LINEAR COMPRESSOR AND LUBRICATING OIL PUMP THEREOF

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Appl. No.: 11/221,916

Filed: Sep. 9, 2005

Foreign Application Priority Data
May 11, 2005 (KR) 2005-39348

Publication Classification

Int. Cl. F04B 17/04 (2006.01)
U.S. Cl. 417/417

Abstract

Disclosed herein are a linear compressor and a lubricating oil pump thereof. The lubricating oil pump comprises a lubricating oil cylinder integrally formed in a frame that supports a compression unit, a lubricating oil piston mounted to be reciprocated inside the lubricating oil cylinder to resonate with the compression unit, and a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston. With this configuration, it is possible to improve the durability of the lubricating oil cylinder and to simplify or omit additional processing of the lubricating oil piston.
FIG. 1 (Prior Art)
LINEAR COMPRESSOR AND LUBRICATING OIL PUMP THEREOF

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a linear compressor and a lubricating oil pump thereof, and, more particularly, to a linear compressor and a lubricating oil pump thereof, which comprises a lubricating oil cylinder protector to prevent generation of friction between a lubricating oil cylinder and a lubricating oil piston.

[0003] 2. Description of the Related Art

[0004] Generally, a linear compressor is an apparatus to compress operating fluid while linearly reciprocating a piston inside a cylinder using a linear driving force of a linear motor.

[0005] FIG. 1 is a longitudinal sectional view of a linear compressor having a lubricating oil pump according to the prior art. The linear compressor shown in FIG. 1 includes a hermetic container 2, and a compression unit arranged in the hermetic container 2 to compress operating fluid.

[0006] The compression unit includes a cylinder 10 to receive operating fluid from a fluid suction pipe 4 provided at the hermetic container 2, a piston 12 mounted to be linearly reciprocated inside the cylinder 10 to thereby compress the operating fluid, and a linear motor 14 to reciprocate the piston 12.

[0007] The cylinder 10 is provided with a discharge unit 16 including a discharge valve 16'. The discharge valve 16' serves to discharge the operating fluid, compressed in the cylinder 10, into a fluid discharge pipe 6 provided at the hermetic container 2.

[0008] The piston 12 is internally formed with an operating fluid passage 12' to guide the operating fluid from the fluid suction pipe 4 into the cylinder 10. A suction valve 18 is provided at one end of the piston 12 located inside the cylinder 10 to open or close the operating fluid passage 12'.

[0009] The compression unit is supported by a metal frame 20 that is also arranged in the hermetic container 2. In this case, the linear motor 14 is able to be supported by both the frame 20 and a linear motor cover 22.

[0010] Now, the operation of the linear compressor configured as stated above will be explained in detail.

[0011] If power is applied to the linear motor 14, the piston 12 is reciprocated in the cylinder 10 using a linear reciprocation driving force from the linear motor 14. According to the resulting reciprocating movement of the piston 12, the discharge valve 16' and the suction valve 18 are repeatedly opened or closed.

[0012] Then, the operating fluid is introduced into the cylinder 10 through the fluid suction pipe 4 and the operating fluid passage 12', defined in the piston 12 in succession, thereby being compressed in the cylinder 10 by the piston 12. Finally, the resulting high-pressure operating fluid is discharged from the cylinder 10 by way of the discharge unit 16 and the fluid discharge pipe 6.

[0013] The suction, compression, and discharge of the operating fluid as stated above are continuously repeated in that order so long as the linear motor 14 is driven.

[0014] Meanwhile, the hermetic container 2 contains lubricating oil 2' stored in a bottom region thereof to lubricate and cool the cylinder 10 and the piston 12. To supply the lubricating oil 2' to the cylinder 10 and the piston 12, an oil supply device 30 is provided in the hermetic container 2.

