figure 1 – is the perspective view of a compressor.

[0014] The elements illustrated in the figures are numbered as follows:

1. Compressor
2. Casing
3. Motor
4. Stator
5. Rotor
6. Crankshaft
7. Oil sucking member
8. Groove
9. Guiding member
10. Lid
11. Hole

[0015] In household appliances, preferably in cooling devices, the circulation of the refrigerant used for refrigeration is provided by a reciprocating hermetic compressor (1). In compressors (1) of this type, lubrication is performed for decreasing the friction losses in the movable components of the compressor (1) during operation, preventing abrasion and removing the heat resulting from friction. The compressor (1) comprises a casing (2) wherein the lubricant lubricating the movable components is filled; a motor (3) that is placed into the casing (2) and composed of two main components, namely a stator (4) and a rotor (5); a crankshaft (6) that transmits the motion received from the motor (3) to the piston; and an oil sucking member (7) that extends into the crankshaft (6) and that enables the lubricant in the casing (2) to be sucked and to be delivered to the

movable components.

[0016] The compressor (1) of the present invention comprises a guiding member (9) that is attached onto the oil sucking member (7), that surrounds the outer surface of the end, contacting the lubricant in the casing (2), of the oil sucking member (7) so that a gap remains therebetween and that has at least one groove (8) extending on the inner lateral wall thereof. When the compressor (1) starts operating, the crankshaft (6) rotates around the oil sucking member (7) that extends thereinto. As a result of this rotation, the lubricant inside the casing (2) goes through the inlet of the oil sucking member (7) which is the only possible path for the lubricant, and is pumped towards the crankshaft (6). The outer surface of the oil sucking member (7) is formed as a screw and carries the lubricant upwards with the rotation of the crankshaft (6). With the effect of the centrifugal force generated as a result of the rotation of the crankshaft (6), the guiding member (9) situated under the crankshaft (6) accumulates the lubricant spread on the casing (2) base in a region bordered by the side walls thereof and raises the lubricant level towards the oil sucking member (7). Thus, the lubricant, that reaches a certain level towards the oil sucking member (7) during the movement of the crankshaft (6), is more easily taken into the oil sucking member (7). By means of the grooves (8), a forced lubricant flow is created in the guiding member (9), enabling the lubricant to be guided toward the inlet of the oil sucking member (7) in a single direction.

[0017] In an embodiment of the present invention, the guiding member (9) is shaped as a hollow cylinder. The oil sucking member (7) is seated into the guiding member (9). The lubricant advancing through the gap between the oil sucking member (7) and the inner wall of the guiding member (9), is guided towards the inlet of the oil sucking member (7) in a single direction. A gap is provided between the side walls of the guiding member (9) and the oil sucking member (7). The gap is large enough to prevent the oil sucking member (7) and the groove (8) from rubbing each other, but small enough to guide the lubricant towards the oil sucking member (7).

[0018] In an embodiment of the present invention, the grooves (8) are helical and

completely surround the lateral wall of the guiding member (9).

