

【DESCRIPTION】

【Invention Title】

RECIPROCATING COMPRESSOR

【Technical Field】

5 The present invention relates to a compressor, and more particularly, a reciprocating compressor capable of varying (switching) an operation mode thereof by partially leaking or blocking a refrigerant contained in a compression space.

10 【Background Art】

A compressor is an apparatus for converting mechanical energy into compression energy of a compressible fluid. Such compressors may be divided into a reciprocating compressor, a rotary compressor, and a scroll compressor, according to a compressing mechanism with respect to fluid.

15 The reciprocating compressor is provided with a driving motor and disposed in a hermetic container for generating a rotational force, and a compression unit receiving the driving force from the driving motor for compressing a refrigerant as a compressible fluid.

20 The compression unit is configured to compress a refrigerant by the reciprocating motion of a piston, which is connected to a crankshaft via a connecting rod, in a cylinder. In recent time, a variable capacity type reciprocating compressor which is capable of adjusting a compression capacity according to a size of a refrigeration load has been introduced. A double-capacity reciprocating compressor (hereinafter, referred to as "double-capacity compressor") among the
25 variable capacity type reciprocating compressor has the piston having a stroke that is variable according to a rotation direction of the crankshaft, and accordingly, operated in a power mode or a saving mode.

【Disclosure】**【Technical Problem】**

However, in the related art double-capacity compressor, in a saving mode,
5 an upper dead point of the piston does not reach the end (i.e., a position where a
discharge valve is located) of the cylinder. A dead volume is accordingly generated,
thereby decreasing a capacity variable ratio under the same pressure condition of
the compressor, resulting in degradation of an efficiency (EER). Further, due to the
decrease of the capacity variable ratio, re-expansion loss increases, thereby
10 further degrading the efficiency of the compressor.

Furthermore, the two limited operation modes of the compressor prevent
the compressor from being operated in more various operation modes, thereby
restricting the implementation of various operation modes of a freezing apparatus
employing the compressor.

15 Therefore, an object of the present invention is to provide a reciprocating
compressor capable of decreasing a dead volume by allowing a piston to have an
upper dead point same in a power mode and a saving mode and also of
controlling an operation mode of the compressor.

Another object of the present invention is to provide a reciprocating
20 compressor capable of variously converting operation modes of the compressor
and a freezing apparatus employing the compressor.

【Technical Solution】

To achieve the objects, in accordance with one aspect of the present
25 invention, there is provided a reciprocating compressor including, a hermetic
container having a hermetic inner space a driving motor installed in the inner
space of the hermetic container and having a crankshaft, a connecting rod

coupled to an eccentric portion of the crankshaft and configured to convert a rotary motion of the driving motor into a linear motion, a piston coupled to the connecting rod and reciprocated within a compression space of a cylinder to compress a refrigerant, and a sleeve coupled between the crankshaft and the connecting rod,
5 wherein the cylinder is provided with at least one exhaust hole configured to allow a refrigerant compressed in the compression space of the cylinder to be partially leaked into the inner space of the hermetic container, the cylinder further provided with a mode switching unit configured to selectively open and close the exhaust hole.

10 Here, the driving motor may be implemented as a bi-directionally rotatable motor, and when the crankshaft is rotated in one direction, the sleeve and the connecting rod are orbited together with being locked to each other so that the compressor is operated in a saving mode, whereas, when the crankshaft is rotated in another direction, the sleeve and the connecting rod are orbited independent of
15 each other without being locked to each other so that the compressor is operated in a power mode.

The compressor may further include a stroke varying device by which the connecting rod and the sleeve are locked to each other and a bearing surface is provided between the eccentric portion of the crankshaft and the sleeve when the
20 crankshaft is rotated in one direction, thereby being operated in the saving mode, while by which the eccentric portion of the crankshaft and the sleeve are locked to each other and the bearing surface is provided between the connecting rod and the sleeve when the crankshaft is rotated in another direction, thereby being operated in the power mode.

25 The stroke varying device may include a latching unit installed between the eccentric portion of the crankshaft and the sleeve and configured to lock or release the sleeve according to the rotation direction of the crankshaft; and a

sleeve locking unit installed between the sleeve and the connecting rod so as to be released when the sleeve is locked by the latching unit while to be locked when the sleeve is released from the latching unit.

5 **【Advantageous Effect】**

The reciprocating compressor according to the present invention employs a plurality of latching units by which the piston can have an upper dead point same in the power mode and the saving mode of the compressor, thereby reducing a dead volume between the piston and a discharge valve in the saving mode and
10 also increasing a variable ratio of cooling capacity of the compressor by allowing part of compressed gas to be selectively leaked.

【Description of Drawings】

FIG. 1 is a longitudinal cross-sectional view of a reciprocating compressor
15 in accordance with the present invention;

FIG. 2 is an exploded perspective view showing a mode switching unit of the compressor in accordance with FIG. 1;

FIG. 3 is a schematic view showing a position of an exhaust hole of the compressor in accordance with FIG. 2;

20 FIG. 4 is an experimental graph for an exhaust hole of the compressor in accordance with FIG. 3;

FIGS. 5 and 6 are longitudinal cross-sectional views each showing a power mode and a saving mode of the compressor in accordance with FIG. 2;

FIG. 7 is a perspective view showing a double-capacity reciprocating
25 compressor employing a mode switching unit in accordance with the present invention; and

FIGS. 8 to 10 are planar views respectively showing a power mode, a first

saving mode and a second saving mode of the compressor of FIG. 7.

【Mode for Invention】

Hereinafter, description will be made in detail of a reciprocating
5 compressor according to one embodiment of the present invention with reference
to the accompanying drawings.

As shown in FIG. 1, a double-capacity compressor according to the
present invention may include a driving motor 10 disposed inside a hermetic
container 1 and bi-directionally rotatable, and a compression part 20 disposed at
10 an upper side of the driving motor 10 and configured to compress a refrigerant by
receiving a rotational force from the driving motor.

