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SPECIFICATION

TITLE OF THE INVENTION

HERMETICALLY SEALED TYPE COMPRESSOR

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

This invention relates to a hermetically sealed type compressor and, more specifically, to a hermetically sealed type compressor which can reduce the discharge of oil contained in a refrigerant compressed in a compressor and to
10 be discharged from a refrigerant discharge pipe and which can be reduced in size.

2. Background Art

The cross section of a conventional hermetically
15 sealed type compressor (such as disclosed in Laid-open Japanese Utility Model Application No. Sho 60-87391 and Japanese Utility Model Publication No. Hei 3-26309) is shown in Fig. 3.

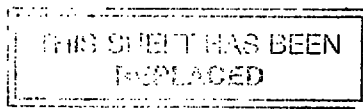
Reference numeral 50 is a hermetically sealed
20 container having an oil reservoir 51 storing oil, in which an electric element 52 is housed in an upper portion and a rotary compression element 53 is housed in a lower portion. The electric element 52 consists of a rotor 55 fitted onto a rotary shaft 54 and a stator 57 having oil return holes 56
25 formed in the outer peripheral surface thereof. Denoted by



58 is an air gap formed by the outer peripheral surface of the rotor 55 and the inner peripheral surface of the stator 57. Denoted by 59 is a wound coil end incorporated in the stator 57. The rotary compression element 53 consists of a
5 cylinder 60, a roller which rolls in the cylinder 60 by an eccentric portion 61 of the rotary shaft 54, a vane 63, in contact with the roller, for partitioning the cylinder 60, an upper bearing 64 and a lower bearing 65 for covering an opening in the cylinder, a discharge valve 66 attached to the
10 upper bearing, and a cup muffler for covering this discharge valve. Denoted by 68 is discharge holes formed in the cup muffler 67, 69 a refrigerant discharge pipe which extends through a top center portion of the hermetically sealed container 50 whose top portion is covered up with the end cap
15 70, and 71 an accumulator. Arrows show the flow directions of a refrigerant.

In the hermetically sealed type compressor having this structure, the refrigerant compressed by the rotary compression element 53 passes through the air gap 58 of the
20 electric element 52 and is supplied to an upper portion of the electric element. Oil contained in the refrigerant supplied to the upper portion of the electric element 52 is separated by centrifugal force produced by the rotation of the rotor 55. This separated oil is scattered to the side of
25 the stator 57. The refrigerant gas is then discharged from





the refrigerant discharge pipe 69 to the outside of the hermetically sealed container 50. The separated oil is returned to the oil reservoir 51 of the hermetically sealed container 50 from the oil return holes 56 formed in the outer
5 peripheral surface of the stator 57.

However, since the length (A) of the refrigerant discharge pipe 69 which extends through the hermetically sealed container 50 from an upper end of the end cap 70 to the distal end thereof is smaller than the length (B) of the
10 end cap 70 from an upper end to a lower end thereof, the oil is discharged from the refrigerant discharge pipe 69 to the outside of the hermetically sealed container 50, accompanied by the refrigerant gas. As a result, the amount of the oil returned to the oil reservoir 51 of the hermetically sealed
15 container 50 becomes small.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a hermetically sealed type compressor which can reduce the
20 discharge of oil contained in the refrigerant gas compressed in the compressor and to be discharged from the refrigerant discharge pipe and which can be reduced in size.

The inventors of the present invention have conducted intensive studies on the above problem and have
25 found that the discharge of oil contained in the refrigerant



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gas to be discharged from the refrigerant discharge pipe as well as the size of the hermetically sealed type compressor can be reduced by laying the refrigerant discharge pipe in the hermetically sealed container and making the length of
5 the refrigerant discharge pipe laid in the hermetically sealed container larger than the length of the end cap for covering a top portion of the hermetically sealed container from an upper end to a lower end thereof. The present invention is predicated upon this finding.

10 According to a first aspect of the present invention, there is provided a hermetically sealed type compressor in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap having a
15 refrigerant discharge pipe and a compression element driven by the rotary shaft of the electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the hermetically sealed container
20 and then discharged from the refrigerant discharge pipe, wherein

the length (a) of the refrigerant discharge pipe laid in the hermetically sealed container from an upper end of the end cap to the distal end thereof is made equal to or
25 larger than the length (b) of the end cap from an upper end



to a lower end thereof. Namely, the relationship between the lengths (a) and (b) can be shown by the following equation (1).

$$(a) \geq (b) \quad \dots (1)$$

5 According to a second aspect of the present invention, there is provided a hermetically sealed type compressor, wherein the refrigerant discharge pipe is laid up to the vicinity of a separation plate provided on an upper end portion of the rotary shaft.

10 The above and other objectives, features and advantages of the invention will become more apparent from the following description when taken in conjunction with the accompanying drawings.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a hermetically sealed type compressor according to an embodiment of the present invention;

Fig. 2 is a sectional view of a hermetically sealed
20 type compressor according to another embodiment of the present invention; and

Fig. 3 is a sectional view of a hermetically sealed type compressor of the prior art.

25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS



Fig. 1 is a sectional view of a hermetically sealed type compressor according to an embodiment of the present invention.

