ABSTRACT

In order to improve a refrigerant compressor system, comprising at least one low-pressure stage and at least one high-pressure stage, a suction duct leading from a suction connection for the refrigerant to the low-pressure stage, an intermediate-pressure duct leading from the low-pressure stage to the high-pressure stage, a high-pressure connection connected to the high-pressure stage, and a lubricant bath to which the intermediate pressure in the intermediate-pressure duct is applied, in such a way that there is always an adequate supply of lubricant for the low-pressure stage, it is proposed that a lubricant feed device draws lubricant from the lubricant reservoir and feeds said lubricant to the induced refrigerant flowing to the low-pressure stage in an intake path.
FIG. 9

10

182
206
204
176

10
REFRIGERANT COMPRESSOR SYSTEM

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] This application is a continuation of International application No. PCT/EP2014/052211 filed on Feb. 5, 2014.

[0002] This patent application claims the benefit of International application No. PCT/EP2014/052212 of Feb. 5, 2014 and German application No. 10 2013 203 268.4 of Feb. 27, 2013, the teachings and disclosure of which are hereby incorporated in their entirety by reference thereto.

BACKGROUND OF THE INVENTION

[0003] The invention relates to a refrigerant compressor system, comprising at least one low-pressure stage and at least one high-pressure stage, a suction duct leading from a suction connection for the refrigerant to the low-pressure stage, an intermediate-pressure duct leading from the low-pressure stage to the high-pressure stage, a high-pressure connection connected to the high-pressure stage, and a lubricant bath to which the intermediate pressure in the intermediate-pressure duct is applied.

[0004] Refrigerant compressor systems of this kind are known from the prior art.

[0005] In these systems, the problem has arisen that damage occurs in the low-pressure stage, especially to valves of said stage, since insufficient lubricant is available, at least in some operating stages.

[0006] It is therefore the underlying object of the invention to improve a refrigerant compressor system of the type in question in such a way that an adequate supply of lubricant for the low-pressure stage is ensured at all times.

SUMMARY OF THE INVENTION

[0007] According to the invention, this object is achieved in the case of a refrigerant compressor system of the type described at the outset by virtue of the fact that a lubricant feed device draws lubricant from the lubricant reservoir and feeds said lubricant to the induced refrigerant flowing to the low-pressure stage.

[0008] The advantage of the solution according to the invention is to be regarded as the fact that there is the possibility, with the lubricant feed device according to the invention, of exploiting the pressure gradient between the intermediate pressure and the suction pressure of the refrigerant compressor system and thus of feeding lubricant from the lubricant reservoir to the induced refrigerant of the low-pressure stage and thereby of ensuring adequate lubrication, especially of valves of the low-pressure stage.

[0009] In principle, feeding in lubricant at any desired points would be conceivable as long as lubricant was fed in to the induced refrigerant.

[0010] However, in order to feed the lubricant into the low-pressure stage in as favorable a manner as possible, provision is preferably made for the lubricant feed device to feed the lubricant to an intake path of the low-pressure stage which extends in the system housing, in particular to an intake duct and/or to an intake manifold of the low-pressure stage, thus allowing the lubricant to be fed in without having to provide components outside the system housing.

[0011] In particular, the intake duct or the intake manifold are also situated in the system housing.

[0012] In order to prevent the quantity of lubricant fed to the induced refrigerant becoming too large and instead to keep it within reasonable limits at all times, provision is preferably made for the lubricant feed device to comprise a dispensing unit, which dispenses a lubricant quantity in accordance with the operating state, such that there is the possibility with the dispensing unit of adapting the quantity of lubricant in accordance with the operating state.

[0013] For example, provision is made to define various operating states and/or operating state ranges and to dispense the lubricant quantity by means of the dispensing unit according to the operating state and/or operating state range.

[0014] As regards dispensing in the individual operating states, it is advantageous if the supply of lubricant by the dispensing unit is stopped when the compressor is stationary in order thereby to avoid accumulation of lubricant in the intake path.

[0015] It is furthermore advantageous if the dispensing unit prevents pressure equalization between the output path and the lubricant bath via the lubricant feed device when or from the time when the compressor is stationary.