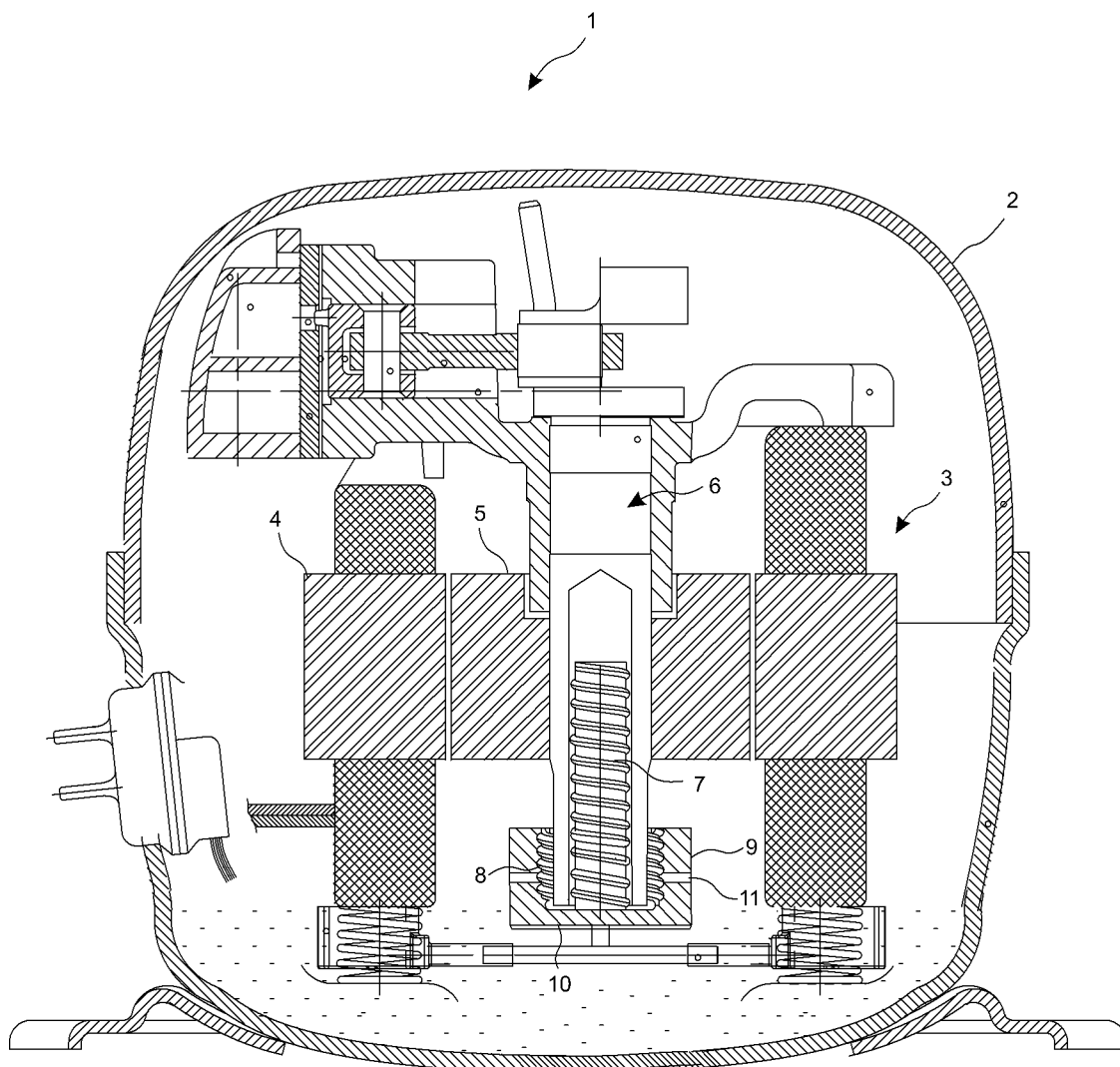
- [0019] In a derivative of this embodiment, more than one groove (8) is inclined downwards towards the casing (2) base. The grooves (8) create a flow surface inclined downwards from the oil sucking member (7) towards the casing (2) base. The flow surface inclined towards the casing (2) base enables the lubricant to be pumped downwards, thus the lubricant confined by the guiding member (9) does not go beyond the oil sucking member (7) end opening into the lubricant. By means of the grooves (8), the lubricant is enabled to flow in one direction and prevented from being distributed uncontrollably in the compressor (1) and the flow of the lubricant is limited so that the lubricant is guided towards the inlet of the oil sucking member (7) only when the crankshaft (6) moves.
- [0020] In an embodiment of the present invention, the grooves (8) extend in a direction opposite to the helical direction of the helical channels on the oil sucking member (7). The outer surface of the oil sucking member (7) is formed as a screw and the channels rotate upwards. With the rotational movement of the crankshaft (6), the lubricant passes through the inlet of the oil sucking member (7) and is pumped upwards along the inner wall of the latter. The grooves (8) function as an additional pump for the lubricant and facilitates the upward delivery of the lubricant. Thus, the lubricant can be carried upwards even in situations the compressor (1) is operated at low rpm and the crankshaft (6) rotates at low speeds. By means of the opposite directions of the grooves (8) and the channels on the oil sucking member (7), an increased amount of lubricant is carried to the crankshaft (6).
- [0021] In an embodiment of the present invention, the compressor (1) comprises a lid (10) covering the end, opening into the lubricant on the casing (2) base, of the guiding member (9) and more than one hole (11) arranged on the lateral surface of the guiding member (9). The lubricant is received into the guiding member (9) by means of the holes (11), and the lubricant is enabled to be accumulated in the guiding member (9) by creating an almost closed region around the oil sucking member (7) by means of the lid (10).

[0022] By means of the present invention, particularly in variable speed compressors (1) the lubrication problem arising from low crankshaft (6) rotational speeds is overcome and the performance of the whole system is improved, and on the other hand mechanical losses are decreased by eliminating the life expectancy problem of the compressor (1) in low speeds.

Claims

1. A compressor (1) **comprisng** a casing (2) wherein the lubricant lubricating the movable components is filled; a motor (3) that is placed into the casing (2) and composed of two main components, namely a stator (4) and a rotor (5); a crankshaft (6) that transmits the motion received from the motor (3) to the piston; and an oil sucking member (7) that extends into the crankshaft (6) and that enables the lubricant in the casing (2) to be sucked and to be delivered to the movable components, **characterized by** a guiding member (9) that is attached onto the oil sucking member (7), that surrounds the outer surface of the end, contacting the lubricant in the casing (2), of the oil sucking member (7) so that a gap remains therebetween and that has at least one groove (8) extending on the inner lateral wall thereof.
2. A compressor (1) as in Claim 1, **characterized by** the guiding member (9) that is shaped as a hollow cylinder.
3. A compressor (1) as in Claim 1 or 2, **characterized by** the helical grooves (8) that extend longitudinally on the inner wall of the guiding member (9).
4. A compressor (1) as in any one of the above claims, **characterized by** more than one groove (8) that extends in a downward inclination towards the casing (2) base.
5. A compressor (1) as in any one of the above claims, **characterized by** the grooves (8) that extend in a direction opposite to the helical direction of the helical channels arranged on the oil sucking member (7).
6. A compressor (1) as in any one of the above claims, **characterized by** a lid (10) covering the end, opening into the lubricant on the casing (2) base, of the guiding member (9) and **by** more than one hole (11) arranged on the lateral surface of the guiding member (9).

Figure 1



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 605 163 A1 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 14 December 2005 (2005-12-14) paragraphs [0177] - [0192]; figures 15, 17, 18 -----	1-6
X	WO 2008/052297 A1 (WHIRLPOOL SA [BR]; JOVITA LUIZ FABIANO [BR]; LOPES ANDREA [BR] WHIRLPO) 8 May 2008 (2008-05-08) page 8, line 35 - page 11, line 34; figure 9 -----	1-6
X	US 2011/229353 A1 (HUELSE EMILIO RODRIGUES [BR] ET AL HULSE EMILIO RODRIGUES [BR] ET AL) 22 September 2011 (2011-09-22) paragraphs [0072], [0034] - [0039]; figures 6,1 -----	1-6



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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Jurado Orenes, A

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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