In Fig. 1, reference numeral 1 is a hermetically sealed container having an oil reservoir 2 in a bottom portion thereof, in which oil is stored. An electric element 3 is housed in an upper portion of this container and a rotary compression element 5 driven by the rotary shaft 4 of this electric element is housed in a lower portion of the container. The electric element 3 consists of a stator 6 fixed to the interior wall of the hermetically sealed container 1 and a rotor 8 fitted onto the rotary shaft 4 with an air gap 7 interposed between it and the stator. The stator 6 consists of an iron core 10 having oil return holes 9 formed by cutting away its outer peripheral surface and a coil 12 having coil ends 11 provided at upper and lower ends of the iron core. The rotor 8 consists of an iron core 13 and end rings 14 provided at upper and lower ends of the iron core.

A half ring-shaped upper balancer 15 and lower balancer 16 are attached to the respective end rings. The rotary compression element 5 consists of a cylinder 17, a roller 19 which rolls in the cylinder 17 by an eccentric portion 18 of the rotary shaft 4, a vane 20, in contact with the roller, for partitioning the cylinder 17, an upper



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bearing 21 and a lower bearing 22 for covering an opening in the cylinder 17, a discharge valve 23 attached to the upper bearing and a cup muffler 24 for covering the discharge valve. A discharge port 25 is formed in the top surface of the cup muffler in such a manner that it is located at a position corresponding to the rotation orbit of the lower balancer 16.

Denoted by 26 is a refrigerant discharge pipe provided through the end cap 27 which covers a top portion of the hermetically sealed container 1. The length (a) of the refrigerant discharge pipe 26 which is laid up to the vicinity of an upper end portion of the rotary shaft 4 in the hermetically sealed container 1 from an upper end of the end cap 27 to the distal end thereof is made larger than the length (b) of the end cap 27 from an upper end to a lower end thereof. Denoted by 28 is an accumulator. Arrows show the flow directions of the refrigerant.

In the thus configured hermetically sealed type compressor, the refrigerant flowing into the cylinder 17 is compressed by the roller 19 and the vane 20 coupled to each other and discharged into the cup muffler 24 by opening the discharge valve 23. The refrigerant in the cup muffler passes through the air gap 7 in the electric element 3 from the discharge port 25 and is discharged to a top portion of the electric element. The refrigerant discharged to the top

portion of the electric element 3 is turned by the rotation of the rotor 8 and oil having a great mass contained in the refrigerant is scattered to the side of the interior wall of the hermetically sealed container 1 by the centrifugal force of the rotation and separated from the refrigerant. The refrigerant from which oil has been separated is discharged to the outside of the hermetically sealed container 1 from the discharge pipe 26. The separated oil is returned to the oil reservoir 2 from the oil return holes 9 of the stator 6.

Oil is present in the upper portion of the electric element 3 in a mist form. When the refrigerant discharge pipe 26 is laid in the hermetically sealed container 1 as described above and the length (a) of the refrigerant discharge pipe 26 laid in the hermetically sealed container 1 is made larger than the length (b) of the end cap 27 for covering a top portion of the hermetically sealed container 1 from an upper end to a lower end thereof, the oil is well separated from the refrigerant and the discharge of the oil contained in the refrigerant gas to be discharged from the refrigerant discharge pipe 26 can be reduced. In addition, according to the present invention, since the length (b) can be reduced while the discharge of the oil contained in the refrigerant gas to be discharged from the refrigerant discharge pipe 26 can be reduced, the total height of the hermetically sealed type compressor can be reduced, thereby



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making it possible to reduce the size of the hermetically sealed type compressor.

Fig. 2 is a sectional view of a hermetically sealed type compressor according to another embodiment of the
5 present invention.

The hermetically sealed type compressor shown in Fig. 2 is structured in the same manner as the hermetically sealed type compressor shown in Fig. 1 except that a separation plate 29 is attached to an upper end portion of
10 the rotary shaft 4 to improve the separation between the refrigerant and the oil and the refrigerant discharge pipe 26 is laid from an upper end of the end cap 27 to the vicinity of the separation plate 29. The length (a) up to the distal end of the refrigerant discharge pipe 26 is made larger than
15 the length (b) of the end cap 27 from an upper end to a lower end thereof. Since the hermetically sealed type compressor shown in Fig. 2 is structured as described above, it has the same or more effects than the hermetically sealed type compressor shown in Fig. 1.

20 The hermetically sealed type compressor of the present invention can reduce the discharge of the oil contained in the refrigerant gas compressed in the compressor and to be discharged from the refrigerant discharge pipe. Further, the hermetically sealed type compressor can be
25 reduced in size.

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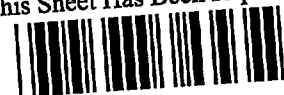
WHAT IS CLAIMED IS:

1. A hermetically sealed type compressor in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion
5 is covered by an end cap having a refrigerant discharge pipe and a compression element driven by the rotary shaft of the electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the
10 hermetically sealed container and then discharged from the refrigerant discharge pipe, wherein

the length (a) of the refrigerant discharge pipe laid in the hermetically sealed container from an upper end of the end cap to the distal end thereof is made equal to or
15 larger than the length (b) of the end cap from an upper end to a lower end thereof.

2. A hermetically sealed type compressor according to claim 1, wherein the refrigerant discharge pipe is laid up to
20 the vicinity of a separation plate provided on an upper end portion of the rotary shaft.