[0016] It is thereby possible, by virtue of the maintenance of the pressure difference in the intake path, to feed lubricant that collects in said path back into the lubricant bath via leakage paths, e.g. in the region of the respective pressure stages, and thus to avoid oil surges, especially in the region of the working valves, when the refrigerant compressor system is restarted.

[0017] Dispensing in a manner dependent on operating states could be accomplished by means of a separate control system provided for this purpose.

[0018] Another, more advantageous solution envisages that the dispensing unit is controlled by the compressor power, with the result that there is the possibility of detecting the operating states by means of the compressor power and dispensing the lubricant quantity in accordance with the compressor power.

[0019] In principle, the dispensing unit could be designed in many different ways in this case.

[0020] For example, the dispensing unit could be controlled in many different ways in accordance with the compressor power.

[0021] For example, there would be the possibility of controlling the compressor power by controlling a drive motor for the refrigerant compressor system and, in accordance with the control of the drive motor, also electronically controlling the dispensing unit by means of this control.

[0022] However, a particularly simple solution envisages that the dispensing unit is controlled by a compressor shaft and dispenses the lubricant quantity in accordance with the speed of the compressor shaft.

[0023] As regards the design of the dispensing unit itself, more precise details have not been given.

[0024] Thus, for example, the dispensing unit could be designed as a slide or valve.

[0025] A particularly simple solution envisages that the dispensing unit is designed as a dispensing pump.

[0026] With a dispensing pump of this kind, there is a simple possibility of performing power-dependent dispensing.

[0027] In particular, the dispensing pump is preferably designed in such a way that it has a speed-dependent delivery volume.
This can be achieved in a particularly simple manner if the dispensing pump is controlled, in particular driven, by the compressor shaft.

As regards the dispensing pump itself, more precise details have not yet been given.

Thus, an advantageous solution envisages that the dispensing pump is a gear pump.

As regards the lubricant mass flow fed to the induced refrigerant, provision is preferably made to prevent said mass flow from becoming too great since otherwise the compressor power and/or durability of the refrigerant compressor system is impaired since, for example, oil compression in the working chambers leads to an increased drive load.

For this reason, provision is preferably made for a lubricant mass flow fed to the induced refrigerant to make up at most 5% of the total mass flow of refrigerant with lubricant drawn in by the low-pressure stage.

As regards the arrangement of the dispensing unit, more precise details have not yet been given.

Thus, provision is preferably made for the refrigerant compressor system to have a system housing on which the dispensing unit is arranged.

In this case, the dispensing unit is preferably arranged in a cover of the system housing since, in this case, it can be installed easily in the system housing, wherein the dispensing unit is, in particular, integrated into the cover.

In order to be able to design the lubricant feed device in as simple and protected a manner as possible, a delivery duct leading from the dispensing unit to the lubricant reservoir is provided on the system housing, preferably on the cover, in particular in the system housing, preferably in the cover, said delivery duct providing the possibility of delivering the lubricant from the lubricant reservoir to the dispensing unit.

It is furthermore expedient if a delivery duct for the lubricant leading from the dispensing unit to the intake path is provided on the system housing, in particular in the system housing, thereby making possible simple production and assembly.

In this case, the delivery duct can extend exclusively in the system housing, e.g. in a cover thereof.

However, there is also the possibility of the delivery duct extending partially in the system housing and partially in a compressor component, e.g. in a compressor shaft.

In the last-mentioned case, selective lubrication of bearings for the compressor shaft can also preferably be accomplished by means of the delivery duct.

In particular, it is advantageous for the feeding of the lubricant to the induced refrigerant flow if a nozzle for the lubricant to be fed to the intake path is associated with said intake path.

As regards the type of compression of the refrigerant in the refrigerant compressor system, no further details have been given in connection with the illustrative embodiments thus far.

Thus, it would be conceivable in principle to provide any kind of compressor, e.g. a scroll compressor or a screw compressor.

However, the solution according to the invention has particular advantages if the refrigerant compressor comprises a reciprocating piston compressor since a reciprocating piston compressor has intake valves which are particularly sensitive to wear.