The driving motor 10, implemented as a constant-speed motor or an
inverter motor both rotatable uni-directionally or bi-directionally, may include a
stator 11 elastically disposed within the hermetic container 1 with being supported
15 by a frame 2, a rotor 12 rotatably disposed inside the stator 11, and a crankshaft
13 coupled to the central portion of the rotor 12 so as to transfer a rotational force
to the compression part 20.

The compression part 20 may include a sleeve 21 rotatably coupled to an
eccentric portion of the crankshaft 13, a connecting rod 22 coupled to an outer
20 circumferential surface of the sleeve 21 in a radial direction to convert a rotary
motion of the crankshaft 21 into a linear motion, a piston 23 coupled to another
end of the connecting rod 22, and a cylinder 24 having a linear compression space
V1 in which the piston 23 is reciprocated in a radial direction so as to compress a
refrigerant.

25 The sleeve 21 may be formed in a cylindrical shape having inner and
outer circumferential surfaces both formed in a right circular shape. Also, the
sleeve 21 may be provided with a shaft hole (no reference numeral given) formed

therethrough in a shaft direction, thus to be rotatably coupled to the eccentric portion of the crankshaft 13. Here, the sleeve 21 may be formed such that its center of shaft matches with its center of rotation, namely, formed in a central cylindrical shape. Alternatively, the sleeve 21 may be formed such that the center
5 of shaft is eccentric to the center of rotation, namely, formed in a eccentric cylindrical shape.

The piston 23 may be formed in a hollow cylindrical shape having a sealed one end, and the connecting rod 22 may be rotatably coupled to the inner space of the piston 23.

10 The cylinder 24, as shown in FIGS. 1 and 2, may be provided with a compression space V1 linearly formed such that the piston 23 is linearly reciprocated therein. A valve assembly 25, which typically includes a suction valve and a discharge valve, may be coupled to a front end of the cylinder 24. An exhaust hole 24a may be formed through the cylinder 24 in a radial direction of the
15 cylinder 24, namely, in a direction approximately orthogonal to a motion direction in which the piston 23 is reciprocated in the compression space V1. A valve groove 24b may be formed to cross the exhaust hole 24a in a direction approximately orthogonal to the exhaust hole 24a such that a valve portion 32 of a mode switching unit 30, which will be explained later, is slidable therein. Further,
20 the mode switching unit 30 may be disposed at one side surface of the cylinder 24 for deciding an operation mode of the compressor by selectively opening and closing the exhaust hole 24a with being moved in a direction of the piston 23 reciprocated.

The exhaust hole 24a may have an inner end penetrating an inner
25 circumferential surface of the compression space V1 and an outer end communicating with an inner space of the hermetic container 1. Preferably, the exhaust hole 24a is disposed at a position where an appropriate amount of

refrigerant is leaked during a compression process of the piston 23 and simultaneously a refrigerant is not excessively sucked from the inner space of the hermetic container 1 during a suction process of the piston 23. For example, the exhaust hole 24a, as shown in FIGS. 3 and 4, may be formed at a position where
5 a value A obtained by dividing a distance B between a central line of the exhaust hole 24a and an upper dead point of the piston 23 by a stroke S of the piston 23 is in the range of $0.7 \leq A \leq 1.0$. Further, only a single exhaust hole 24a may be formed. In the alternative manner, a plurality of exhaust holes may be formed in a circumferential direction. In case of the plurality of exhaust holes formed, the
10 plurality of exhaust holes may be formed on the same circumference, but, in some cases, formed on different circumferences in consideration of an amount of refrigerant leaked out of the compression space V1 and an amount of refrigerant sucked into the inner space of the hermetic container 1.

The mode switching unit 30 may be implemented as a solenoid valve
15 which typically becomes an electromagnet upon power being supplied so as to selectively open and close the exhaust hole 24a. For instance, the mode switching unit 30 may include a driving portion 31 implemented as an electromagnet, and a valve portion 32 for opening and closing the exhaust hole 24a with being reciprocated in the valve groove 24b of the cylinder 24 by the driving portion 31.
20 Preferably, the mode switching unit 30 is configured to open the exhaust hole 24a when power is not supplied thereto while closing the exhaust hole 24a when power is supplied thereto, considering the characteristic of a freezing apparatus employing the compressor that the freezing apparatus is usually operated in a saving mode except for an initiation thereof.

25 Unexplained reference numeral 26 denotes a discharge cover, and V2 denotes a discharge space.

The double-capacity compressor according to the present invention will be

operated as follows.

That is, when power is applied to the stator 11 of the driving motor 10, the rotor 12 is rotated together with the crankshaft 13 by the interaction with the stator 11. The connecting rod 22, coupled to the eccentric portion of the crankshaft 13 with the sleeve 21 interposed therebetween, is then orbited, according to the piston 23 coupled to the connecting rod 22 is linearly reciprocated in the compression space V1 of the cylinder 24 so as to compress a refrigerant. Such series of processes are repeatedly performed. Here, in a manner of supplying or not supplying power to the mode switching unit 30, the refrigerant compressed in the compression space V1 is allowed to be partially leaked into the inner space of the hermetic container 1, thereby switching the operation mode of the compressor into a power mode or saving mode.

For example, as shown in FIG. 5, in the power mode of the compressor, upon power being supplied to the mode switching unit 30, the valve portion 32 of the mode switching unit 30 blocks (closes) the exhaust hole 24a. Accordingly, a refrigerant sucked into the compression space V1 is all compressed by the reciprocating motion of the piston 23, thereby being discharged into the discharge space V2 of the discharge cover 26.

On the contrary, as shown in FIG. 6, in the saving mode of the compressor, power is not applied to the mode switching unit 30, and accordingly the mode switching unit 30 opens the exhaust hole 24a. Hence, a refrigerant sucked into the compression space V1 is partially leaked into the inner space of the hermetic container 1 while the piston 23 is reciprocated, and then part of the compressed refrigerant is completely compressed to be discharged into the discharge space V2 of the discharge cover 26.