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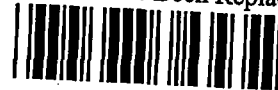


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ABSTRACT OF THE DISCLOSURE

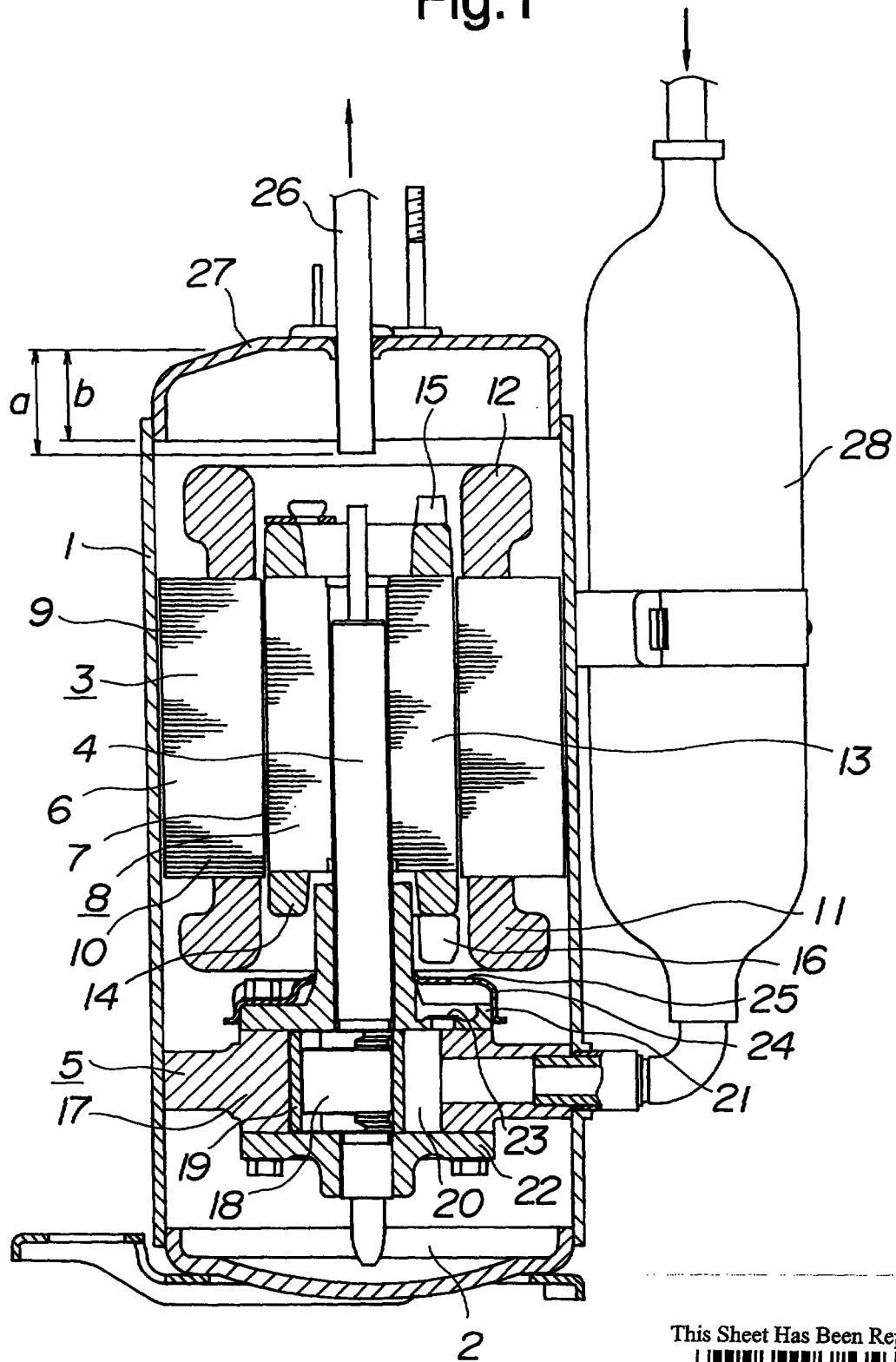
In a hermetically sealed type compressor capable of reducing the discharge of oil contained in a refrigerant gas compressed in a compressor and to be discharged from a
5 refrigerant discharge pipe, in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap having a refrigerant discharge pipe and a compression element driven by the rotary shaft of the
10 electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the hermetically sealed container and then discharged from the refrigerant discharge pipe, the length up to the distal end
15 of the refrigerant discharge pipe laid in the hermetically sealed container is made equal to or larger than the length of the end cap from an upper end to a lower end thereof.

