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(54) **COMPRESSOR SYSTEM AND METHOD OF LUBRICATING THE COMPRESSOR SYSTEM**

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(57) **ABSTRACT**

A compressor system comprising a compressor (e.g., rotary screw compressor) a gearbox and a lubrication system for providing lubrication to the compressor and the gearbox is disclosed. The compressor and the gearbox are provided in operational association with one another within a compressor housing. The compressor system further comprises a gear pump for lubricating the gearbox and a compressor oil circuit for lubricating the compressor from a lubricant source within the lubrication system. The lubrication system further includes at least two lubricant feeds, with one feed connecting the gear pump and one feed connecting the compressor oil circuit. Upon activation of the gear pump and/or the compressor oil circuit, lubricant from the lubricant source is encouraged to flow through the associated lubricant feed for distribution to the associated portion of the compressor system. An additional connection line connecting the gear pump and the compressor oil circuit is provided to continuously provide lubrication to associated portions upon the gear pump or the lubricant feed connecting the compressor oil circuit becomes inoperative.

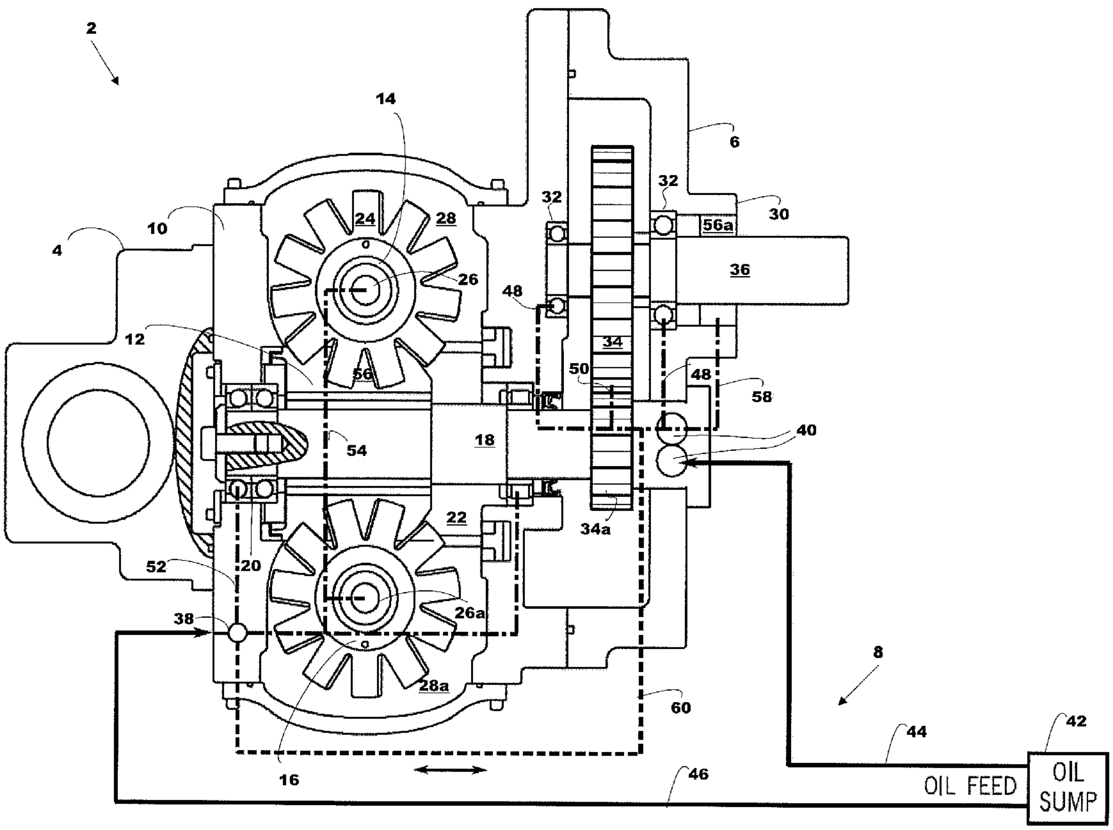

FIG. 1

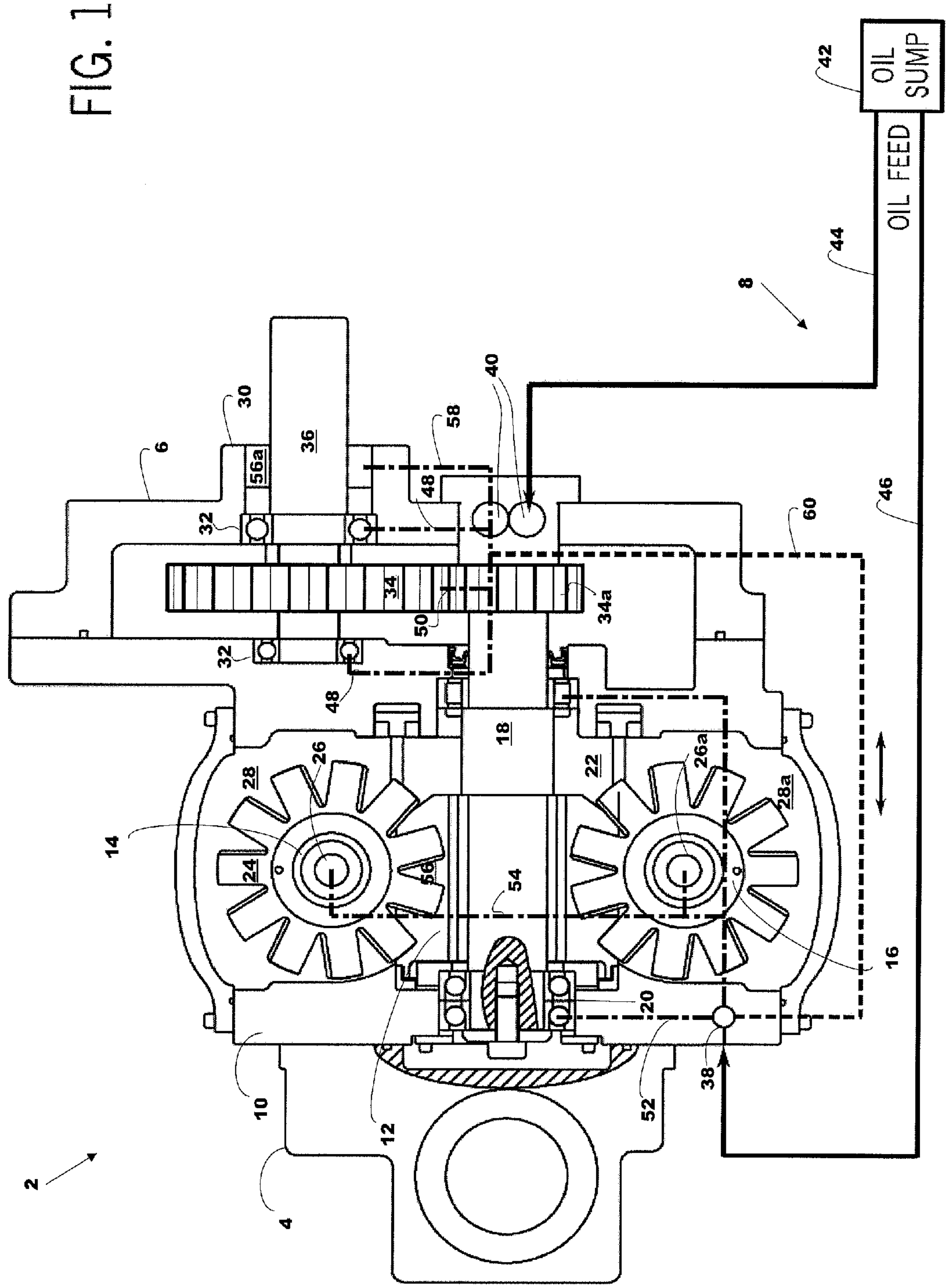

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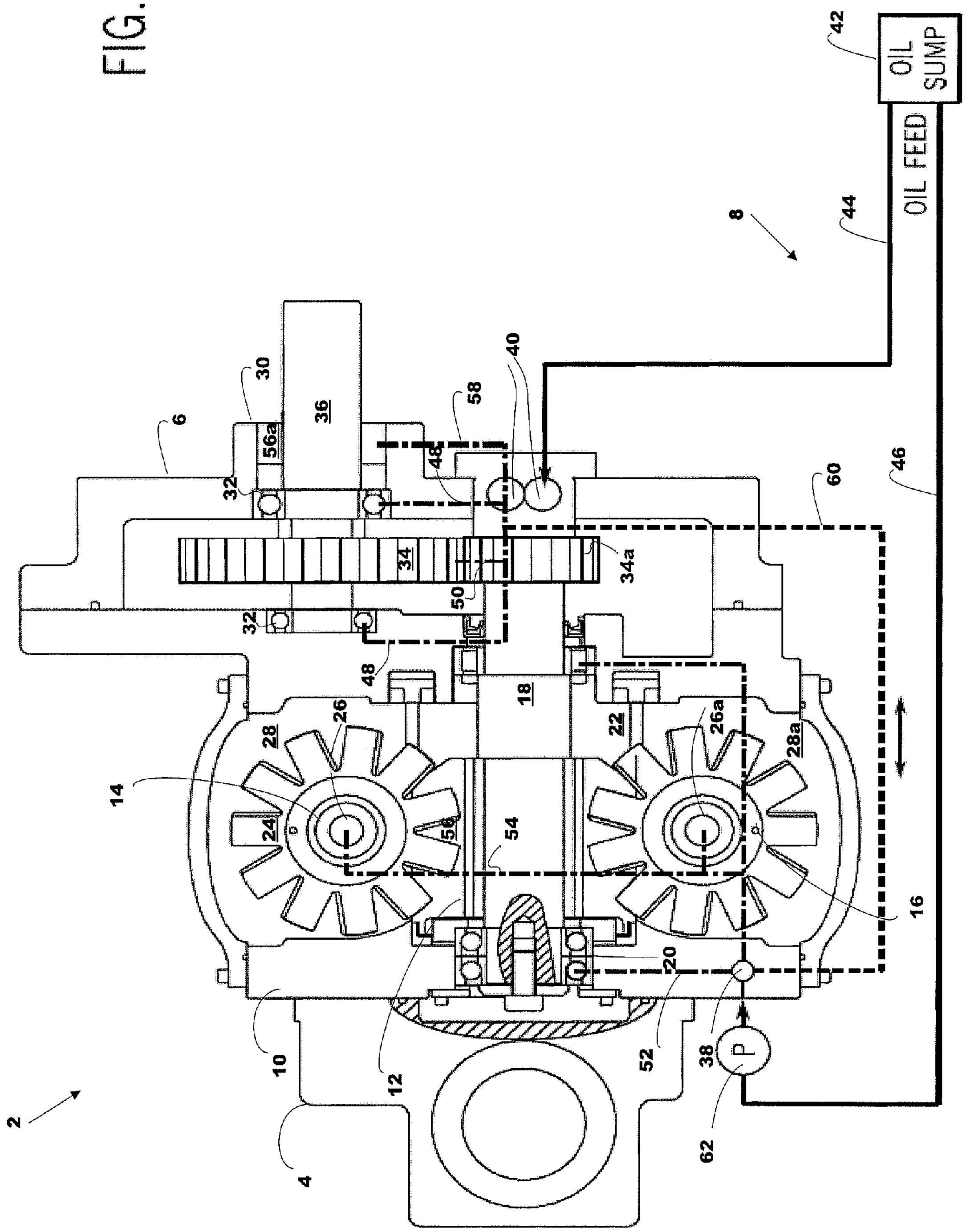
