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(54) Method for preventing moisture entering and foam forming in a compressor, and the compressor obtained in this manner

(57) In a method for preventing moisture entering a compressor (C), in particular for use in a refrigeration circuit, before the compressor is connected into this latter, and for preventing foam forming therein following its connection into said circuit, an anti-foaming fluid is fed into the compressor (C) following its manufacture and is extracted from the compressor after this has been connected into the refrigeration circuit.

A compressor (C) obtained by the aforesaid method comprises a casing (1) in which, following its manufacture and up to the moment of its connection to the usual members of a refrigeration circuit, there is contained a gas able to prevent moisture entering said casing. Said gas is an anti-foaming fluid.

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Description

This invention relates to a method in accordance with the introduction to the corresponding independent claim.

The invention also relates to a compressor in accordance with the introduction to the corresponding independent claim.

With particular reference to compressors (specifically motor-compressor units) for refrigeration circuits, such compressors after manufacture and testing are usually filled with dry air (or a similar gas) to prevent moisture entering their casing. This air is then removed from the compressor when connected into the refrigeration circuit to enable the refrigerant fluid to be fed into the circuit.

This method gave excellent results until hydrocarbons such as isobutane were used as refrigerant fluids in place of halogenated refrigerants (CFC/HFC). Such hydrocarbons normally operate in the refrigeration circuit at a lower pressure than that typical of refrigeration circuits using halogenated fluids. With the use of these new refrigerant fluids it has been noticed that foam forms in the liquid lubricant (present in every compressor) after the expulsion of the dry air and the subsequent filling with the refrigerant. This is very probably due to the fact that when under vacuum during the extraction of the air from the compressor, a part of the air which has mixed with the lubricant is released.

This fact plus the reduced pressure of the refrigerant gas (for example isobutane) lead to the formation of said foam.

This causes serious problems in the circuit into which the compressor is connected. For example, the foam prevents circulation of the refrigerant gas within the circuit and in any event reduces its efficiency.

An object of the present invention is to provide a method for eliminating moisture within a compressor, in particular of a refrigeration circuit, subsequent to its manufacture and up to the moment of its connection into said circuit, which overcomes the drawbacks of the state of the art.

A particular object of the invention is to provide a method of the said type which ensures the absence of foam within the refrigeration circuit during the normal use of this circuit.

A further object of the invention is to provide a compressor (specifically a motor-compressor unit) in which there is considerable insulation against moisture subsequent to its manufacture and up to the moment of its connection to the usual members of a refrigeration circuit.

These and further objects which will be apparent to the expert of the art are attained by a method in accordance with the characterising part of the corresponding claim.

The aforesaid objects and others which will be apparent to the expert of the art are further attained by a compressor in accordance with the characterising part of the corresponding independent claim.

The invention will be more apparent from the accompanying drawing, which is provided by way of non-limiting example and in which the single figure shows a compressor obtained in accordance with the invention.

According to the invention, the compressor comprises a usual casing 1 containing an electric motor (not shown) for driving a usual moving piston with reciprocating movement within a cylinder (not shown), to pump refrigerant fluid within a corresponding circuit. Three conduits 2, 3, 4 emerge from said casing. The conduits 2 and 3 are arranged to be connected to the refrigeration circuit and in particular to the usual condenser and to the usual evaporator (not shown) of this circuit respectively. These three conduits are temporarily closed in any known manner after the compressor C leaves the production line.

After its manufacture, a usual lubricant for its moving parts is fed into the compressor C by being introduced into the casing 1 through the conduit 4. The compressor is then subjected to an operational test in known manner. A fluid or rather a gas is then fed into the casing 1 through the third conduit 4 to fill the entire inner space of the casing to protect the internal members of the compressor until the moment of its connection to the refrigeration circuit. After this filling, the conduit 4 is closed in known manner.

As stated, the gas commonly used up to the present time has been dry air. With the use of hydrocarbons (such as isobutane) as refrigerant gas (present in the refrigeration circuit at a lower pressure than halogenated fluids), it has been noted that after the compressor C has been connected to the usual members of the refrigeration circuit in which this gas is used, foam is present in the lubricant contained in the casing 1. It has now been surprisingly found that if an anti-foaming gas such as carbon dioxide (CO_2) is used instead of dry air, the foam problem disappears.