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Fig.1

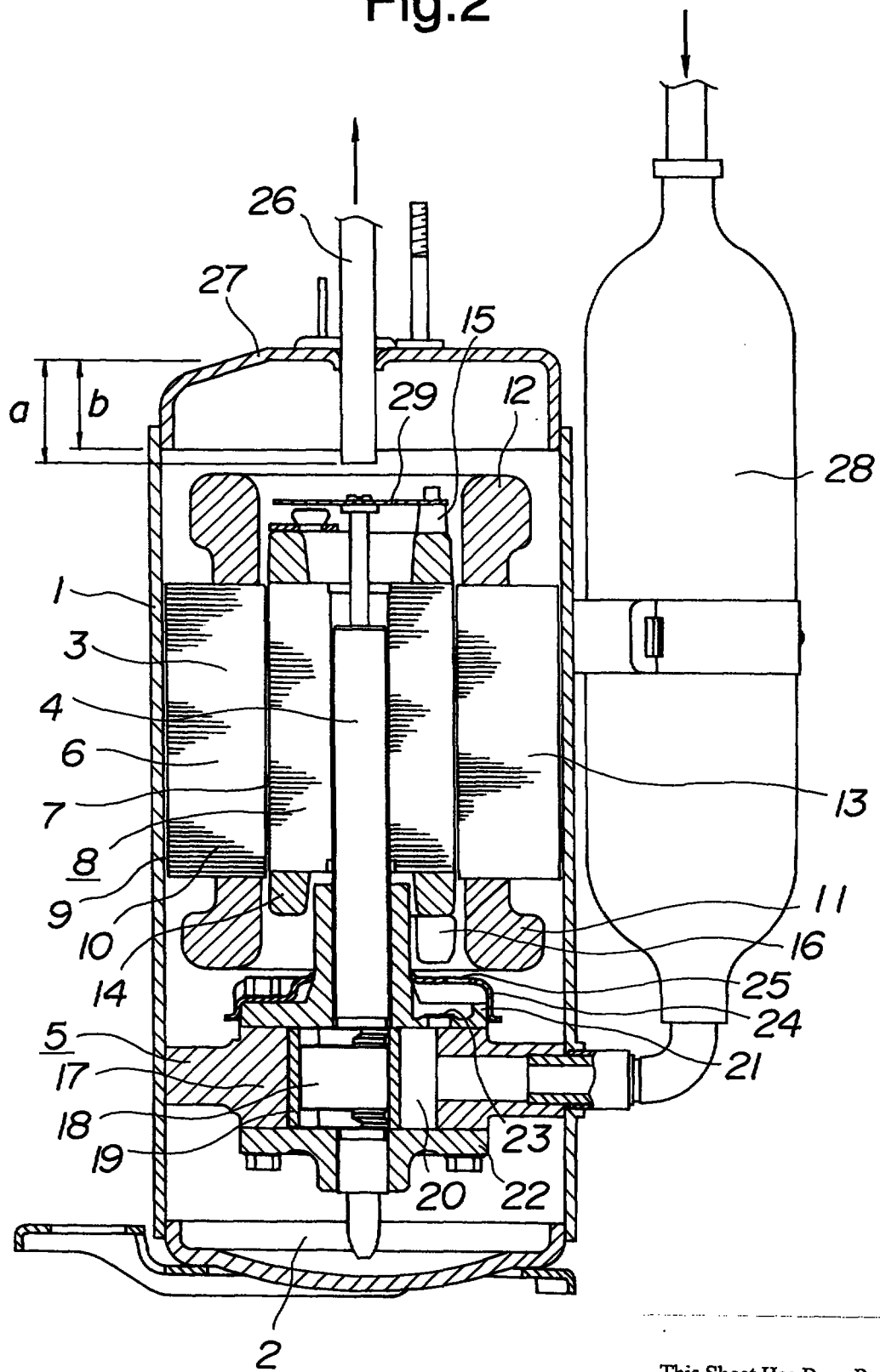


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Fig.2

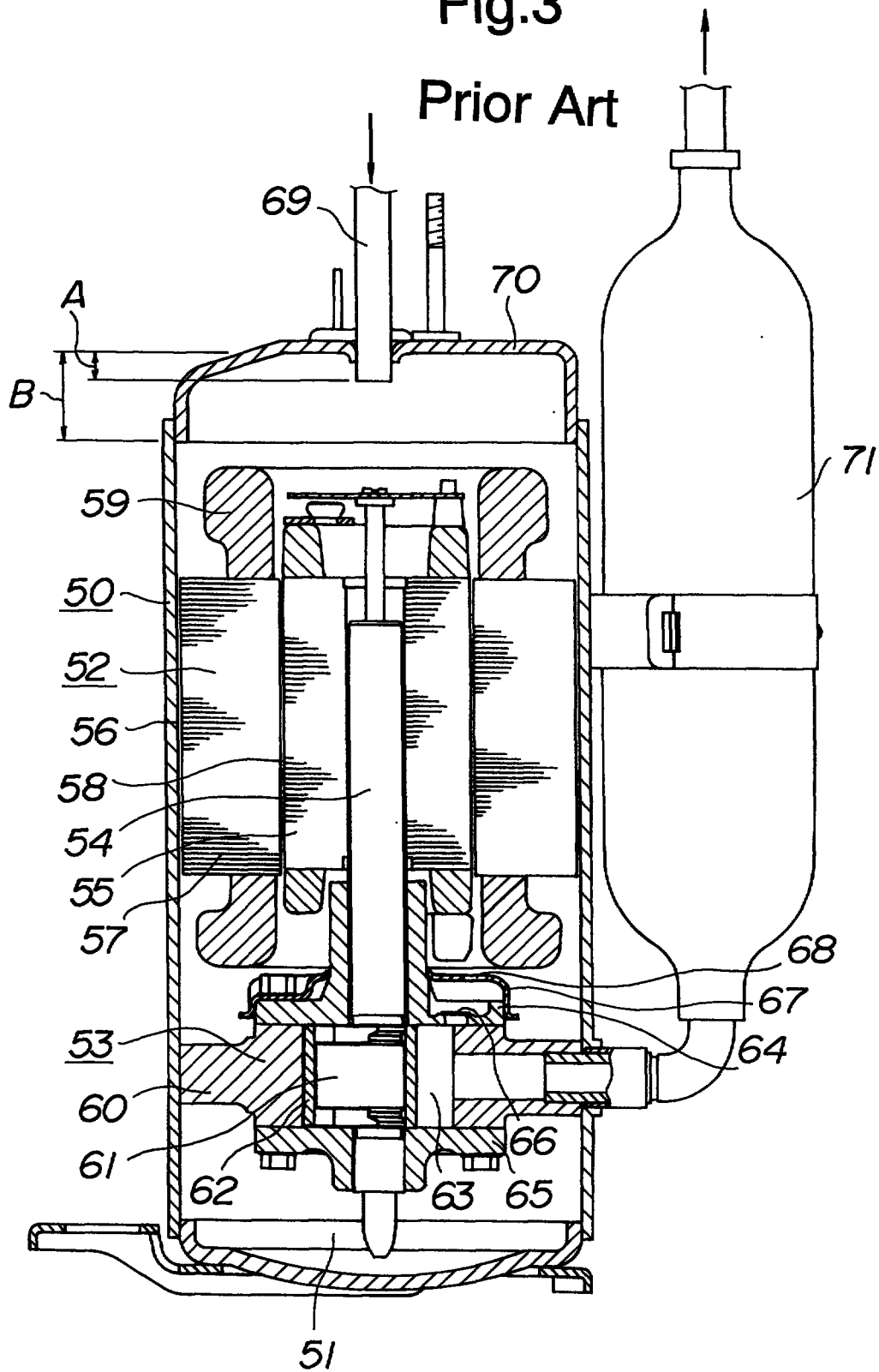


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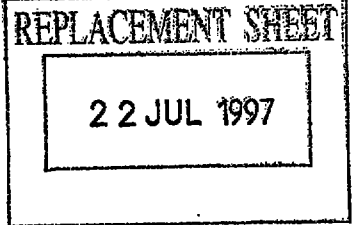
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Fig.3
Prior Art



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SPECIFICATION

TITLE OF THE INVENTION

HERMETICALLY SEALED TYPE COMPRESSOR

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

 This invention relates to a hermetically sealed type compressor and, more specifically, to a hermetically sealed type compressor which can reduce the discharge of oil contained in a refrigerant compressed in a compressor and to
10 be discharged from a refrigerant discharge pipe and which can be reduced in size.

2. Background Art

 The cross section of a conventional hermetically
15 sealed type compressor (such as disclosed in Laid-open Japanese Utility Model Application No. Sho 60-87391 and Japanese Utility Model Publication No. Hei 3-26309) is shown in Fig. 3.

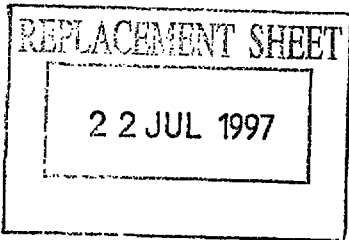
 Reference numeral 50 is a hermetically sealed
20 container having an oil reservoir 51 storing oil, in which an electric element 52 is housed in an upper portion and a rotary compression element 53 is housed in a lower portion. The electric element 52 consists of a rotor 55 fitted onto a rotary shaft 54 and a stator 57 having oil return holes 56
25 formed in the outer peripheral surface thereof. Denoted by

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58 is an air gap formed by the outer peripheral surface of the rotor 55 and the inner peripheral surface of the stator 57. Denoted by 59 is a wound coil end incorporated in the stator 57. The rotary compression element 53 consists of a cylinder 60, a roller which rolls in the cylinder 60 by an eccentric portion 61 of the rotary shaft 54, a vane 63, in contact with the roller, for partitioning the cylinder 60, an upper bearing 64 and a lower bearing 65 for covering an opening in the cylinder, a discharge valve 66 attached to the upper bearing, and a cup muffler for covering this discharge valve. Denoted by 68 is discharge holes formed in the cup muffler 67, 69 a refrigerant discharge pipe which extends through a top center portion of the hermetically sealed container 50 whose top portion is covered up with the end cap 70, and 71 an accumulator. Arrows show the flow directions of a refrigerant.