It has furthermore proven advantageous in the design of a low-pressure stage and of a high-pressure stage if the piston compressor comprises a first cylinder bank to form the low-pressure stage and a second cylinder bank to form the high-pressure stage, thus allowing both the low-pressure stage and the high-pressure stage to be separated in a simple manner by the fact that they are formed by different cylinder banks of a compressor.

Moreover, more precise details as regards the arrangement of the lubricant reservoir have not yet been given.

For example, the lubricant reservoir could be an external reservoir.

However, a particularly simple solution envisages that lubricant reservoir is arranged in a drive space of the system housing, wherein the drive for the low-pressure stage and the high-pressure stage is arranged in the drive space.

In particular, provision is made here for the lubricant reservoir to be arranged at the bottom of the drive space.

Further features and advantages of the invention form the subject matter of the following description and of the graphical representation of a number of illustrative embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a side view of a refrigerant compressor system according to the invention;

FIG. 2 shows an elevation of the refrigerant compressor system in the direction of arrow A in FIG. 1;

FIG. 3 shows a section along the line 3-3 in FIG. 2;

FIG. 4 shows a section along the line 4-4 in FIG. 3;

FIG. 5 shows a section along the line 5-5 in FIG. 2;

FIG. 6 shows a section along the line 6-6 in FIG. 2;

FIG. 7 shows a section along the line 7-7 in FIG. 6 with a cutaway illustration of the cylinder head, of the valve plate and of the cylinder liners of a cylinder bank;

FIG. 8 shows an enlarged illustration of the section in FIG. 6 in the region of the valve plate and of the intake valve;

FIG. 9 shows a plan view in the direction of arrow A in FIG. 3;

FIG. 10 shows a section along the line 10-10 in FIG. 9;

FIG. 11 shows an elevation corresponding to FIG. 9 with a plan view of a dispensing pump according to the first illustrative embodiment;

FIG. 12 shows a longitudinal section similar to FIG. 3 through a second illustrative embodiment of a refrigerant compressor system according to the invention, and;

FIG. 13 shows a section similar to FIG. 10 through the second illustrative embodiment of the refrigerant compressor system according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

An illustrative embodiment of a refrigerant compressor system, which is shown in FIGS. 1 and 2, comprises a system housing, denoted overall by 12, which extends in a longitudinal direction 14.

In this case, the system housing 12 comprises a central housing body 16, which likewise extends in the longitudinal direction 14 and, on a first end, carries a first end cover 22 and, on a second end, a second end cover 24, which
is, for example, furthermore provided on its side facing away from the central housing body 16 with a flange surface 26 for mounting a converter.

[0066] As shown in FIG. 3, the central housing body 16 comprises a drive housing section 32 of a piston compressor 40, which encloses a drive space 34, wherein the drive space 34 extends between the first end cover 22 and a partition wall 36 of the central housing body 16, said wall being situated between the drive housing section 32 and a motor housing section 42 of the central housing body 16.

[0067] The motor housing section 42 for holding an electric motor 50 comprises a motor space 44 which, for its part, is situated in turn between the partition wall 36 and the second end cover 24, wherein the motor space 44 also furthermore extends from the motor housing section 42 into the second end cover 24.

[0068] Seated in the motor space 44 is the electric motor, which is denoted overall by 50 and which comprises a stator 52 arranged in the motor space 44 and a rotor 54 surrounded by the stator 52, wherein the rotor 54 is rotatable about an axis of rotation 56.

[0069] For this purpose, the rotor 54 is seated on a compressor shaft of the piston compressor 40, said shaft being denoted overall by 60, carrying the rotor 54 by means of a rotor carrier section 62 extending in the motor space 44, and supporting said rotor in a manner which allows it to rotate about the axis of rotation 56. However, the compressor shaft also extends into the drive space 34 and has a drive section 64, which passes through the drive space 34 and carries a plurality of eccentrics 66.

[0070] For its part, the compressor shaft 60 is mounted in the system housing 12 in a bearing receptacle 72, which is provided on the partition wall 36, and in a bearing receptacle 74, which is provided on the first end cover 22, with the result that the drive section 64 is situated with the eccentrics 66 between the bearing receptacles 72 and 74, while the rotor carrier section 62 starts from bearing receptacle 72 and extends with a free end in the motor space 44.