Consequently, according to the invention, after the operational test has been performed, the compressor is filled with an anti-foaming gas of the stated type. This gas, for example CO_2, is fed into the casing 1 at a suitable gauge pressure, for example 0.4 bar. The introduction of this gas may however be preceded by prior "scavenging" of the interior of the casing 1 with dry air.

These operations are preferably carried out automatically in a controlled-atmosphere environment of zero or practically zero humidity.

The compressor obtained in this manner can be stored for an indefinite time, until it is connected into a refrigeration circuit, for example of a domestic refrigerator or freezer. At the moment of this connection, the conduit 4 is reopened and is connected to a suction circuit which draws from the casing 1 the gas present in it to create a degree of vacuum (however not such that the lubricant escapes from the casing). This suction results in the extraction of a considerable quantity of gas, which is also removed substantially completely from the lubri-

cant present in the compressor. Foam is absent within the refrigeration circuit during its use, notwithstanding the low pressure of the refrigerant fluid.

This operation is preceded by connecting the compressor to the refrigeration circuit via its conduits 2 and 3.

After attaining the vacuum the refrigerant fluid, for example isobutane or another similar hydrocarbon, is fed into the compressor through the conduit 4. When filling is complete, the conduit 4 is permanently reclosed mechanically.

The aforesaid operations are carried out in a controlled-atmosphere environment.

Because of the particular gas used, a compressor resulting from the method of the invention can be used in a refrigeration circuit without foam arising in this latter, hence enabling its potential to be fully utilized.

Claims

1. A method for preventing moisture entering a compressor, in particular for use in a refrigeration circuit, before the compressor is connected into this latter, and for preventing foam forming therein following its connection into said circuit, characterised by feeding an anti-foaming fluid into the compressor (C) following its manufacture.

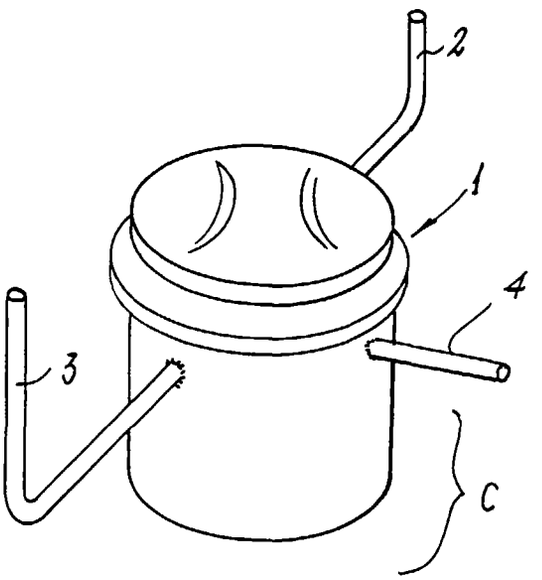
2. A method as claimed in claim 1, characterised in that the anti-foaming fluid is fed into the compressor within a controlled-atmosphere environment.

3. A method as claimed in claim 1, characterised in that the anti-foaming fluid is extracted from the compressor after it has been connected to the refrigeration circuit.

4. A method as claimed in claim 1, characterised in that the anti-foaming fluid is fed in at a pressure above atmospheric.

5. A compressor (C) obtained in accordance with the method claimed in claim 1, comprising a casing (1) in which, following its manufacture and up to the moment of its connection to the usual members of a refrigeration circuit, there is contained a gas able to prevent moisture entering said casing, characterised that said gas is an anti-foaming fluid.

6. A compressor as claimed in claim 5, characterised in that the anti-foaming fluid is carbon dioxide.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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 3749

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-A-24 11 337 (NECKARELZ) 18 September 1975 * page 1, paragraph 1 - page 7, paragraph 2; figure 1 *	1,5	F04B39/04
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 530 (M-1485), 24 September 1993 & JP-A-05 141350 (HITACHI LTD), 8 June 1993, * abstract *	1,5	
A	DE-A-31 35 091 (DWM COPELAND GMBH) 17 March 1983 * page 4, paragraph 1 - page 6 *	1,5	
A	PATENT ABSTRACTS OF JAPAN vol. 009, no. 209 (M-407), 27 August 1985 & JP-A-60 069289 (HITACHI SEISAKUSHO KK), 19 April 1985, * abstract *	1,5	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F04B
F25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 July 1996	Bertrand, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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