In the hermetically sealed type compressor having this structure, the refrigerant compressed by the rotary compression element 53 passes through the air gap 58 of the electric element 52 and is supplied to an upper portion of the electric element. Oil contained in the refrigerant supplied to the upper portion of the electric element 52 is separated by centrifugal force produced by the rotation of the rotor 55. This separated oil is scattered to the side of the stator 57. The refrigerant gas is then discharged from



the refrigerant discharge pipe 69 to the outside of the hermetically sealed container 50. The separated oil is returned to the oil reservoir 51 of the hermetically sealed container 50 from the oil return holes 56 formed in the outer
5 peripheral surface of the stator 57.

However, since the length (A) of the refrigerant discharge pipe 69 which extends through the hermetically sealed container 50 from an upper end of the end cap 70 to the distal end thereof is smaller than the length (B) of the
10 end cap 70 from an upper end to a lower end thereof, the oil is discharged from the refrigerant discharge pipe 69 to the outside of the hermetically sealed container 50, accompanied by the refrigerant gas. As a result, the amount of the oil returned to the oil reservoir 51 of the hermetically sealed
15 container 50 becomes small.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a hermetically sealed type compressor which can reduce the
20 discharge of oil contained in the refrigerant gas compressed in the compressor and to be discharged from the refrigerant discharge pipe and which can be reduced in size.

The inventors of the present invention have conducted intensive studies on the above problem and have
25 found that the discharge of oil contained in the refrigerant

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gas to be discharged from the refrigerant discharge pipe as well as the size of the hermetically sealed type compressor can be reduced by laying the refrigerant discharge pipe in the hermetically sealed container and making the length of the refrigerant discharge pipe laid in the hermetically sealed container larger than the length of the end cap for covering a top portion of the hermetically sealed container from an upper end to a lower end thereof. The present invention is predicated upon this finding.