[0071] As shown in FIG. 3, the eccentrics 66 of the drive section 64 of the compressor shaft 60 are used to drive a plurality of cylinders 82 of the piston compressor 40, these being arranged in the form of two cylinder banks 84 and 86 in the drive housing section 32, for example, wherein each of the cylinders 82 has a cylinder space 92, in which a piston 94 can be moved in a stroke direction 96, wherein each cylinder space 92 is surrounded, for example, by a cylinder liner 98 seated in the drive section.

[0072] For its part, each piston 94 is driven by a connecting rod 102, which is mounted in an articulated fashion on the piston 94 at one end and surrounds one of the eccentrics 66 at the other end.

[0073] The cylinder spaces 92 of each of the cylinder banks 84 and 86 are closed off by a valve plate 104 and 106, respectively, wherein the respective valve plate 104 or 106 carries a cylinder head 112 or 114, respectively, on its side facing away from the respective cylinder liner 98.

[0074] Cylinder head 112 is associated with the first cylinder bank 84, and cylinder head 114 is associated with the second cylinder bank 86.

[0075] For example, each of the valve plates 104, 106 and each of the cylinder heads 112 and 114 fits over all of the cylinder spaces 92 of the cylinders 82 of the respective cylinder banks 84 and 86.

[0076] As shown in FIGS. 1 and 5, a suction shutoff valve 122 is provided, for example, in the refrigerant compressor system 10 according to the invention, said valve being provided, for its part, with a suction connection 124, being mounted on the first end cover 22, for example, and feeding refrigerant to be drawn in to a suction duct 126, which is provided in the first end cover 22 and the drive housing section 32 and which extends from the suction shutoff valve 122 to the first cylinder bank 84, wherein the suction duct 126 passes through an aperture 128 in the drive housing section 32, said aperture being in alignment with an aperture 132 in valve plate 104, with the result that the induced refrigerant can flow out of the drive housing section 32, pass through valve plate 104 and enter a suction chamber 134 of cylinder head 112, as shown in FIGS. 3, 6 and 7.

[0077] In particular, the suction duct 126 and the suction chamber 134 form an intake path 130, provided in the system housing 12, for the induced refrigerant.

[0078] However, it is also possible to provide a simple suction line connection instead of the suction shutoff valve 122, whether by means of a screwed joint or a flanged joint.

[0079] The suction chamber 134 is situated on a side of the respective valve plate 104, 106 facing away from the cylinder space 92 and above suction openings 136 for all the cylinders 82 of the respective cylinder bank 84, 86, said openings being arranged in the respective valve plate 104, 106, wherein a working valve or suction valve 138 is associated with each said suction opening 136 on a side facing the cylinder space 92, said valve being arranged, for example, on valve plate 104 and comprising a suction flap or valve tongue 140, which closes the suction opening 136 in the closed position depicted in solid lines in FIGS. 7 and 8, in which it rests on valve plate 104, and exposes the suction opening 136 in an open position, which is depicted in dashed lines in FIGS. 7 and 8, allowing refrigerant to be drawn into the cylinder space 92 through said opening.

[0080] To define the mobility of the valve tongue 140, use is made, on the one hand, of valve plate 104 in the closed position of said tongue and, on the other hand, a guide recess 142 is provided in a cylinder liner collar 144 of the cylinder liner 98, for example, into which recess the respective valve tongue 140 engages by means of a tongue tip 146, ensuring that the tongue tip 146 is guided in the guide recess 142 during its movement between its closed position and its open position.

[0081] To define the position of maximum opening of the valve tongue 140, that is to say the position furthest away from valve plate 104, the guide recess 142 thus forming with the stop surface 148 a stop limiter.

[0082] In the respective cylinder head, in cylinder head 112 in FIGS. 7 and 8, the suction chamber 134 is furthermore associated with an oppositely situated pressure chamber 152, which is likewise formed in cylinder head 112, wherein a row of outlet valves 154 is arranged in the pressure chamber 152, said outlet valves being seated on valve plate 104, for example, and likewise being capable of exposing outlet openings, thus allowing compressed refrigerant to enter the pressure chamber 152 from the cylinder space 92.