In the meantime, another embodiment of a double-capacity compressor according to the preset invention will be described hereinafter.

That is, the previous embodiment has illustrated that when the stroke of the piston 23 is uniformly controlled, part of the refrigerant compressed in the compression space is leaked so as to vary the capacity of the compressor. However, this embodiment illustrates that even when a stroke varying unit is provided for varying the capacity of the compressor by varying the stroke of the piston, part of the refrigerant compressed in the compression space is leaked, thereby further varying the capacity of the compressor.

For example, as shown in FIG. 7, a double-capacity compressor according to the present invention may have a driving motor 10 implemented as a constant-speed motor or an inverter motor, which is rotatable in a forward direction and a reverse direction. A sleeve 121 coupled to the eccentric portion of the crankshaft 13 is implemented as an eccentric sleeve having a center of shaft being eccentric from a center of rotation. A latching unit 140, by which the sleeve 121 is locked to or released from the crankshaft 13 according to the operation mode of the compressor, may be installed between the eccentric portion of the crankshaft 13 and the sleeve 121, and a sleeve locking unit 150 for locking or releasing the sleeve 121 and a connecting rod 122 according to the operation mode of the compressor may be installed between the sleeve 121 and the connecting rod 122.

The latching unit 140 may include a latching pin 141 disposed at the eccentric portion of the crankshaft 13, a pin stopper 142 coupled to the sleeve 121 and having the latching pin 141 stopped thereby or released therefrom according to a rotation direction of the crankshaft 13, and a pin spring 143 for elastically supporting the latching pin 141 always in a direction that the latching pin 141 is drawn out.

Here, the pin stopper 142 may have the entire inner circumferential surface, formed in a shape that two or more circles are combined, so that the latching pin 51 can be stopped by a stopping end in the power mode, whereas

being slid through the inner circumferential surface of an opposite end of the stopping end in the saving mode. Alternatively, the pin stopper 142 may have the inner circumferential surface formed by a single circle. In this case, the inner circumferential surface of the pin stopper 142 is preferably disposed to be eccentric from the center of the eccentric portion of the crankshaft 13, thereby selectively locking the latching pin 141 according to the operation mode. Also, in that case, since the pin stopper 142 may be coupled only to the stopping end by which the latching pin 141 is stopped, the number and size of bolts should be considered so as to sufficiently endure the load of the latching pin 141 when the latching pin 141 is stopped at the stopping end.

The sleeve locking unit 150 may include first magnets 151 coupled to the sleeve 121, and second magnets 152 coupled to the connecting rod 122 with an air gap apart from an outer circumferential surface of the first magnets 151.

Each of the first and second magnets 151 and 152 is preferably formed such that a positive (+) pole and a negative (-) pole are appeared at least once or more within one period of an electric angle. The first and second magnets 151 and 152 may be implemented as permanent magnets, but in some cases, they may be electromagnets.

Here, in case where the first and second magnets 151 and 152 are permanent magnets, preferably, the first and second magnets 62 are radially disposed respectively in plurality, in a circumferential direction. Also, preferably, each of the first and second magnets 61 and 62 is formed such that inner circumferential surface and outer circumferential surface thereof have different polarities from each other, thereby forming a closed loop. The first and second magnets 151 and 152 may have the same arcuate angle, and be alternately arranged with different polarities in the circumferential direction. Accordingly, when the crankshaft 13 is rotated in a clockwise direction, i.e., in a saving mode, the first

and second magnets 151 and 152 are attracted towards different polarities, so as to fix a correct position where the sleeve 121 and the connecting rod 122 are locked to each other.

5 Meanwhile, even in this case, a cylinder 124 has a linearly formed compression space in which the piston 123 is linearly reciprocated, and a valve assembly (not shown) including a suction valve and a discharge valve is coupled to a front end of the cylinder 124. The cylinder 124 may be provided with an exhaust hole 124a formed through the cylinder 124 in a radial direction of the cylinder 24, namely, in a direction approximately orthogonal to a direction in which
10 the piston 23 is reciprocated in the compression space V1. A valve groove 124b may be formed to cross the exhaust hole 124a in a direction approximately orthogonal to the exhaust hole 124a such that a valve portion 132 of a mode switching unit 130, which will be explained later, is slidable therein. Further, the mode switching unit 130 may be disposed at one side surface of the cylinder 124
15 for deciding an operation mode of the compressor by selectively opening or closing the exhaust hole 24a with being moved in a reciprocating direction of the piston 123.

Here, the exhaust hole 124a formed through the cylinder 124 may be formed in the same manner to the previous embodiment. The mode switching unit
20 130 may also be configured and coupled same to that in the previous embodiment. So, the detailed description thereof will be understood by the previous embodiment, and will not be repeated.

The reciprocating compressor according to the present invention will operate as follows.

25 That is, when power is applied to a stator of the driving motor 10, a rotor is rotated together with the crankshaft 13 by the interaction with the stator. The connecting rod 122, coupled to the eccentric portion of the crankshaft 13 with the

sleeve 121 interposed therebetween, is then orbited. Accordingly, the piston 123 coupled to the connecting rod 122 is linearly reciprocated in the compression space of the cylinder 124, thereby compressing a refrigerant. Such series of processes are repeatedly performed, which will be described in more detail.

5 As shown in FIG. 8, in the power mode of the compressor, the crankshaft 13 is rotated in a reverse direction, i.e., in a counterclockwise direction, and the latching pin 141 disposed at the eccentric portion of the crankshaft 13 is supported by the pin spring 143, thereby being protruded in a radial direction. Accordingly, the latching pin 141 is then stopped by a stopping end of the pin stopper 142.