[0015] The oil supply device 30 includes a lubricating oil pump 30', and a lubricating oil channel 32 to circulate the lubricating oil 2' stored in the bottom region of the hermetic container 2 into a gap between the cylinder 10 and the piston 12 by way of the lubricating oil pump 30' according to a pumping operation of the lubricating oil pump 30'.

[0016] The lubricating oil pump 30' includes a lubricating oil cylinder 34 integrally formed in the frame 20, a lubricating oil piston 35 mounted to be reciprocated in the lubricating oil cylinder 34, and first and second resonance springs 36 and 37 located at opposite lateral sides of the lubricating oil piston 35 about the piston 35.

[0017] In operation of the lubricating oil pump 30', it is important to minimize generation of friction between the lubricating oil piston 35 and the lubricating oil cylinder 34 during reciprocating movement of the piston 35. For this, the lubricating oil piston 35 must be manufactured by primarily processing bearing steel and then, performing additional heat-treatment and polishing processes thereon to achieve a good surface roughness. If necessary, the lubricating oil piston 35 may be plated with electrophoretic nickel to further improve wear-resistance and lubrication properties.

[0018] However, the prior art linear compressor as stated above has the following problems.

[0019] Firstly, since metal-on-metal friction is generated between the lubricating oil cylinder 34 and the lubricating oil piston 35, and both the lubricating oil cylinder 34 and the frame 20 are conventionally made of aluminum having a low hardness, as stated above, the lubricating oil piston 35 must be subjected to additional processes required to achieve a good surface roughness as well as a nickel plating process. This complicates manufacture of the lubricating oil piston 35 and increases manufacturing costs thereof.

[0020] Secondly, even if the lubricating oil piston 35 is manufactured to minimize friction between the lubricating oil piston 35 and the lubricating oil cylinder 34, the lifespan of the lubricating oil cylinder 34 is reduced due to the direct metal-on-metal friction between the lubricating oil cylinder 34 and the lubricating oil piston 35, resulting in frequent exchange of the lubricating oil pump 30'. This is a severe problem because the exchange of the lubricating oil pump 30' requires the exchange of the frame 20.

SUMMARY OF THE INVENTION

[0021] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a linear compressor and a lubricating oil pump thereof, which can prevent generation of friction between a lubricating oil cylinder and a lubricating oil piston, thereby improving durability of the lubricating oil cylinder and minimizing additional processing of the lubricating oil piston.

[0022] In accordance with a first aspect of the present invention, the above and other objects can be accomplished
by the provision of a lubricating oil pump for use in a linear compressor comprising: a lubricating oil cylinder to suction lubricating oil; a lubricating oil piston to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil; and a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.

0023 Preferably, the lubricating oil cylinder protector may be a tubular liner interposed between the lubricating oil cylinder and the lubricating oil piston.

0024 Preferably, the liner may be made of Teflon or a polymer material.

0025 Preferably, the liner may be press fitted in the lubricating oil cylinder.

0026 Preferably, the lubricating oil cylinder may have a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder, the open second end of the lubricating oil cylinder may be covered with a lubricating oil cylinder cap, and the liner may be inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.

0027 In accordance with a second aspect of the present invention, the above and other objects can be accomplished by the provision of a linear compressor comprising: a hermetic container containing lubricating oil stored in a bottom region thereof; a compression unit arranged in the hermetic container to compress operating fluid using a driving force from a linear motor; a lubricating oil cylinder mounted to the compression unit to suction or discharge the lubricating oil stored in the hermetic container; a lubricating oil piston mounted to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil; a resonance unit to resonate the lubricating oil piston with the compression unit to thereby allow the lubricating oil piston to be reciprocated; and a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.

0028 Preferably, a metal frame may be arranged in the hermetic container to support the compression unit, and the lubricating oil cylinder may be integrally formed in the frame.

0029 Preferably, the lubricating oil cylinder protector may be a tubular liner interposed between the lubricating oil cylinder and the lubricating oil piston.