FIG. 2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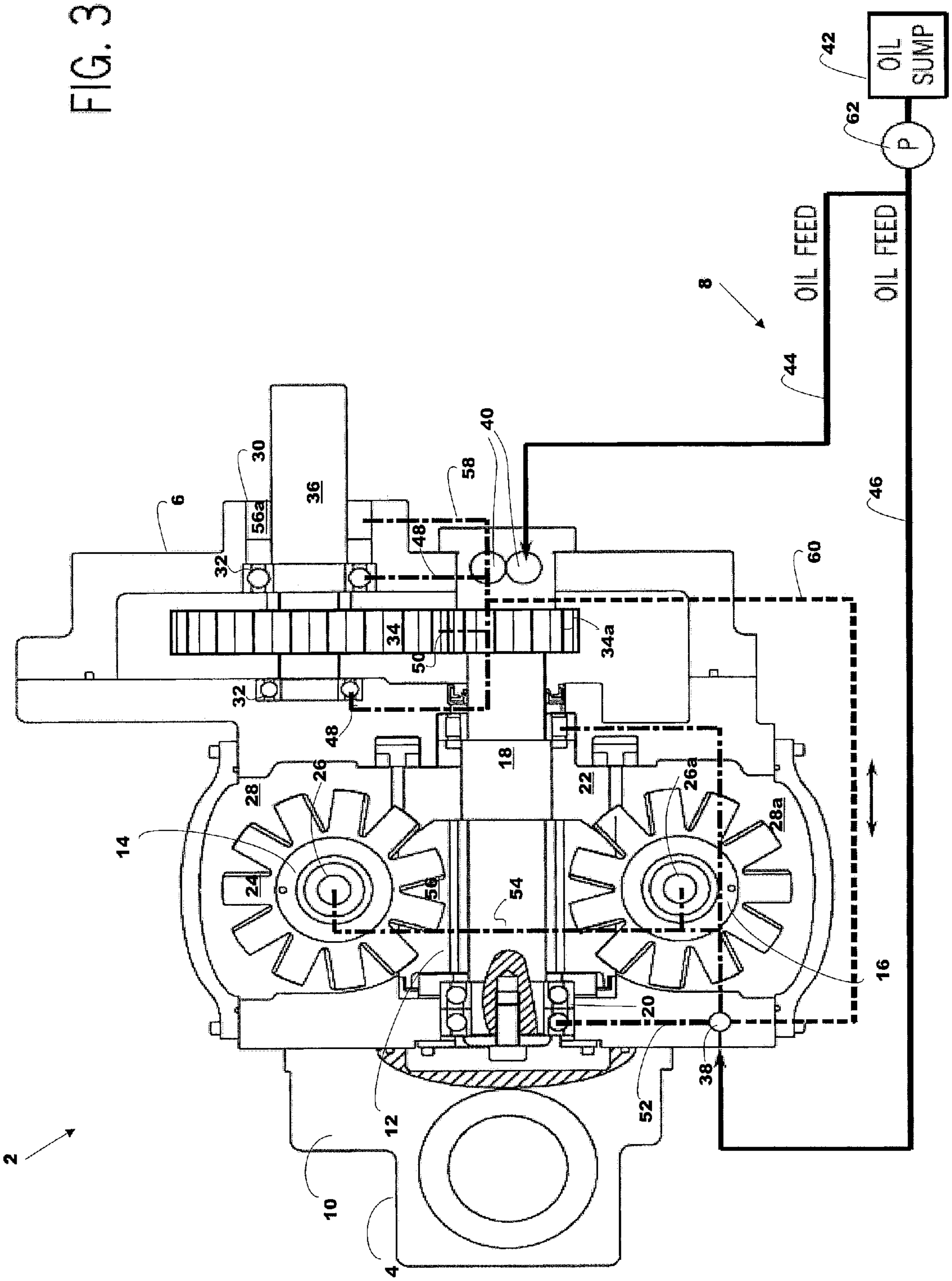
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FIG. 3

COMPRESSOR SYSTEM AND METHOD OF LUBRICATING THE COMPRESSOR SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of pending U.S. Provisional Patent Application No. 60/989,527 filed Nov. 21, 2007, which is hereby incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention relates generally to compressors and compressor components, and, more particularly, to systems and methods for providing lubrication to such compressors and compressor components. In one aspect, the present invention relates to systems and methods for providing lubrication to compressors having internal gearboxes.