[0083] The cylinders 82 of cylinder bank 86 are also formed in the same way as the cylinders 82 of cylinder bank 84 with
the valve plate 104 and 106, wherein, in particular, valve plate 106 and cylinder head 114 are designed in a corresponding way.

[0084] As shown particularly in FIGS. 4 and 5, the refrigerant compressor system with the two cylinder banks 84 and 86 operates as a two-stage compressor, that is to say that refrigerant drawn in at suction pressure PS by the cylinders 82 of the first cylinder bank 84, which form a low-pressure stage 156, is initially compressed to an intermediate pressure P2 and then flows into the motor space 44, flows through the motor space 44 and flows from the latter into an intermediate-pressure duct 162 of the drive housing section 32, with the result that the refrigerant at intermediate pressure P2 can enter the suction chamber 134 of cylinder head 114 of cylinder bank 86 and is finally compressed to high pressure P1 by the cylinders 82 of the second cylinder bank 86, which form a high-pressure stage 158, wherein the refrigerant at high pressure P1 can then emerge from the high-pressure connection 164.

[0085] In order to avoid damage to the suction valves 138, as evidenced, for example, by the valve tongues 140 exhibiting spalling over the course of time, especially in the region of their tongue tips 146, caused at least in part by impacts by the valve tongues 140 and/or the tongue tip 146 on valve plate 104 and/or the stop surfaces 148, a lubricant feed device denoted overall by 170 is provided, which takes lubricant from a lubricant bath 174 formed above a bottom region 172 of the drive space 34 by means of a first delivery duct 176 provided in the first end cover 22, for example, and by means of a filter 178 arranged ahead of said duct and feeds said oil to a dispensing unit 180 via delivery duct 176 (FIGS. 3 and 9 to 11).

[0086] From the dispensing unit 180, the lubricant is fed via a second delivery duct 182, which is shown in FIGS. 6 and 9 to 11 and is provided in the first end cover 22, and via a filter 184, which is also arranged in said duct, to a nozzle 186, which is inserted into the suction duct 126 and by means of which the lubricant can be injected into the suction duct 126, through which induced refrigerant flows, with the result that the lubricant injected into the suction duct 126 is taken along by the induced refrigerant and is fed at least to the suction valves 138 in order to lubricate the latter.

[0087] The pressure difference for the delivery of the lubricant by the lubricant feed device 170 is already given by the fact that a pressure corresponding to the intermediate pressure P2 is present in the drive space 34, this pressure being higher than the suction pressure PS, with the result that this pressure difference is already sufficient to deliver the lubricant from the lubricant bath 174 to the nozzle 186.

[0088] Thus, the dispensing unit 180 does not necessarily have to produce a pressure difference but serves primarily to achieve dispensing of the lubricant in accordance with a power of the lubricant compressor system, in the simplest case in accordance with a speed of the compressor shaft 60.

[0089] This feed in lubricant forms a lubricant coating, especially in the region of valve plate 104 and of the stop surfaces 148 of the guide recesses 142, by means of which coating impact of the valve tongues 140 and of the tongue tips 146 of the valve tongues 140 on valve plate 104 and/or the stop surfaces 148 is damped in order thereby to avoid spalling in the region of the tongue tips 146 and/or of the valve tongues 140.

[0090] To make the dispensing unit 180 as simple as possible, said unit could be a volume-controlling valve.

[0091] In particular, the dispensing unit 180 is designed as a dispensing pump 190 with a speed-dependent, in particular speed-proportional, delivery volume, which pump is coupled to the compressor shaft 60 and is thus driven in synchronism with the compressor shaft 60 in order to make the dispensing of the lubricant injected into the suction duct 126 via the nozzle 148 proportional to the speed of the compressor shaft 60.

[0092] As shown in FIG. 11, the dispensing pump 190 is designed as a gear pump, which has an internally toothed outer body 192 and a corresponding externally toothed inner body 194, which, on the one hand, is rotatable about an axis 196 of an eccentric journal 198, wherein the eccentric journal, for its part, is arranged eccentrically with respect to the axis of rotation 56 of the compressor shaft 60 and is formed integrally on the compressor shaft 60, with the result that the inner body 194 of the gear pump 190 is driven directly by the compressor shaft 60.