10 Here, as the latching pin 141 is stopped by the stopping end of the pin stopper 142, the crankshaft 13 and the sleeve 121 are integrally tied up to be forcibly rotated. Accordingly, the sleeve 121 and the connecting rod 122 overcome the magnetic force generated the first and second magnets 151 and 152 to be slid with respect to each other. Consequently, the crankshaft 13 and the sleeve 121 are rotated

15 together with a maximum eccentric amount, and the piston 123 can be reciprocated by two times the total eccentric amount, obtained by adding the eccentric amount of the eccentric portion to the eccentric amount of the sleeve 121, thereby causing the compressor to generate the maximum refrigerating capacity.

20 On the other hand, as shown in FIG. 9, in a first saving mode of the compressor, the crankshaft 12 is rotated in a forward direction, i.e., in a clockwise direction, and accordingly, the latching pin 141 is slid along the inner circumferential surface of the pin stopper 142 without being stopped by the opposite end of the stopping end of the pin stopper 142 even though the latching

25 pin 141 is protruded by the pin spring 143. During this process, the sleeve 121 may have a tendency to be rotated independent of the crankshaft 13, but, the sleeve 121 and the connecting rod 122 are rotated together with being integrally

5 tied up due to the magnetic force generated between the first magnet 151 of the sleeve 121 and the second magnet 152 of the connecting rod 122. Accordingly, the piston 123 is reciprocated by two times the eccentric amount of the eccentric portion, thereby causing the compressor to generate a minimum refrigerating capacity. Here, the piston 123 has a stroke shorter than a stroke implemented in the power mode. However, since the sleeve 121 is rotated with the connecting rod 122 with being fixed at the position eccentric from the piston 123 with the maximum state, the upper dead point of the piston 123 is moved to be nearly the same as the upper dead point implemented in the power operation.

10 In the meantime, as shown in FIG. 10, in the power mode of the compressor, when power is applied to the mode switching unit 130, the valve portion 132 of the mode switching unit 130 blocks the exhaust hole 124a of the cylinder 124, such that a refrigerant sucked into the compression space V1 is all compressed by the reciprocating motion of the piston 123, thereby being
15 discharged into the discharge space V2 of the discharge cover 26. However, when the power applied to the mode switching unit 130 is cut off, the valve portion 132 of the mode switching unit 130 opens the exhaust hole 124a, such that the refrigerant sucked into the compression space V1 is partially leaked into the inner space of the hermetic container 1 while the piston 123 is reciprocated, and part of
20 the compressed refrigerant is completely compressed, thereby being discharged into the discharge space of the discharge cover. Here, the amount of exhausted refrigerant can be increased or decreased by adjusting the position, the number and the size of the exhaust hole 124a, thereby controlling the capacity of the compressor. That is, in this mode, the capacity of the compressor can be between
25 the capacity in the power mode and the capacity in the first saving mode or decreased smaller than that in the first saving mode. Such mode is referred to as a second saving mode.

Although not shown, when power is applied to the mode switching unit in the first saving mode, even a third saving mode in which the capacity is decreased smaller than that in the second saving mode can be implemented.

As such, the piston can have the upper dead point same in the power mode and saving mode, thereby reducing a dead volume and controlling the operation mode of the compressor. Further, the operation modes of the compressor and a freezing apparatus employing the compressor can variously be switched into power mode, first saving mode, second saving mode, third saving mode and the like.

10

[Industrial Availability]

The reciprocating compressor according to the present invention may be applied to any device having a variable cooling capacity, such as a home refrigerator and an industrial freezing apparatus.

【CLAIMS】

1. A reciprocating compressor comprising:

a hermetic container having a hermetic inner space;

5 a driving motor installed in the inner space of the hermetic container and having a crankshaft;

a connecting rod coupled to an eccentric portion of the crankshaft and configured to convert a rotary motion of the driving motor into a linear motion;

10 a piston coupled to the connecting rod and reciprocated within a compression space of a cylinder to compress a refrigerant; and

a sleeve coupled between the crankshaft and the connecting rod,

wherein the cylinder is provided with at least one exhaust hole configured to allow a refrigerant compressed in the compression space of the cylinder to be partially leaked into the inner space of the hermetic container, the cylinder further
15 provided with a mode switching unit configured to selectively open and close the exhaust hole.

2. The compressor of claim 1, wherein the driving motor is implemented as a uni-directionally rotatable motor.

20

3. The compressor of claim 1, wherein the driving motor is implemented as a bi-directionally rotatable motor.

4. The compressor of claim 3, wherein when the crankshaft is rotated in
25 one direction, the sleeve and the connecting rod are orbited together with being locked to each other so that the compressor is operated in a saving mode, whereas, when the crankshaft is rotated in another direction, the sleeve and the

connecting rod are orbited independent of each other without being locked to each other so that the compressor is operated in a power mode.

5 5. The compressor of claim 4, wherein a stroke of the piston is two times an eccentric amount of the eccentric portion in the saving mode, whereas the stroke of the piston is two times the total eccentric amount obtained by adding the eccentric amount of the eccentric portion to eccentric amount of the sleeve in the power mode.

10 6. The compressor of claim 4, wherein the piston has an upper dead point approximately same in the saving mode and the power mode.

15 7. The compress of claim 4, further comprising a stroke varying device by which the connecting rod and the sleeve are locked to each other and a bearing surface is provided between the eccentric portion of the crankshaft and the sleeve when the crankshaft is rotated in one direction, thereby being operated in the saving mode, while by which the eccentric portion of the crankshaft and the sleeve are locked to each other and the bearing surface is provided between the connecting rod and the sleeve when the crankshaft is rotated in another direction, 20 thereby being operated in the power mode.

8. The compressor of claim 7, wherein the stroke varying device comprises:

25 a latching unit installed between the eccentric portion of the crankshaft and the sleeve and configured to lock or release the sleeve according to the rotation direction of the crankshaft; and

a sleeve locking unit installed between the sleeve and the connecting rod

so as to be released when the sleeve is locked by the latching unit while to be locked when the sleeve is released from the latching unit.

9. The compressor of claim 8, wherein the latching unit comprises:

5 a latching pin coupled to the eccentric portion of the crankshaft in a radial direction; and

a pin stopper disposed at the eccentric sleeve and configured to lock or release the latching pin according to the rotation direction of the crankshaft.