BACKGROUND OF THE INVENTION

[0003] Compressors are used, for example, in compression systems (e.g., refrigeration systems) to compress gas, such as "halocarbon", ammonia, natural gas, or the like. Typically, compressors employ a wide variety of components in operational association with one another. When the compressor is operated, many of these components contact each other such that surfaces of the components rub, and/or wear against each other. Therefore, it is necessary to provide the compressor components with lubrication.

[0004] If the components are not adequately lubricated, numerous undesirable conditions can be encountered. For example, shifting, sliding, abrading, of rotating components, as well as other components that are in "intimate" contact with each other, can subject such components to wear and tear due to friction. As such, without adequate lubrication, friction tends to inhibit, or potentially prevent altogether, relative movement of the components. Abrasion of non-lubricated, or sparsely lubricated, components in intimate engagement or contact can cause surfaces of the components to become scored, pitted, gouged, or otherwise damaged.

[0005] Often, to provide lubrication effectively and efficiently, one or more pumps are used within a compressor system. Although sufficient in many respects, such pumps may not be adequate in at least some circumstances. For example, in the event of a pump becoming inoperative, the flow of lubricant to the portions of the compressor system lubricated by that pump is obstructed. Additionally, if unobserved, substantial damage to certain compressor components can potentially occur and can thus affect the overall functioning of the compressor system. It would therefore be advantageous if a system that continuously provided lubrication to the various components of the compressor is developed and more specifically, if such continuous lubrication was not impeded or obstructed upon a pump or similar mechanism used with or within the compressor system becoming inoperative.

SUMMARY OF THE INVENTION

[0006] In accordance with one aspect of the invention, a compressor system is disclosed. In at least some embodiments of the present invention, the compressor system includes: (i) a compressor oil circuit in operable association with a compressor for compressing fluids, (ii) a gear pump in operable association with a gearbox, wherein the gearbox comprises a plurality of gears mounted on a gear shaft for driving the compressor, and (iii) a lubrication system including at least two lubricant feeds for carrying lubricant to the compressor and the gearbox from a lubricant source. Also provided is a connection line connecting the compressor and the gearbox for transferring lubricant from the compressor oil circuit to the gear pump and/or from the gear pump to the compressor oil circuit.

[0007] In another aspect of the present invention, a method of lubricating the compressor system is disclosed. The method includes providing a compressor, a gearbox having a plurality of gears, a compressor oil circuit, a gear pump and a lubrication system comprising a lubricant source and at least two lubricant feeds. The method further includes providing a connection line between the compressor and the gearbox for transferring lubricant from the compressor oil circuit to the gear pump and/or from the gear pump to the compressor oil circuit. The method additionally includes transferring lubricant from the lubricant source via the at least two lubricant feeds to the compressor and the gearbox.

[0008] In still another aspect of the present invention, a compressor system in combination with a lubrication system is provided. The compressor system further includes a rotary screw compressor and a gearbox in operational association with the compressor, while the lubrication system for lubricating the compressor system includes a lubricant source and at least two lubricant feeds for transferring lubricant from the lubricant source to the compressor and the gearbox. Also provided is a connection line connecting the gearbox and the compressor for transferring lubricant from the compressor oil circuit to the gear pump and/or from the gear pump to the compressor oil circuit.

[0009] Various other aspects, objects, features and embodiments of the present invention are disclosed with reference to the following specification, including the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Features of the present invention which are believed to be novel are set forth with particularity in the appended claims. Embodiments of the invention are disclosed with reference to the accompanying drawings and these embodiments are provided for illustrative purposes only. The invention is not limited in its application to the details of construction or the arrangement of the components illustrated in the drawings. Rather, the invention is capable of other embodiments and/or of being practiced or carried out in other various ways. The drawings illustrate a best mode presently contemplated for carrying out the invention. Like reference numerals are used to indicate like components. In the drawings:

[0011] FIG. **1** is a schematic top view, partly in cross-section with portions broken away, of an exemplary compressor system employing a rotary screw compressor, a gearbox and a lubrication system in accordance with at least some embodiments of the present invention;

[0012] FIG. **2** is a schematic top view, partly in cross-section with portions broken away, of the compressor system of FIG. **1**, further including an additional pump positioned in a first location with respect to the compressor system, in accordance with at least some embodiments of the present invention; and

[0013] FIG. **3** is a schematic top view, partly in cross-section with portions broken away, of the compressor system of FIG. **1**, and further including an additional pump positioned in a second location with respect to the compressor system, in accordance with at least some embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0014] Referring to FIGS. **1**, **2** and **3**, top views, partly in cross-section and with portions broken away, of a compressor system **2** are shown in accordance with at least some embodiments of the present invention. The compressor system **2** employs a compressor **4**, as shown a rotary screw compressor, a gearbox **6** and a lubrication system **8**. Notwithstanding the fact that the present embodiments (FIGS. **1-3**) illustrate use of a rotary screw compressor, this invention is nevertheless contemplated for use with a wide variety of compressors other than a rotary screw compressor. For example, rotary piston compressors, rotary vane compressors and scroll compressors can be used in other embodiments. One of skill will appreciate that, in alternate embodiments, compressors other than those mentioned above, including non-rotary-type compressors, can be used as well and such use is contemplated and considered within the scope of the present invention.