0030 Preferably, the liner may be made of Teflon or a polymer material.

0031 Preferably, the liner may be press fitted in the lubricating oil cylinder.

0032 Preferably, the lubricating oil cylinder may have a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder, the open second end of the lubricating oil cylinder may be covered with a lubricating oil cylinder cap, and the liner may be inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.

0033 Preferably, the liner may have the same length as that of the lubricating oil cylinder.

0034 Preferably, the lubricating oil cylinder cap may be a linear motor cover to support the linear motor.

0035 In accordance with a third aspect of the present invention, the above and other objects can be accomplished by the provision of a linear compressor comprising: a hermetic container containing lubricating oil stored in a bottom region thereof; a compression unit having a cylinder arranged in the hermetic container to suction and discharge operating fluid, a piston mounted to be reciprocated inside the cylinder, and a linear motor to reciprocate the piston; a frame to support the compression unit; a linear motor cover to support the linear motor along with the frame; a lubricating oil cylinder integrally formed in the frame to be located between the frame and the linear motor cover and adapted to suction and discharge the lubricating oil stored in the hermetic container; a lubricating oil piston mounted to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil; a resonance unit to resonate the lubricating oil piston with the compression unit to thereby allow the lubricating oil piston to be reciprocated; and a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.

0036 Preferably, the lubricating oil cylinder and the lubricating oil piston may be made of metal.

0037 Preferably, the lubricating oil cylinder may be mounted in parallel relative to the cylinder of the compression unit.

0038 Preferably, the lubricating oil cylinder may have a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder, and the open second end of the lubricating oil cylinder being covered with the linear motor cover.

0039 Preferably, the lubricating oil cylinder protector may be a tubular liner to be inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.

0040 Preferably, the liner may be made of Teflon or a polymer material.

0041 Preferably, the liner may be press fitted in the lubricating oil cylinder.

0042 The linear compressor and the lubricating oil pump thereof according to the present invention configured as stated above can prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston by making use of the lubricating oil cylinder protector, resulting in improved durability of the lubricating oil cylinder, and simplifying or omitting additional processing of the lubricating oil piston.

**BRIEF DESCRIPTION OF THE DRAWINGS**

0043 The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:
FIG. 1 is a longitudinal sectional view illustrating a linear compressor having a lubricating oil pump according to the prior art;

FIG. 2 is a longitudinal sectional view illustrating a linear compressor having a lubricating oil pump according to an embodiment of the present invention;

FIG. 3 is an enlarged sectional view of the portion ‘A’ of FIG. 2; and

FIG. 4 is a cross sectional view taken along the line B-B shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, a linear compressor and a lubricating oil pump thereof according to a preferred embodiment of the present invention will be described with reference to the accompanying drawings.

For reference, there may be provided several preferred embodiments of the linear compressor and the lubricating oil pump according to the present invention, and hereinafter, the most preferred embodiment will be explained. The basic structure of the linear compressor is identical to the above described prior art, and thus, a detailed description thereof will be omitted.

FIG. 2 is a longitudinal sectional view illustrating a linear compressor having a lubricating oil pump according to an embodiment of the present invention.

As shown in FIG. 2, the linear compressor comprises a hermetic container 50 forming the outer appearance of the compressor, a frame 60 arranged in the hermetic container 50 at one side thereof, a linear motor cover 62 arranged in the hermetic container 50 at the other side thereof, and a compression unit provided between the linear motor cover 62 and the frame 60 to compress operating fluid.

The hermetic container 50 is divided into a lower container 52 having an open upper surface, and an upper cover 54 to cover the upper surface of the lower container 52.

The hermetic container 50 includes a fluid suction pipe 56 to introduce the operating fluid, from an exterior source, into the hermetic container 50, and a fluid discharge pipe 58 connected to a discharge unit 80 to discharge compressed operating fluid to the outside of the hermetic container 50.

Conventionally, the frame 60 is molded of aluminum.