10 10. The compressor of claim 8, wherein the sleeve locking unit comprises:

a first magnet coupled to the eccentric sleeve; and

a second magnet disposed at the connecting rod with an air gap apart from an outer circumferential surface of the first magnet.

15 11. The compressor of claim 10, wherein each of the first magnet and the second magnet is disposed such that a positive (+) pole and a negative (-) pole are appeared at least one or more times within one period of an electric angle.

20 12. The compressor of claim 10, wherein the first magnet and the second magnet are radially arranged in plurality, respectively, in a circumferential direction.

13. The compressor of claim 12, wherein the plurality of first magnets and the plurality of second magnets are arranged so as to form a closed loop, respectively.

25

14. The compressor of claim 12, wherein each of the first and second magnets is formed such that inner circumferential surface and outer

circumferential surface thereof have different polarities, the first magnets and the second magnets alternately having different polarities, respectively, in the circumferential direction.

5 15. The compressor of claim 10, wherein the first magnet and the second magnet are implemented as a permanent magnet.

 16. The compressor of claim 10, wherein the first magnet and the second magnet are implemented as an electromagnet.

10

 17. The compressor of any of claims 1 to 16, wherein the exhaust hole is formed at a position where a value A obtained by dividing a distance B between a central line of the exhaust hole and an upper dead point of the piston by a stroke S of the piston is in the range of $0.7 \leq A \leq 1.0$.

【ABSTRACT】

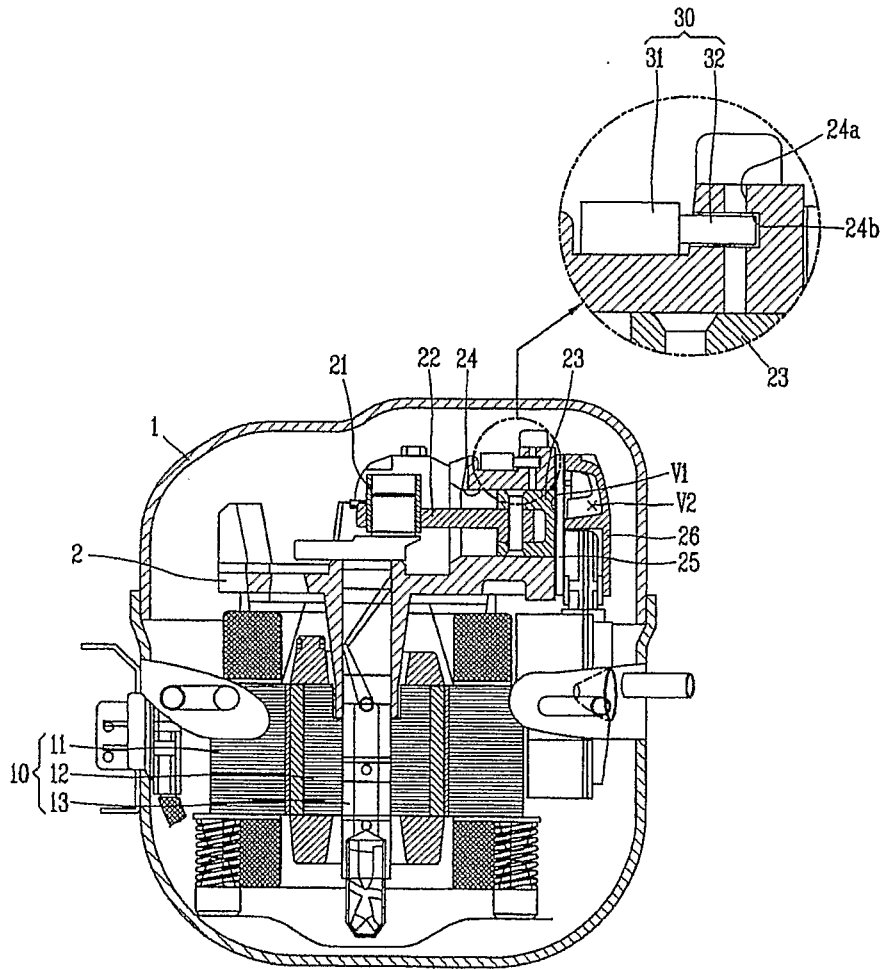
Disclosed is a reciprocating compressor, including a latching unit which uses a magnetic force and by which a piston is reciprocated by two times a total eccentric amount obtained by adding an eccentric amount of an eccentric portion to an eccentric amount of an eccentric sleeve in a power mode, while the piston is reciprocated by two times the eccentric amount of the eccentric portion in a saving mode, whereby the piston can have an upper dead point same in the power mode and the saving mode of the compressor, resulting in reducing a dead volume between the piston and a discharge valve and increasing a variable ratio of a cooling capacity of the compressor in the saving mode.