[0015] The compressor **4** includes a compressor housing **10**, and a plurality of compressor components within the compressor housing in operable association with another (explained below). As shown, the compressor housing **10** houses a single cylindrical main rotor **12** in intermeshing arrangement with first and second cylindrical star rotors (also referred herein as gate rotors and star-shaped rotors) **14** and **16**, respectively. The main rotor **12** is mounted for rotation on a main rotor shaft **18**, that is rotatably supported at opposite ends on compressor bearing assemblies **20** within a cylindrical bore **22**. The main rotor **12** further includes a plurality of helical grooves formed thereon, which in association with the star rotors **14** and **16** define compression chambers.

[0016] In particular, each of the first and the second star rotors **14** and **16**, respectively, are located diametrically opposite (i.e., 180 degrees apart) the main rotor **12**. The star rotors **14** and **16** further include a plurality of gear teeth **24**, such that rotation of the star rotors about an axis perpendicular to and spaced from an axis of rotation of the main rotor **12** causes the gear teeth of the star rotors to successively engage a helical groove of the main rotor. By virtue of such engagement of the helical grooves of the main rotor **12** with the gear teeth **24** of the star rotors **14** and **16**, compression chambers for compressing a gas are defined. Each of the star rotors **14** and **16** is additionally mounted for rotation on gate rotor shafts **26** and **26***a*, respectively, within spaces **28** and **28***a*, respectively, defined within the compressor housing **10**. The gate rotor shafts **26** and **26***a* are further supported on opposite ends by bearing assemblies (not shown).

[0017] Although not shown, the compressor housing **10** is provided with one gas suction port and with two gas discharge ports (one near each star rotor). Two dual slide valve assemblies can additionally be provided on the compressor housing **10** (one assembly near each gate rotor) wherein each slide valve assembly comprises a suction slide valve (also referred to as a "capacity slide valve") and a discharge slide valve (also referred to as a "volume slide valve") for controlling the associated suction port and the associated discharge port, respectively. The slide valves can additionally be employed for accomplishing loading and unloading of the compressor by controlling admission and discharge of gas into and from the compression chambers, described above. U.S. Pat. Nos. 4,610,612, 4,610,613, 4,704,069, the teachings and disclosures of which are incorporated herein in their entireties, are assigned to the same assignee as the present application, and disclose a slide-valve assembly described above,

[0018] In operation, gas is drawn in through the gas suction port and is routed through the compression chambers for compression therewithin. Typically, compression of the gas is achieved by rotation of the star rotors **14** and **16** in synchronism with the main rotor **12** causing the gear teeth **24** of the star rotors to intermesh with the helical grooves of the main rotor. By virtue of such intermeshing engagement between the gear teeth **24** of the star rotors **14** and **16** and the helical grooves of the main rotor **12**, the volume of the gas is reduced, thereby achieving compression of the gas. The compressed gas from each associated compression chamber then exits through its associated discharge port. In general, the operation of compressors for compressing gas (e.g., rotary screw compressors) is generally well known in the art and is therefore, not explained here in detail for conciseness of expression.

[0019] Also provided within the compressor housing **10** is the gearbox **6** for driving various components of the compressor **4** including the main rotor **12** and the star rotors **14** and **16**. The gearbox **6** includes a gearbox housing **30** mounted within the compressor housing **10** by way of a plurality of gearbox bearings **32**. In at least some embodiments of the present invention, the gearbox **6** is integrally mounted within the compressor housing **10**. The gearbox **6** itself is typically driven by way of one motor (not shown) present either within the compressor housing **10** or otherwise located external to the compressor housing and connected to the gearbox. Additionally, the type of motor(s) for driving the gearbox can vary.

[0020] The gearbox further includes a plurality of intermeshing gear **34** mounted on a gear shaft **36** and gear **34***a* mounted on the main rotor shaft **18**. By virtue of driving the gearbox **6** via the motor(s), the gear shaft **36** can drive the plurality of gears **34**, which in turn drive the gears **34***a*. The gears **34***a* further drive the main rotor shaft **18** for transmitting power from the motor to the various components of the compressor **4** (e.g., the main rotor **12** and the star rotors **14** and **16**).

[0021] Additionally, to effectively provide lubrication to various compressor components and gearbox components, the present invention employs a gear pump **40**. The gear pump **40** is a conventional type of pump that is commonly available and frequently employed in compressor systems. Typically, the gear pump **40** is mounted within the compressor housing **10** for encouraging lubricant flow from the lubrication system **8** and injecting such lubricant to the various portions of the compressor **4** and the gearbox **6**. Notwithstanding the fact that in the present embodiment, the gear pump **40** is mounted as described herein, in at least some other embodiments of the present invention, the location of the compressor and the gear pumps can vary to convenience.

[0022] With respect to the lubrication system **8**, a lubricant source **42** capable of providing a supply of lubricant for lubricating the compressor system **2** is provided within the lubrication system. In at least some embodiments of the present invention, the lubricant source **42** is an oil sump, capable of storing and supplying a lubricant. In some other embodiments, the lubricant source **42** can be an oil tank, a lubricant supply line or possibly even storage containers storing a fixed quantity of lubricant. Additionally, the lubricant can be any of a wide variety of lubricants that are commonly employed for lubricating compressors and gearboxes and/or used for reducing friction between various contacting components. For example, in at least some embodiments of the present invention, the lubricant can be compressor oil, lubricating oil and the like.