The linear motor cover 62 has an operating fluid suction channel 62' connected to the fluid suction pipe 56.

The compression unit includes a cylinder 70 mounted to the frame 60 and adapted to suction and discharge the operating fluid, and a piston 72 mounted to linearly reciprocate inside the cylinder 70 to thereby compress the operating fluid inside the cylinder 70.

The cylinder 70 has a hollow cylindrical structure having both open ends so that the piston 72 is inserted into the cylinder 70 through one of the ends and the compressed operating fluid is discharged from the cylinder 70 through the other end.

The discharge unit 80 is provided at the other end of the cylinder 70 to discharge the compressed operating fluid from the cylinder 70 into the fluid discharge pipe 58.

The discharge unit 80 includes a discharge cover assembly 82 mounted at the other end of the cylinder 70 and connected to the fluid discharge pipe 58, and a discharge valve 84 mounted in the discharge cover assembly 82 to open or close the other end of the cylinder 70.

The discharge cover assembly 82 includes an inner discharge cover 81 located around the discharge valve 84 and formed with an inner discharge cover hole 81', and an outer discharge cover 83 outwardly spaced apart from the inner discharge cover 81 and connected to the fluid discharge pipe 58.

The discharge valve 84 includes a discharge valve body 85 mounted at the other end of the cylinder 70 in a horizontally movable manner, and a discharge valve spring 86 located between the discharge valve body 85 and the inner discharge cover 81 to elastically support the discharge valve body 85.

The piston 72 is internally formed with a piston fluid passage 72' having both open ends to guide introduction of the operating fluid into the cylinder 70.

A suction valve 73 is mounted at one end of the piston fluid passage 72' to open or close the piston fluid passage 72'.

The suction valve 73 is designed to be elastically deformed depending on a pressure difference between the piston fluid passage 72' and the cylinder 70, thereby opening or closing the end of the piston fluid passage 72'.

Meanwhile, the compression unit further includes a linear motor 90 to reciprocate the piston 72. The linear motor 90 is supported at the outside of the cylinder 70 by means of the frame 60 and the linear motor cover 62.

The linear motor 90 is divided into a mover connected to the piston 72 to cooperate with the piston 72, and a stator to electronically interact with the mover to linearly reciprocate the mover.

The mover includes a magnet 92 radially outwardly spaced apart from the cylinder 70 to be linearly reciprocated inside the stator, and a magnet frame 94 configured to support the magnet 92 affixed thereon and connected to the piston 72 to cooperate with the piston 72 to thereby transmit a linear reciprocation driving force from the linear motor 90 to the piston 72.

The stator includes a ring-shaped outer core 95 radially outwardly spaced apart from the cylinder 70 to be mounted between the frame 60 and the linear motor cover 62, a coil 96 provided in the outer core 95 to produce a magnetic field, and a ring-shaped inner core 98 inwardly spaced apart from the outer core 95 to define a predetermined gap therebetween to be press-fitted at the outside of the cylinder 70.

The mover is located between the outer core 95 and the inner core 98.
In operation of the linear compressor according to the present invention as stated above, the piston 72 is reciprocated in the cylinder 70 using the linear reciprocation driving force from the linear motor 90, resulting in suction, compression, and discharge of the operating fluid to or from the cylinder 70.

Referring again to FIG. 2, the hermetic container 50 contains lubricating oil 50' stored in a bottom region thereof. The lubricating oil 50' is used to lubricate and cool the cylinder 70 and the piston 72.

The lubricating oil 50' stored in the hermetic container 50 is supplied to the cylinder 70 and the piston 72 through a lubricating oil suction unit 100.

The lubricating oil suction unit 100 includes a lubricating oil suction pipe 102 mounted to be partially immersed in the lubricating oil 50' stored in the bottom region of the hermetic container 50, a lubricating oil cover 104 mounted on a side of the frame 60 and connected to the lubricating oil suction pipe 102 to define a lubricating oil space 104' with the frame 60, a frame lubricating oil channel 106 perforated through the frame 60 to be connected to the lubricating oil space 104' of the lubricating oil cover 104, and a cylinder lubricating oil channel 108 perforated through the cylinder 70 to be connected to the frame lubricating oil channel 106.