10 According to a first aspect of the present invention, there is provided a hermetically sealed type compressor in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap having a refrigerant discharge pipe and a compression element driven by the rotary shaft of the electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the hermetically sealed container and then discharged from the refrigerant discharge pipe, wherein

the length (a) of the refrigerant discharge pipe laid in the hermetically sealed container from an upper end of the end cap to the distal end thereof is made equal to or larger than the length (b) of the end cap from an upper end

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to a lower end thereof. Namely, the relationship between the lengths (a) and (b) can be shown by the following equation (1).

$$(a) \geq (b) \quad \dots (1)$$

5 According to a second aspect of the present invention, there is provided a hermetically sealed type compressor, wherein the refrigerant discharge pipe is laid up to the vicinity of a separation plate provided on an upper end portion of the rotary shaft.

10 The above and other objectives, features and advantages of the invention will become more apparent from the following description when taken in conjunction with the accompanying drawings.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a hermetically sealed type compressor according to an embodiment of the present invention;

Fig. 2 is a sectional view of a hermetically sealed
20 type compressor according to another embodiment of the present invention; and

Fig. 3 is a sectional view of a hermetically sealed type compressor of the prior art.

25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a sectional view of a hermetically sealed type compressor according to an embodiment of the present invention.

In Fig. 1, reference numeral 1 is a hermetically sealed container having an oil reservoir 2 in a bottom portion thereof, in which oil is stored. An electric element 3 is housed in an upper portion of this container and a rotary compression element 5 driven by the rotary shaft 4 of this electric element is housed in a lower portion of the container. The electric element 3 consists of a stator 6 fixed to the interior wall of the hermetically sealed container 1 and a rotor 8 fitted onto the rotary shaft 4 with an air gap 7 interposed between it and the stator. The stator 6 consists of an iron core 10 having oil return holes 9 formed by cutting away its outer peripheral surface and a coil 12 having coil ends 11 provided at upper and lower ends of the iron core. The rotor 8 consists of an iron core 13 and end rings 14 provided at upper and lower ends of the iron core.

A half ring-shaped upper balancer 15 and lower balancer 16 are attached to the respective end rings. The rotary compression element 5 consists of a cylinder 17, a roller 19 which rolls in the cylinder 17 by an eccentric portion 18 of the rotary shaft 4, a vane 20, in contact with the roller, for partitioning the cylinder 17, an upper

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bearing 21 and a lower bearing 22 for covering an opening in the cylinder 17, a discharge valve 23 attached to the upper bearing and a cup muffler 24 for covering the discharge valve. A discharge port 25 is formed in the top surface of the cup muffler in such a manner that it is located at a position corresponding to the rotation orbit of the lower balancer 16.

Denoted by 26 is a refrigerant discharge pipe provided through the end cap 27 which covers a top portion of the hermetically sealed container 1. The length (a) of the refrigerant discharge pipe 26 which is laid up to the vicinity of an upper end portion of the rotary shaft 4 in the hermetically sealed container 1 from an upper end of the end cap 27 to the distal end thereof is made larger than the length (b) of the end cap 27 from an upper end to a lower end thereof. Denoted by 28 is an accumulator. Arrows show the flow directions of the refrigerant.

In the thus configured hermetically sealed type compressor, the refrigerant flowing into the cylinder 17 is compressed by the roller 19 and the vane 20 coupled to each other and discharged into the cup muffler 24 by opening the discharge valve 23. The refrigerant in the cup muffler passes through the air gap 7 in the electric element 3 from the discharge port 25 and is discharged to a top portion of the electric element. The refrigerant discharged to the top

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portion of the electric element 3 is turned by the rotation of the rotor 8 and oil having a great mass contained in the refrigerant is scattered to the side of the interior wall of the hermetically sealed container 1 by the centrifugal force of the rotation and separated from the refrigerant. The refrigerant from which oil has been separated is discharged to the outside of the hermetically sealed container 1 from the discharge pipe 26. The separated oil is returned to the oil reservoir 2 from the oil return holes 9 of the stator 6.

Oil is present in the upper portion of the electric element 3 in a mist form. When the refrigerant discharge pipe 26 is laid in the hermetically sealed container 1 as described above and the length (a) of the refrigerant discharge pipe 26 laid in the hermetically sealed container 1 is made larger than the length (b) of the end cap 27 for covering a top portion of the hermetically sealed container 1 from an upper end to a lower end thereof, the oil is well separated from the refrigerant and the discharge of the oil contained in the refrigerant gas to be discharged from the refrigerant discharge pipe 26 can be reduced. In addition, according to the present invention, since the length (b) can be reduced while the discharge of the oil contained in the refrigerant gas to be discharged from the refrigerant discharge pipe 26 can be reduced, the total height of the hermetically sealed type compressor can be reduced, thereby

making it possible to reduce the size of the hermetically sealed type compressor.

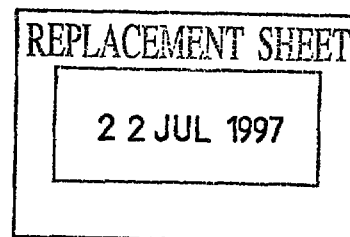
Fig. 2 is a sectional view of a hermetically sealed type compressor according to another embodiment of the present invention.