[0023] Also provided within the lubrication system **8** is a plurality of lubricant feeds, extending from the lubricant source **42** and supplying lubricant to the compressor system **2**. In particular, at least some embodiments of the present invention employ a first lubricant feed **44** extending up to the gear pump **40**, and a second lubricant feed **46** extending to the compressor **4**. Typically, each of the lubricant feeds **44** and **46** can be any of a conduit, a pipe or a member for carrying lubricant to the gearbox **6** and the compressor **4**, respectively. By virtue of providing the lubricant feeds **44** and **46** connected to the gear pump **40** and the compressor **4**, respectively, lubricant can flow from the lubricant source **42** to the compressor **4** and the gearbox **6** through the lubricant feeds on activation of the associated pump for providing lubrication thereto.

[0024] Upon reaching the gear pump **40** and/or the compressor **4**, lubricant from the first and the second lubricant feeds **44** and **46**, respectively, is distributed to various portions of the gearbox **6** and the compressor. For example, as shown in each of FIGS. **1-3**, in the gearbox **6**, lubricant can be provided to the gear bearings **32**, and the plurality of gears **34** and **34***a* (including the gear shaft **36**) as shown by communication links **48** and **50**, respectively. Notwithstanding the fact that in the present embodiment, the communication links **48** and **50** are not shown to extend to all the gear bearings **32** and the gears **34** and **34***a,* it is nevertheless contemplated that lubricant be provided to all gear bearings, all gears and, additionally, all other components within the gearbox in close contact with one another. Relatedly, lubricant from the second lubricant feed **46** to the compressor **4** can be injected into the compressor **4** for providing lubrication to various components of the compressor. In particular, lubricant from the lubricant feed **46** is distributed to the compressor components by way of an oil circuit **38**. The oil circuit **38** is typically internal to the compressor housing **10**, and further includes a plurality of communication links for transporting lubricant within the compressor **4**. For example, as shown by exemplary communication links **52** and **54**, lubricant can be provided to the compressor bearing assemblies **20** and shafts (e.g., main rotor shaft **18** and star rotor shafts **26** and **26***a*), respectively. Although not shown as providing lubrication to all compressor bearings and shafts, lubricant is provided to all compressor bearing assemblies **20**, shafts (e.g., main rotor shaft **18** and gate rotor shafts **26** and **26***a*), and other components in close and intimate contact with one another.

[0025] Additionally, during operation of the compressor system **2**, lubricant can typically be supplied to the compression chambers to provide point seal **56** at points (as shown by exemplary communication link **54**), where the main rotor **12** meshes with the star rotors **14** and **16**, and with the compressor housing **10** to thereby effectively seal the chambers against gas leakage during gas compression. Seal points other than those shown within the compressor system **2** can be provided. Additionally, as shown by the communication link **58**, lubricant to the seal point **56***a* is provided by the gear pump **40**. Nevertheless, in other embodiments, such seal points can be supplied with lubricant from the compressor **4** (e.g., by the oil circuit **38**) as well. Lubricant can additionally be provided to various components of the motor(s) employed for driving the gearbox **6**. Subsequent to lubricating the various components of the compressor **4** and the gearbox **6** via lubricant flowing through the first and the second lubricant feeds **44** and **46**, respectively, the lubricant is discharged from the discharge ports, recovered and re-circulated. Recovering of the lubricant is well known in the art and therefore, not explained here.

[0026] In general, the gear pump **40** is driven by the main rotor shaft **18** for providing power to the pump for pumping lubricant from the lubricant source **42** through the lubricant feeds **44** and **46**, and injecting and supplying lubricant from the lubricant feeds to the various components of the compressor system **2**. Upon the gear pump **40** becoming inoperative, the lubricant flow to the gearbox **6** and the seal points **56***a* can be disrupted. Relatedly, upon the second lubricant feed **46** becoming inoperative, lubrication to various components of the compressor **4** can be disrupted. If unnoticed, such obstruction can cause severe damage to the components of the compressor system **2** and can significantly reduce the overall performance of the compressor system.

[0027] To prevent such occurrences, an additional lubricant feed **60** (also referred herein as oil connection, connection line, and oil line) connecting the first and the second lubricant feeds **44** and **46**, respectively, is provided in the present invention. In particular, as shown in the present embodiment, the connection line **60** extends from the gear pump **40** to the compressor **4** (and, particularly to the oil circuit **38**). Nevertheless, in alternate embodiments, the connection line **60** can be provided from any point of the first lubricant feed **44** to any point of the second lubricant feed **46**. By virtue of providing such a connection line, lubricant can be fed from the compressor **4** to the gearbox **6** and vice versa. Similar to the first and the second lubricant feeds **44** and **46**, respectively, the connection line **60** can be any of a conduit, pipe or a member for supplying lubricant. Additionally, the connection line **60** is capable of transferring the lubricant from the compressor **4** to the gearbox **6** and/or from the gearbox to the compressor when the gear pump **40** is inoperative. Relatedly, the connection line **60** is capable of transferring the lubricant from the compressor **4** to the gearbox **6** and/or from the gearbox to the compressor when the second lubricant feed **46** supplying lubricant to the compressor oil circuit **38** is inoperative. In case of poor lubricant flow or on occasions when one of the gear pump **40** or the second lubricant feed **46** becomes inoperative, the other system takes over (e.g., through the connection line **60**) and lubricates the appropriate rotating parts. In this way the connection line **60** serves to ensure, and further enhance lubrication during, for example, start up and operation of the compressor system **2**.