[0093] In this case, the outer body 192 and the inner body 194 are formed in such a way relative to one another that the eccentric revolution of the eccentric journal 198 between the outer body 192 and the inner body 194 leads to the formation of free spaces 202 which are moved in a circulating fashion around the axis of rotation 56 of the compressor shaft 60 through the eccentric movement of the eccentric journal 198, with the result that lubricant fed in through delivery duct 176 via an inlet pocket 204 enters the free spaces 202 which form and is delivered, by the movement of the free spaces 202 around the axis of rotation 56, to an outlet pocket 206, which is connected to delivery duct 182, thus allowing the lubricant to be fed through the latter to the nozzle 186 directed into the suction duct 126.

[0094] In this case, the gear pump 190 is constructed in such a way that, when the eccentric journal 198 is no longer moving around the axis of rotation 56 and the inner body 194 is therefore stationary, lubricant delivery by the lubricant feed device 170 is blocked, and thus the feeding of lubricant to the suction duct 126 is blocked when the compressor shaft 60 is stationary.

[0095] This has the advantage that, when the drive of the compressor shaft 60 is stationary and thus also when the piston 94 is stationary, no more lubricant can flow into the suction duct 126 from the lubricant bath 174 since the dispensing pump 190 prevents this.

[0096] However, the dispensing pump 190 furthermore also blocks a buildup of the pressure in the suction duct 126 when the compressor shaft 60 is stationary and the inner body 194 is thus stationary, with the result that lubricant which is still present in the suction duct 126 flows back to the lubricant bath 174 via different paths, e.g. leaks in the region of the pistons 94 of the cylinder banks 84, 86.

[0097] This furthermore has the advantage that there is thus the possibility of preventing flooding of the suction duct 126 with lubricant when the refrigerant compressor system according to the invention is stationary and furthermore also of maintaining the pressure in the suction duct 126 in order to feed the lubricant in the suction duct 126 back to the lubricant bath 104 via leaks, e.g. in the region of the cylinder banks 84, 86, and thus of avoiding oil surges when the refrigerant compressor system restarts.

[0098] In the first illustrative embodiment of the solution according to the invention, the lubricant feed device 170 is integrated into the first end cover 22, with the result that delivery duct 176 and delivery duct 182 with the nozzle 184,
in particular, are situated in the first end cover 22, and the filters 178 and 184 too are preferably likewise seated in the first end cover 22.

[0099] Moreover, the first cover 22 advantageously also comprises a receptacle 212 for the outer body 192 of the dispensing pump 190, wherein the inlet pocket 204 and the outlet pocket 206 also open into this receptacle 212 at the end, in particular between the bearing receptacle 74 and receptacle 212.

[0100] The outer body 192 can be inserted non-rotatably into receptacle 212, and the inner body 194 is then seated in said outer body, when mounted on the eccentric journal 198 in the manner described in such a way as to be rotatable about the axis 196 and thus revolves about the axis of rotation 56 with the eccentric journal 198.

[0101] In a second illustrative embodiment of a refrigerant compressor system according to the invention, shown in FIGS. 12 and 13, features which are identical with those of the first illustrative embodiment are provided with the same reference signs, and therefore in this regard reference can also be made in full to the statements relating to the first illustrative embodiment.

[0102] In particular, the lubricant bath 174 is provided in the drive space 34 in the same way as in the first illustrative embodiment, from which both the lubricant feed device 170 takes lubricant, likewise through the delivery duct 176 provided in the first end cover 22.

[0103] The dispensing unit 180, formed by the dispensing pump 190, is furthermore likewise provided in the first end cover 22 in the same way as in the first illustrative embodiment and is designed in the same way as described in connection with the first illustrative embodiment.

[0104] However, the dispensing pump 190 does not deliver the lubricant to a delivery duct extending onward in the first end cover 22 but delivers it into a compressor shaft duct 222, which preferably extends coaxially with the axis of rotation 56 in the compressor shaft 60, wherein a transverse duct 224 in the partition wall 36 in the region of bearing receptacle 72 leads from the compressor shaft duct 222 to a receiving groove 226, which is provided in bearing receptacle 72, which surrounds the compressor shaft 60 and from which, in turn, a delivery duct 228 in the partition wall 36 and in the drive housing section 32 extends as far as a nozzle 232, which opens into the suction duct 126 in the drive housing section 32.