The hermetically sealed type compressor shown in Fig. 2 is structured in the same manner as the hermetically sealed type compressor shown in Fig. 1 except that a separation plate 29 is attached to an upper end portion of the rotary shaft 4 to improve the separation between the refrigerant and the oil and the refrigerant discharge pipe 26 is laid from an upper end of the end cap 27 to the vicinity of the separation plate 29. The length (a) up to the distal end of the refrigerant discharge pipe 26 is made larger than the length (b) of the end cap 27 from an upper end to a lower end thereof. Since the hermetically sealed type compressor shown in Fig. 2 is structured as described above, it has the same or more effects than the hermetically sealed type compressor shown in Fig. 1.

The hermetically sealed type compressor of the present invention can reduce the discharge of the oil contained in the refrigerant gas compressed in the compressor and to be discharged from the refrigerant discharge pipe. Further, the hermetically sealed type compressor can be reduced in size.



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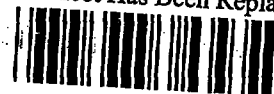
WHAT IS CLAIMED IS:

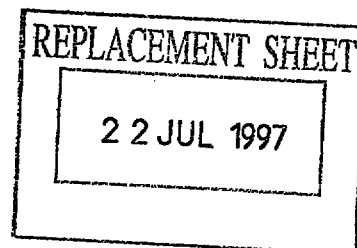
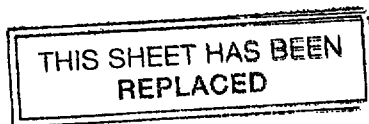
1. A hermetically sealed type compressor in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap having a refrigerant discharge pipe and a compression element driven by the rotary shaft of the electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the hermetically sealed container and then discharged from the refrigerant discharge pipe, wherein
- the length (a) of the refrigerant discharge pipe laid in the hermetically sealed container from an upper end of the end cap to the distal end thereof is made equal to or larger than the length (b) of the end cap from an upper end to a lower end thereof.



2. A hermetically sealed type compressor according to claim 1, wherein the refrigerant discharge pipe is laid up to the vicinity of a separation plate provided on an upper end portion of the rotary shaft.

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HERMETICALLY SEALED TYPE COMPRESSOR

ABSTRACT OF THE DISCLOSURE

In a hermetically sealed type compressor capable of reducing the discharge of oil contained in a refrigerant gas compressed in a compressor and to be discharged from a refrigerant discharge pipe, in which an electric element having a rotary shaft is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap having a refrigerant discharge pipe and a compression element driven by the rotary shaft of the electric element is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element, discharged into the hermetically sealed container and then discharged from the refrigerant discharge pipe, the length up to the distal end of the refrigerant discharge pipe laid in the hermetically sealed container is made equal to or larger than the length of the end cap from an upper end to a lower end thereof.