[0028] Further, the connection line **60** can be located internally within the compressor housing **10** or potentially external to the compressor housing. Relatedly, the first and the second lubricant feeds **44** and **46**, respectively, can be positioned either internal or external to the compressor housing **10**. When placed external to the compressor housing **10**, the lubricant feeds, including the first the second lubricant feeds **44** and **46**, respectively, and the connection line **60**, can be used as a retrofit to the compressor system **2**. Replacement and maintenance of the lubricant feeds can be simplified by providing the lubricant feed assembly exterior to the compressor housing. However, externally located lubricant feeds are more prone to damage and breakage. Leakage from broken or ruptured feeds is significantly reduced by providing the feeds internal to the compressor housing **10**. Therefore, depending upon the embodiment, the lubricant feeds can be located either internal or external to the compressor system **2**.

[0029] Additionally, as shown in FIGS. **2** and **3**, an auxiliary and/or secondary pump **62** can be used in the compressor system **2** for providing an additional pumping of the lubricant during poor lubricant flow. The secondary pump **62** can be used in conjunction with the gear pump **40**. In general, the secondary pump **62** can be any of a wide variety of pumps that are commonly available and frequently employed in compressor systems. Further, the location of the secondary pump **62** within the compressor system **2** can vary. For example, as shown in FIG. **2**, the secondary pump **62** can be positioned in close proximity to the compressor **4**. In other embodiments, the secondary pump **62** can be positioned at any point on the second lubricant feed **46**.

[0030] Although not shown, a similar secondary pump can also be positioned adjacent the gear pump **40** and/or the first lubricant feed **44**. Additionally, instead of providing a separate secondary pump for the gear pump, a secondary pump can be provided at the originating point of the first and the second lubricant feeds **44** and **46**, respectively, (e.g., close to the lubricant source **42**), as can be seen in FIG. **3**. Also, FIG. **3** provides an alternate configuration of the lubricant feeds **44** and **46**, in which a single lubricant feed from the lubricant source **42** can later be divided into two separate lubricant feeds headed towards the compressor **4** (e.g., to the oil circuit **38**) and the gear pump **40**.

[0031] Notwithstanding the embodiments of the present invention described above with respect to FIGS. **1-3**, additions and/or refinements to the invention are contemplated. For example, additional components employed in conventional compressors and gearboxes, although, not shown, can be used within the compressor system **2**. Separate lubricant filters and lubricant coolers for filtering debris from the lubricant and cooling the lubricant, respectively, can be used in other embodiments. Although the present embodiments of the invention describe a single lubricant feed (e.g., first lubricant feed to the gear pump and second lubricant feed to the compressor) from the lubricant source **42** to each of the gear pump **40** and the compressor **4**, in alternate embodiments, a plurality of lubricant feeds can be provided. Relatedly, multiple connection lines connecting the compressor **4** and the gearbox **6** can be provided in alternate embodiments for transferring lubricant from the compressor to the gearbox and vice-versa in the event of the gear pump **40** or the second lubricant feed **46** becoming inoperative.

[0032] As indicated above, the lubricant feeds need not be present within the compressor housing, but can rather be located external to the compressor housing. Similarly, the gearbox need not be integral but can otherwise be external to the compressor housing. The shape, size, type and number of the various components within the compressor system **2** can vary in alternate embodiments.

[0033] Further, despite any methods being outlined in a step-by-step sequence, the completion of acts or steps in a particular chronological order is not mandatory. Further, elimination, modification, rearrangement, combination, reordering, or the like, of acts or steps is contemplated and considered within the scope of the description and claims.

[0034] Accordingly, it is specifically intended that the present invention not be limited to the embodiments and illustrations contained herein, but include modified forms of those embodiments including portions of the embodiments and combinations of elements of different embodiments as come within the scope of the following claims.

We claim:

1) A compressor system, comprising:
at least one compressor oil circuit in operable association with a compressor for compressing fluids;
at least one gear pump in operable association with a gearbox, the gearbox comprising a plurality of gears mounted on a gear shaft for driving the compressor;
a lubrication system for lubricating the gearbox and the compressor, the lubrication system comprising, (i) a lubricant source for providing a lubricant; and (ii) at least two lubricant feeds for providing a lubricant from the lubricant source to the compressor and the gearbox; and
at least one connection line connecting the compressor and the gearbox for providing lubrication thereto by transferring the lubricant from the gear pump to the compressor oil circuit and/or from the compressor oil circuit to the gear pump;
wherein the at least one compressor oil circuit is connected at least indirectly to at least one of the at least two lubricant feeds, the compressor oil circuit capable of receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds for distribution within the compressor; and
wherein the at least one gear pump is connected at least indirectly to at least one of the at least two lubricant feeds, the gear pump capable of receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds for distribution within the gearbox.

2) The system of claim **1**, wherein the compressor is a rotary screw compressor comprising a helically grooved main rotor and at least two star rotors in operational association with the main rotor.

3) The system of claim **1**, wherein the at least one connection line is capable of transferring the lubricant from the compressor to the gearbox and/or from the gearbox to the compressor when the gear pump is inoperative.

4) The system of claim **1**, wherein the at least one connection line is capable of transferring the lubricant from the compressor to the gearbox and/or from the gearbox to the compressor when the at least one of the at least two lubricant feeds connected at least indirectly to the at least one compressor oil circuit is inoperative.