A first lubricating oil suction valve 103 is provided between the lubricating oil suction pipe 102 and the lubricating oil space 104' of the lubricating oil cover 104. The first lubricating oil suction valve 103 is opened or closed as it is elastically deformed depending on a pressure difference between the lubricating oil suction pipe 102 and the lubricating oil space 104' of the lubricating oil cover 104.

Also, a second lubricating oil suction valve 105 is provided between the lubricating oil space 104' of the lubricating oil cover 104 and the frame lubricating oil channel 106. Similarly, the second lubricating oil suction valve 105 is opened or closed as it is elastically deformed depending on a pressure difference between the lubricating oil space 104' of the lubricating oil cover 104 and the frame lubricating oil channel 106.

The lubricating oil 50', supplied into a gap between the cylinder 70 and the piston 72 by way of the lubricating oil supply unit 100, is again discharged into the hermetic container 50 via a lubricating oil discharge portion 110.

The lubricating oil discharge portion 110 is perforated through the frame 60.

Meanwhile, the lubricating oil 50' may flow through the lubricating oil suction unit 100 and the lubricating oil discharge portion 110 based on a pumping operation of a lubricating oil pump 120 that is mounted at the lubricating oil suction unit 100.

FIG. 3 is an enlarged sectional view of the portion 'A' of FIG. 2, and FIG. 4 is a cross sectional view taken along the line B-B shown in FIG. 3. FIGS. 3 and 4 illustrate the lubricating oil pump of the linear compressor according to the present invention in detail.

As shown in FIGS. 3 and 4, the lubricating oil pump 120 is designed to induce a pumping operation using resonance force caused by vibration generated from the compression unit during operation of the compression unit.

The lubricating oil pump 120 of the linear compressor according to the present invention includes a lubricating oil cylinder 122 configured to communicate with the lubricating oil space 104' of the lubricating oil cover 104 located at a lower portion of the compression unit, a lubricating oil piston 124 mounted to be linearly reciprocated inside the lubricating oil cylinder 122, and a resonance unit located inside the lubricating oil cylinder 122 to resonate the lubricating oil piston 124 with the compression unit.

The lubricating oil cylinder 122 is made of aluminum, and is integrally formed in the frame 60.

Preferably, the lubricating oil cylinder 122 is arranged in parallel relative to the cylinder 70 so that the lubricating oil piston 124 resonates with vibration generated in the compression unit when the piston 72 is linearly reciprocated by the linear motor 90. That is, the lubricating oil cylinder 122 has a longitudinally elongated shape suitable to allow the lubricating oil piston 124 to be longitudinally reciprocated therein.

The lubricating oil cylinder 122 has a hollow cylindrical structure having both open ends, and one of the ends, i.e. the lubricating oil entrance/exit end, of the lubricating oil cylinder 122 has a diameter smaller than an inner diameter of the lubricating oil cylinder 122.

The lubricating oil cylinder cap may be obtained as the linear motor cover 62 comes into close contact with an end surface of the lubricating oil cylinder 122. That is, the linear motor cover 62 serves as the lubricating oil cylinder cap.

The lubricating oil piston 124 is made of bearing steel, and has a circular bar shape having a length shorter than the lubricating oil cylinder 122.

The resonance unit includes a pair of resonance springs 126 and 127 of coil spring type. The resonance springs 126 and 127 are located at opposite sides of the lubricating oil piston 124 and are designed to be elastically deformed in the same direction as a vibrating direction of the compression unit.

Meanwhile, the lubricating oil pump 120 further includes a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder 122 and the lubricating oil piston 124 during reciprocation of the lubricating oil piston 124.