[0105] The compressor shaft duct 222 is furthermore provided with further transverse ducts, wherein a transverse duct 242 is used for lubricating a sliding bearing 244 between the compressor shaft 60 and bearing receptacle 74, transverse ducts 246 are used for lubricating sliding bearings 248 between the eccentrics 66 and the connecting rods 102, and transverse ducts 252 are used for lubricating sliding bearings 254 between the compressor shaft 60 and bearing receptacle 72, for example.

[0106] The lubricant feed device 170 according to the invention thus serves not only to feed lubricant to the suction duct 126 in order to achieve the effects in the region of the suction valves 138 which have been described in connection with the first illustrative embodiment but also to supply bearings 244, 248, 254 in the region of the compressor shaft 60 with lubricant.

[0107] Apart from the lubrication of the various sliding bearings, the same advantages are achieved in the second illustrative embodiment as have been described in detail in connection with the first illustrative embodiment.

1. A refrigerant compressor system, comprising at least one low-pressure stage and at least one high-pressure stage, a suction duct leading from a suction connection for the refrigerant to the low-pressure stage, an intermediate-pressure duct leading from the low-pressure stage to the high-pressure stage, a high-pressure connection connection connected to the high-pressure stage, and a lubricant bath to which the intermediate pressure in the intermediate-pressure duct is applied, a lubricant feed device draws lubricant from the lubricant reservoir and feeds said lubricant to the induced refrigerant flowing to the low-pressure stage in an intake path.

2. The refrigerant compressor system as claimed in claim 1, wherein the lubricant feed device feeds the lubricant to an intake path of the low-pressure stage which extends in the system housing.

3. The refrigerant compressor system as claimed in claim 1, wherein the lubricant feed device comprises a dispensing unit, which dispenses a lubricant quantity in accordance with the operating state.

4. The refrigerant compressor system as claimed in claim 3, wherein the dispensing unit is controlled by the compressor power.

5. The refrigerant compressor system as claimed in claim 3, wherein the dispensing unit is controlled by a compressor shaft.

6. The refrigerant compressor system as claimed in claim 3, wherein the dispensing unit is designed as a dispensing pump.

7. The refrigerant compressor system as claimed in claim 6, wherein the dispensing pump has a speed-dependent delivery volume.

8. The refrigerant compressor system as claimed in claim 6, wherein the dispensing pump is a gear pump.

9. The refrigerant compressor system as claimed in claim 1, wherein a lubricant mass flow fed to the induced refrigerant makes up at most 5% of the total mass flow of refrigerant with lubricant drawn in by the low-pressure stage.

10. The refrigerant compressor system as claimed in claim 3, wherein the refrigerant compressor system has a system housing on which the dispensing unit is arranged.

11. The refrigerant compressor system as claimed in claim 10, wherein the dispensing unit is arranged on a cover of the system housing.

12. The refrigerant compressor system as claimed in claim 11, wherein the dispensing unit is integrated into the cover.

13. The refrigerant compressor system as claimed in claim 11, wherein a delivery duct leading from the dispensing unit to the lubricant reservoir is provided on the system housing.

14. The refrigerant compressor system as claimed in claim 11, wherein a delivery duct for lubricant leading from the dispensing unit to the intake path is provided on the system housing.

15. The refrigerant compressor system as claimed in claim 1, wherein a nozzle for the lubricant to be fed to the intake path is associated with said intake path.

16. The refrigerant compressor system as claimed in claim 1, wherein the refrigerant compressor system comprises a piston compressor.

17. The refrigerant compressor system as claimed in claim 16, wherein the piston compressor comprises a first cylinder bank to form the low-pressure stage and a second cylinder bank to form the high-pressure stage.
18. The refrigerant compressor system as claimed in claim 1, wherein the lubricant reservoir is arranged in a drive space of the system housing.

19. The refrigerant compressor system as claimed in claim 18, wherein the lubricant reservoir is arranged at the bottom of the drive space.

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