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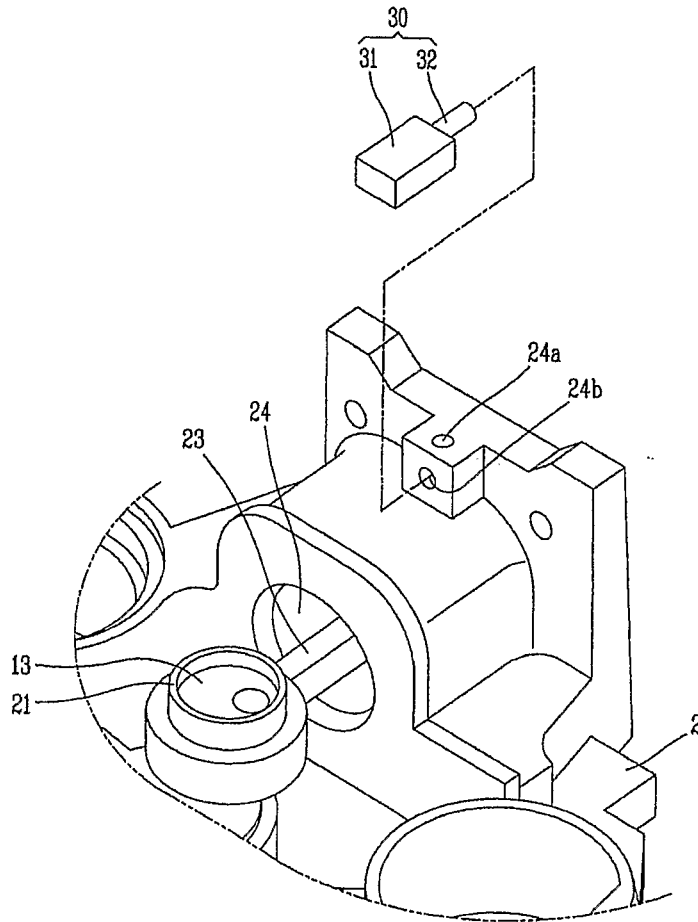
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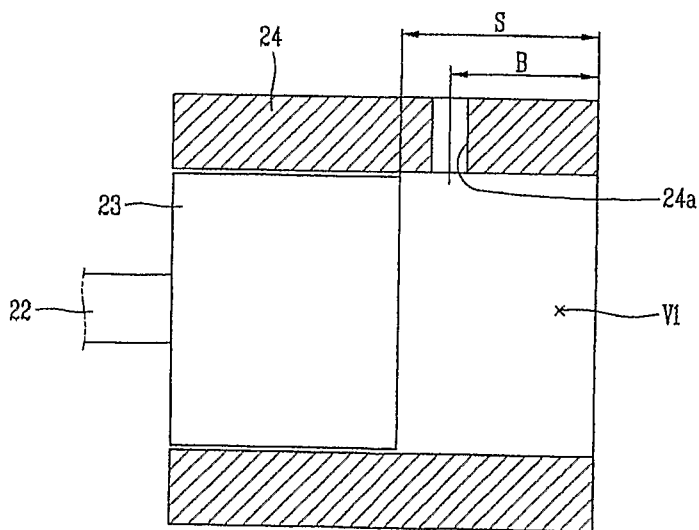
[Fig.1]



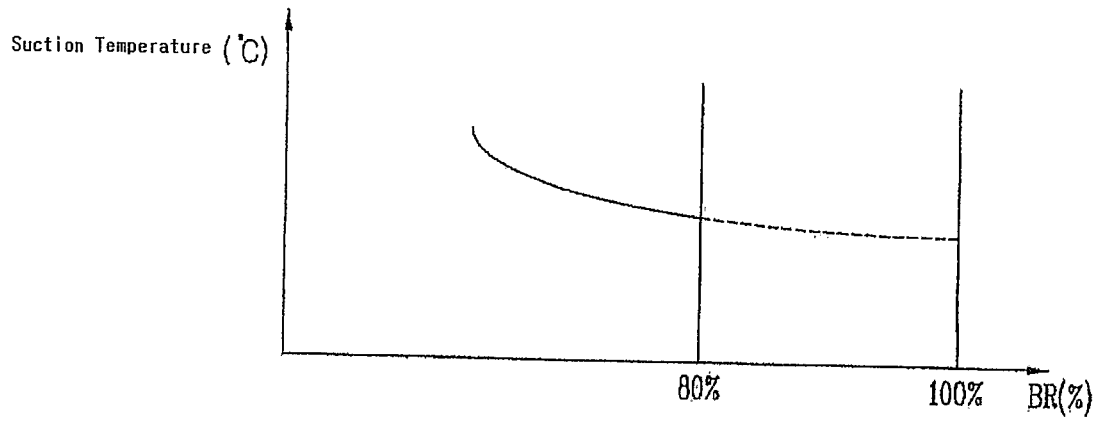
[Fig. 2]



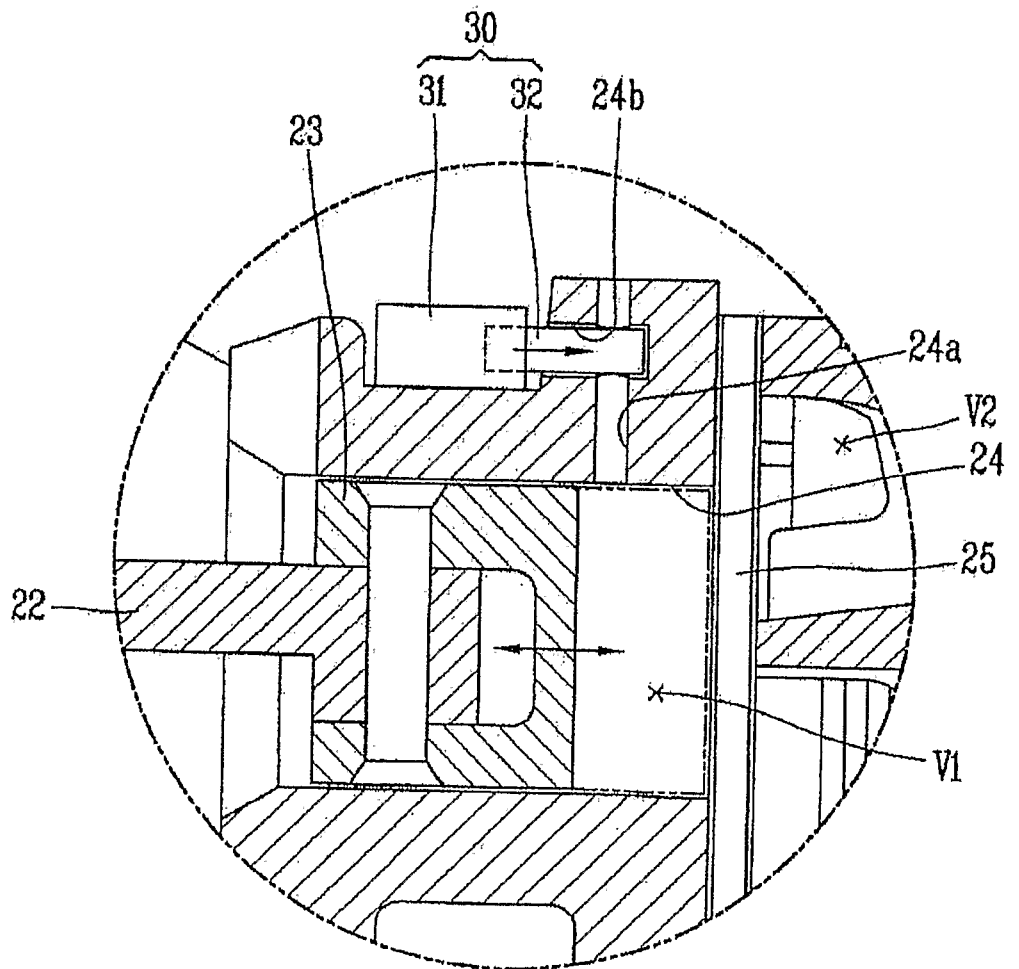
[Fig. 3]