The lubricating oil cylinder protector may be formed of a tubular liner 123 interposed between the lubricating oil cylinder 122 and the lubricating oil piston 124 to allow reciprocating movement of the lubricating oil piston 124 therein.

Preferably, the tubular liner 123 has the same longitudinal length as that of the lubricating oil cylinder 122 to protect the overall inner wall of the lubricating oil cylinder 122.

To allow the tubular liner 123 to be smoothly inserted into the lubricating oil cylinder 122, an outer
diameter of the tubular liner 123 is determined to have a predetermined tolerance with respect to the inner diameter of the lubricating oil cylinder 122.

[0093] In this case, the liner 123 may be loosely inserted in the lubricating oil cylinder 122 because the liner 123 is able to be fixed by the frame 60 and the linear motor cover 62, or otherwise, may be press fitted in the lubricating oil cylinder 122.

[0094] The liner 123 is preferably made of Teflon or a polymer material to prevent generation of metal-on-metal friction between the liner 123 and the lubricating oil piston 124.

[0095] Now, the operation of the lubricating oil pump of the linear compressor configured as stated above will be explained.

[0096] When the compression unit is driven by the linear motor 90, the lubricating oil piston 124 is longitudinally reciprocated in the lubricating oil cylinder 122 using the resonance force with the compression unit, thereby causing the lubricating oil 50' to be pumped.

[0097] That is, if the lubricating oil piston 124 is moved rearward, the lubricating oil space 104' of the lubricating oil cover 104 enters a low-pressure state. In such a low-pressure state, the lubricating oil space 104' of the lubricating oil cover 104 communicates with the lubricating oil suction pipe 102 while being closed relative to the frame lubricating oil channel 106. Thereby, the lubricating oil 50' is introduced by way of the lubricating oil suction pipe 102 to be filled in the lubricating oil space 104' of the lubricating oil cover 104.

[0098] After that, if the lubricating oil piston 124 is moved forward, the lubricating oil space 104' of the lubricating oil cover 104 enters a high-pressure state. In such a high-pressure state, the lubricating oil space 104' of the lubricating oil cover 104 communicates with the frame lubricating oil channel 106 while being closed relative to the lubricating oil suction pipe 102. Thereby, the lubricating oil 50', filled in the lubricating oil space 104' of the lubricating oil cover 104, passes through the frame lubricating oil channel 106 and the cylinder lubricating oil channel 108 in succession, thereby being supplied into the gap between the cylinder 70 and the piston 72.

[0099] After being used to cool and lubricate the cylinder 70 and the piston 72, the lubricating oil 50' between the cylinder 70 and the piston 72 is finally discharged into the hermetic container 50 through the lubricating oil discharge portion 110.

[0100] As is apparent from the above description, a linear compressor and a lubricating oil pump thereof according to the present invention have the following effects.

[0101] Firstly, according to the present invention, there is no friction between a lubricating oil cylinder and a lubricating oil piston during reciprocating movement of the lubricating oil piston through the use of a lubricating oil cylinder protector. Therefore, in spite of the fact that the lubricating oil cylinder is integrally formed in a frame made of aluminum having a hardness lower than that of the lubricating oil piston, the present invention can achieve high durability of the lubricating oil cylinder.

[0102] Secondly, as a result of preventing generation of friction using the lubricating oil cylinder protector, the lubricating oil piston does not require additional processing to improve surface roughness, wear-resistance, and lubrication properties after being molded. This simplifies a manufacturing process and reduces manufacturing costs of the lubricating oil piston as compared to the prior art.

[0103] Thirdly, according to the present invention, the lubricating oil cylinder protector is a liner made of Teflon or a polymer material, rather than metals. This further simplifies or eliminates any additional processing of the lubricating oil piston.

[0104] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A lubricating oil pump for use in a linear compressor comprising:
   a lubricating oil cylinder to suction lubricating oil;
   a lubricating oil piston to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil; and
   a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.