5) The system of claim **1**, wherein the gearbox further comprises:
a gearbox housing mounted within a compressor housing by at least one gear bearing.

6) The system of claim **5**, wherein the gearbox is mounted integral to the compressor housing.

7) The system of claim **1**, wherein the lubricant source is an oil sump for providing a supply of lubricant for lubricating the compressor and the gearbox.

8) The system of claim **1**, wherein the at least two lubricant feeds comprise a first lubricant feed connected at least indirectly to the lubricant source and in fluid communication with the compressor; and a second lubricant feed connected at least indirectly to the lubricant source and in fluid communication with the gearbox.

9) The system of claim **1**, wherein the lubrication system is integral to the compressor housing.

10) The system of claim **1** further comprising at least one secondary pump connected at least indirectly to the at least two lubricant feeds for lubricating the compressor and the gearbox.

11) The system of claim 10, wherein the at least one secondary pump for lubricating the compressor and the gearbox comprises locating the at least one secondary pump either adjacent to the lubricant source, or adjacent to the compressor.

12) The system of claim 1, wherein the at least one connection line connecting the compressor and the gearbox is positioned either external to the compressor housing or internal to the compressor housing.

13) The system of claim 1, wherein the at least one connection line further comprises a first end and a second end, the first end being connected to a gear pump in the gearbox and the second end being connected to the at least one compressor oil circuit in the compressor for transferring the lubricant from the gearbox to the compressor and/or from the compressor to the gearbox.

14) A method of providing lubrication to a compressor system, the method comprising:

providing (a) a compressor for compressing fluids; (b) a gearbox having a plurality of gears for driving the compressor; (c) a lubricant source for providing a lubricant; (d) at least two lubricant feeds originating from the lubricant source; (e) a gear pump in operational association with the gearbox for providing lubrication thereto; and (f) a compressor oil circuit in operational association with the compressor for providing lubrication thereto;

providing at least one connection line connecting the compressor and the gearbox for providing lubrication thereto by transferring the lubricant from the gear pump to the compressor oil circuit and/or from the compressor oil circuit to the gear pump; and

transferring the lubricant from the lubricant source to the compressor and the gearbox through the at least two lubricant feeds;

wherein the at least one connection line is capable of transferring lubricant from the gear pump to the compressor oil circuit and/or from the compressor oil circuit to the gear pump for a particular period of time when either the gear pump or at least one of the at least two lubricant feeds connected at least indirectly to the compressor oil circuit is at least partially inoperative.

15) The method of claim 14, further comprising:

connecting the gear pump at least indirectly to at least one of the at least two lubricant feeds; and

receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds for distribution of the received lubricant within the gearbox by the gear pump.

16) The method of claim 14, further comprising:

receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds connected at least indirectly to the compressor oil circuit for distribution of the received lubricant within the compressor by the compressor oil circuit.

17) The method of claim 14, wherein the providing the at least one connection line connecting the compressor and the gearbox further comprises positioning the at least one connection line either external to the compressor housing or internal to the compressor housing

18) The method of claim 14, further comprising providing at least one secondary pump connected at least indirectly to the at least one lubricant feed for providing the lubricant to the compressor and the gearbox.

19) The method of claim 18, wherein the providing the at least one secondary pump for providing lubricant to the compressor and the gearbox comprises locating the at least one secondary pump either adjacent to the lubricant source or adjacent to the compressor.

20) A compressor system in combination with a lubrication system, the combination comprising:

a compressor system comprising:

a rotary screw compressor; and

a gearbox in operational association with the rotary screw compressor; and

a lubrication system for lubricating the compressor system, the lubrication system comprising:

a lubricant source for providing a lubricant; and

at least two lubricant feeds originating from the lubricant source and in fluid communication with the compressor system;

wherein the compressor system further comprises (i) a gear pump in operational association with the gearbox for providing lubrication thereto and connected at least indirectly to at least one of the at least two lubricant feeds, the gear pump capable of receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds for distribution within the gearbox; and (ii) a compressor oil circuit in operational association with the compressor for providing lubrication thereto and connected at least indirectly to at least one of the at least two lubricant feeds, the compressor oil circuit capable of receiving the lubricant from the lubricant source through the at least one of the at least two lubricant feeds for distribution within the compressor; and

wherein the at least one connection line is capable of transferring lubricant from the gear pump to the compressor oil circuit and/or from the compressor oil circuit to the gear pump for a particular period of time when either the gear pump or the at least one of the at least two lubricant feeds connected at least indirectly to compressor oil circuit is at least partially inoperative.

21) The combination of claim 20, wherein the rotary screw compressor of the compressor system further comprises:

a compressor housing;

a main rotor having helical grooves and mounted for rotation on a rotor axis in a rotor bore in said compressor housing; and

a pair of star rotors rotatably mounted in said housing and engageable with said helical grooves to define a plurality of gas compression chambers;

22) The combination of claim 20, wherein the compressor system further comprises at least one secondary pump connected at least indirectly to the at least one lubricant feed for providing the lubricant to the compressor and the gearbox.

23) The combination of claim 20, wherein the at least one connection line connecting the compressor and the gearbox is for transferring the lubricant from the gearbox to the compressor and/or from the compressor to the gearbox, and wherein the connection line is located either external to the compressor housing or internal to the compressor housing and ensures proper compressor lubrication during startup and operation.

24) The combination of claim 20, wherein the at least one connection line provides lubrication to the compressor system to enhance lubricant flow.

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