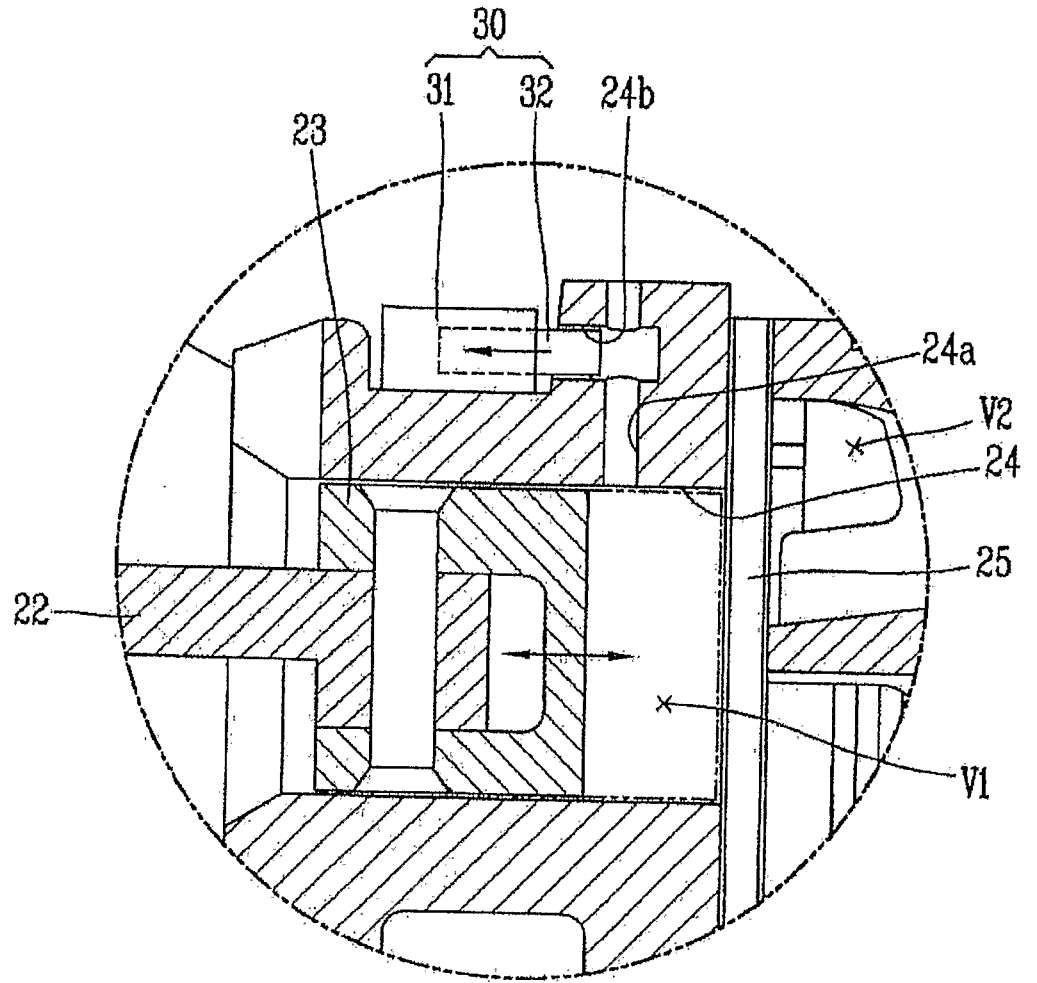
[Fig. 4]



[Fig. 5]