2. The pump as set forth in claim 1, wherein the lubricating oil cylinder protector is a tubular liner interposed between the lubricating oil cylinder and the lubricating oil piston.

3. The pump as set forth in claim 2, wherein the liner is made of Teflon or a polymer material.

4. The pump as set forth in claim 2, wherein the liner is press fitted in the lubricating oil cylinder.

5. The pump as set forth in claim 2, wherein:
   the lubricating oil cylinder has a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder,
   the open second end of the lubricating oil cylinder is covered with a lubricating oil cylinder cap; and
   the liner is inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.

6. A linear compressor comprising:
   a hermetic container containing lubricating oil stored in a bottom region thereof;
   a compression unit arranged in the hermetic container to compress operating fluid using a driving force from a linear motor;
   a lubricating oil cylinder mounted to the compression unit to suction or discharge the lubricating oil stored in the hermetic container;
   a lubricating oil piston mounted to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil;
a resonance unit to resonate the lubricating oil piston with
the compression unit to thereby allow the lubricating oil piston to be reciprocated; and
a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.
7. The compressor as set forth in claim 6, wherein:
a metal frame is arranged in the hermetic container to support the compression unit; and
the lubricating oil cylinder is integrally formed in the frame.
8. The compressor as set forth in claim 6, wherein the lubricating oil cylinder protector is a tubular liner interposed between the lubricating oil cylinder and the lubricating oil piston.
9. The compressor as set forth in claim 8, wherein the liner is made of Teflon or a polymer material.
10. The compressor as set forth in claim 8, wherein the liner is press fitted in the lubricating oil cylinder.
11. The compressor as set forth in claim 8, wherein:
the lubricating oil cylinder has a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder;
the open second end of the lubricating oil cylinder is covered with a lubricating oil cylinder cap; and
the liner is inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.
12. The compressor as set forth in claim 11, wherein the liner has the same length as that of the lubricating oil cylinder.
13. The compressor as set forth in claim 11, wherein the lubricating oil cylinder cap is a linear motor cover to support the linear motor.
14. A linear compressor comprising:
a hermetic container containing lubricating oil stored in a bottom region thereof;
a compression unit having a cylinder arranged in the hermetic container to suction and discharge operating fluid, a piston mounted to be reciprocated inside the cylinder, and a linear motor to reciprocate the piston; a frame to support the compression unit;
a linear motor cover to support the linear motor along with the frame;
a lubricating oil cylinder integrally formed in the frame to be located between the frame and the linear motor cover and adapted to suction and discharge the lubricating oil stored in the hermetic container;
a lubricating oil piston mounted to be reciprocated inside the lubricating oil cylinder to thereby pump the lubricating oil;
a resonance unit to resonate the lubricating oil cylinder to thereby pump the lubricating oil;
a lubricating oil cylinder protector to prevent generation of friction between the lubricating oil cylinder and the lubricating oil piston.
15. The compressor as set forth in claim 14, wherein the lubricating oil cylinder and the lubricating oil piston are made of metal.
16. The compressor as set forth in claim 15, wherein the lubricating oil cylinder is mounted in parallel relative to the cylinder of the compression unit.
17. The compressor as set forth in claim 15, wherein the lubricating oil cylinder has a hollow cylindrical structure having open first and second ends, the first end of the lubricating oil cylinder as a lubricating oil entrance/exit end having a diameter smaller than an inner diameter of the lubricating oil cylinder, and the open second end of the lubricating oil cylinder being covered with the linear motor cover.
18. The compressor as set forth in claim 17, wherein the lubricating oil cylinder protector is a tubular liner to be inserted into the lubricating oil cylinder through the open second end of the lubricating oil cylinder.
19. The compressor as set forth in claim 18, wherein the liner is made of Teflon or a polymer material.
20. The compressor as set forth in claim 18, wherein the liner is press fitted in the lubricating oil cylinder.

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