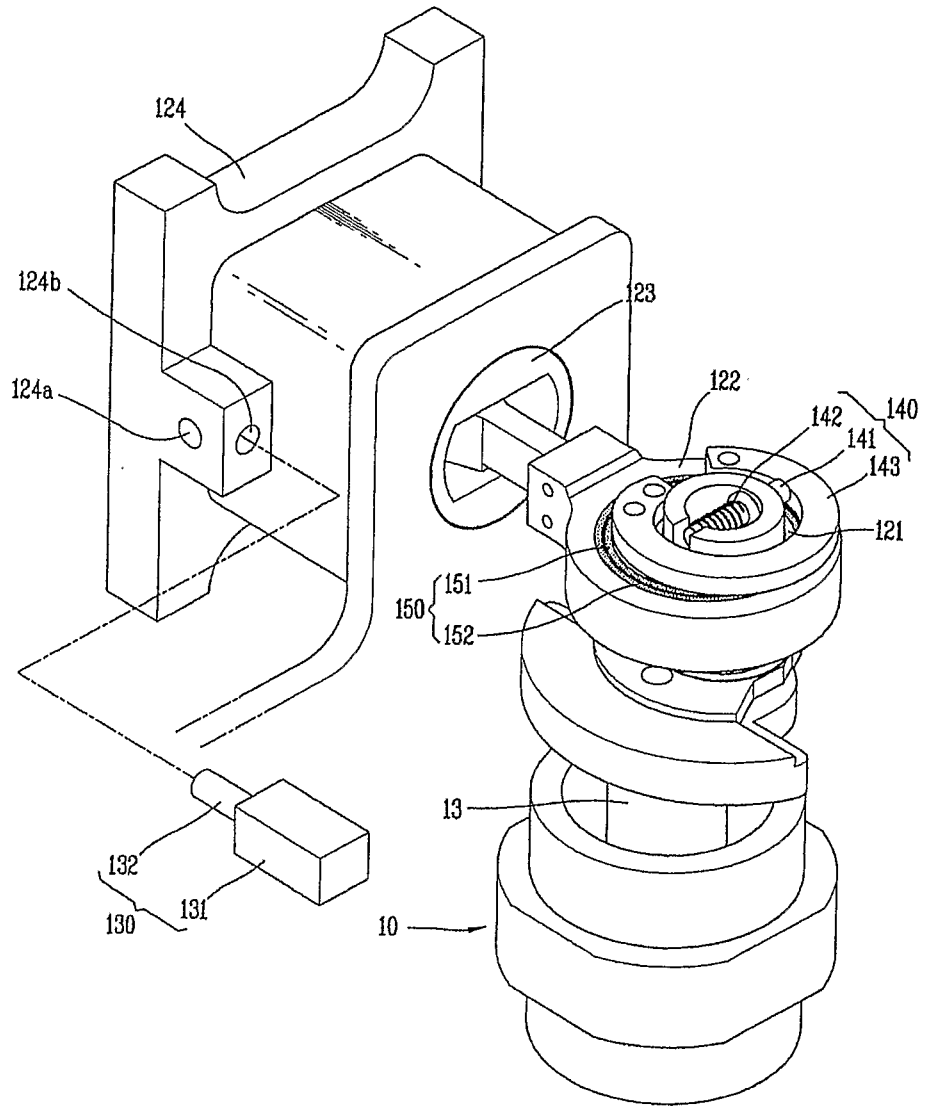


[Fig. 6]

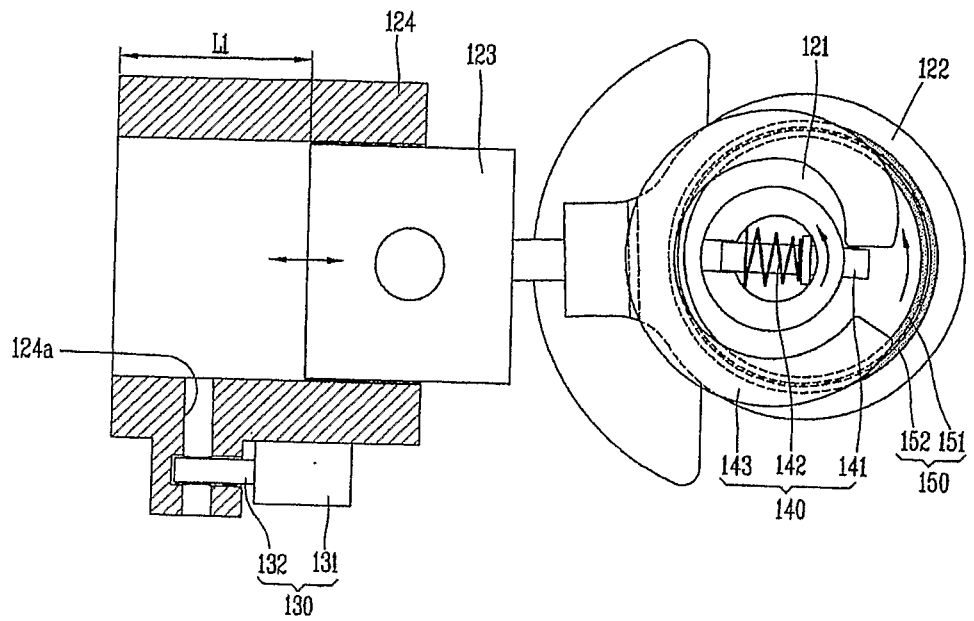


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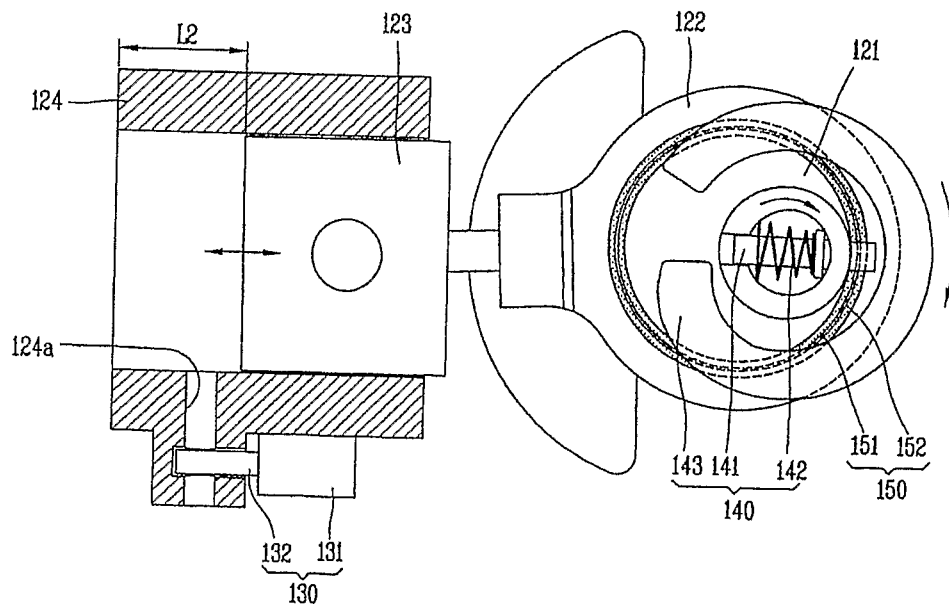
[Fig. 7]



[Fig. 8]



[Fig. 9]



[Fig. 10]