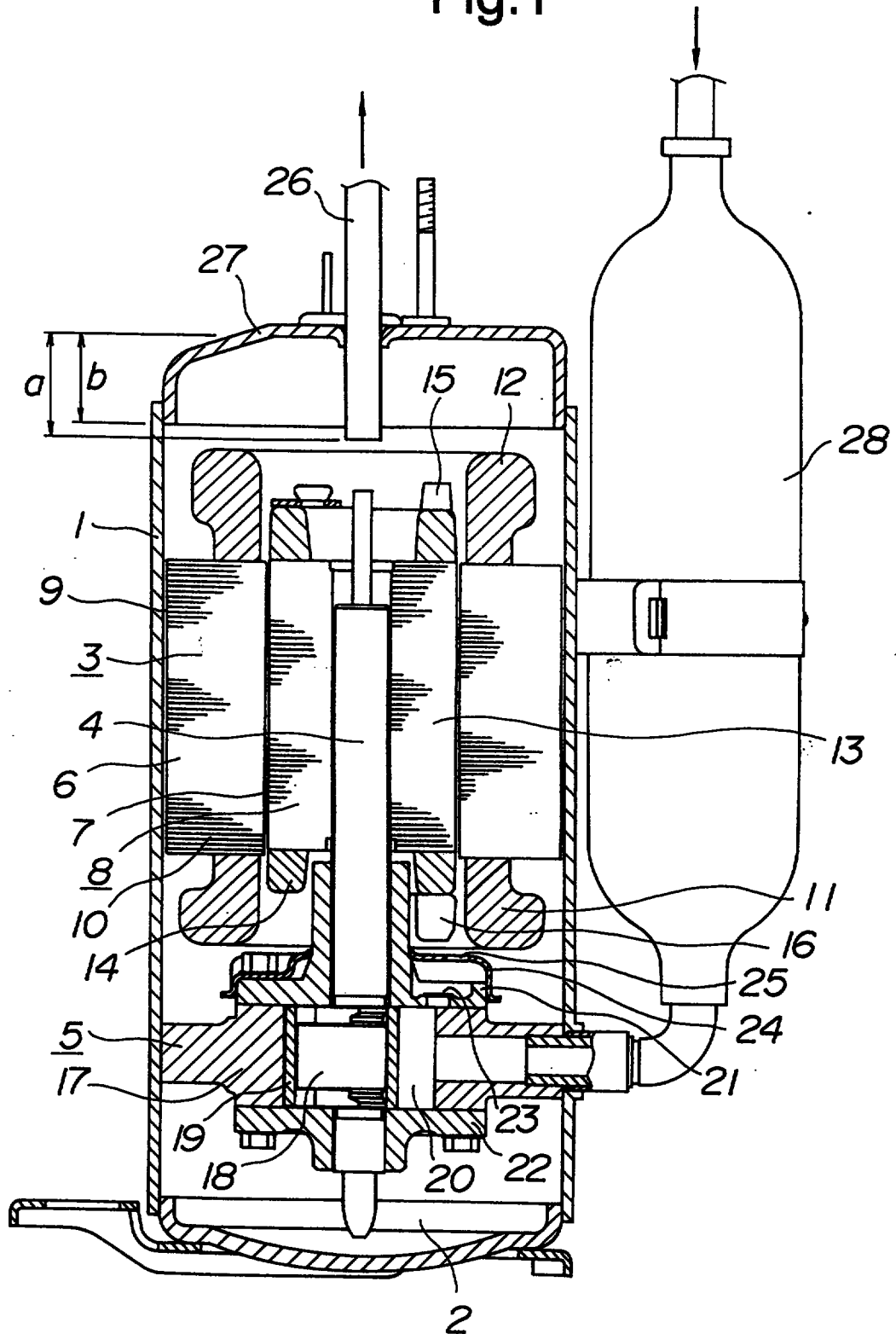
Figure 1

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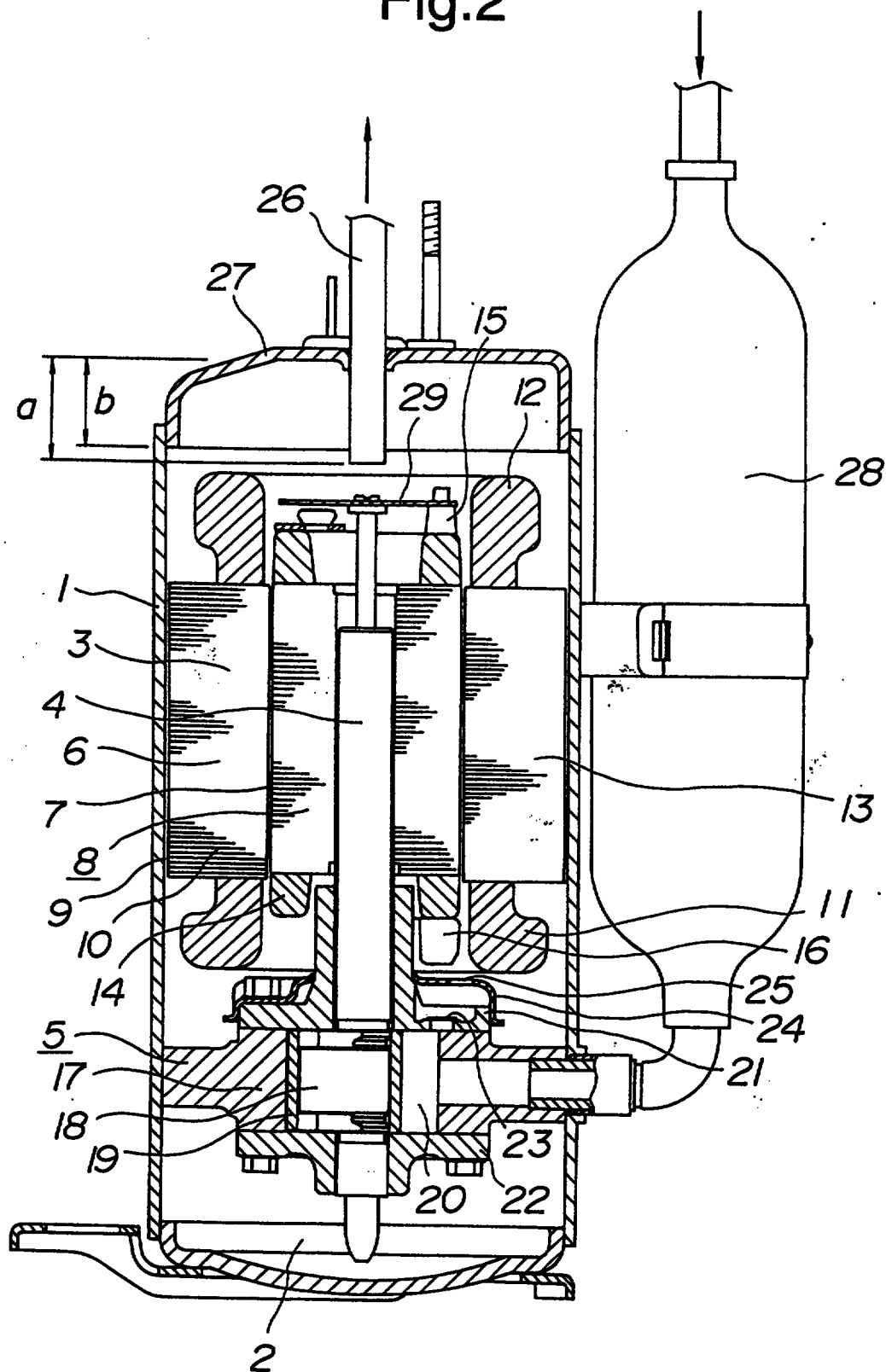
Fig.1



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Fig.2



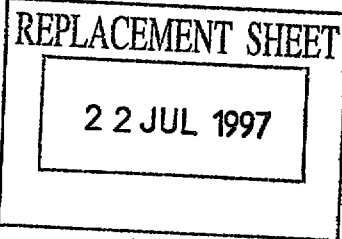
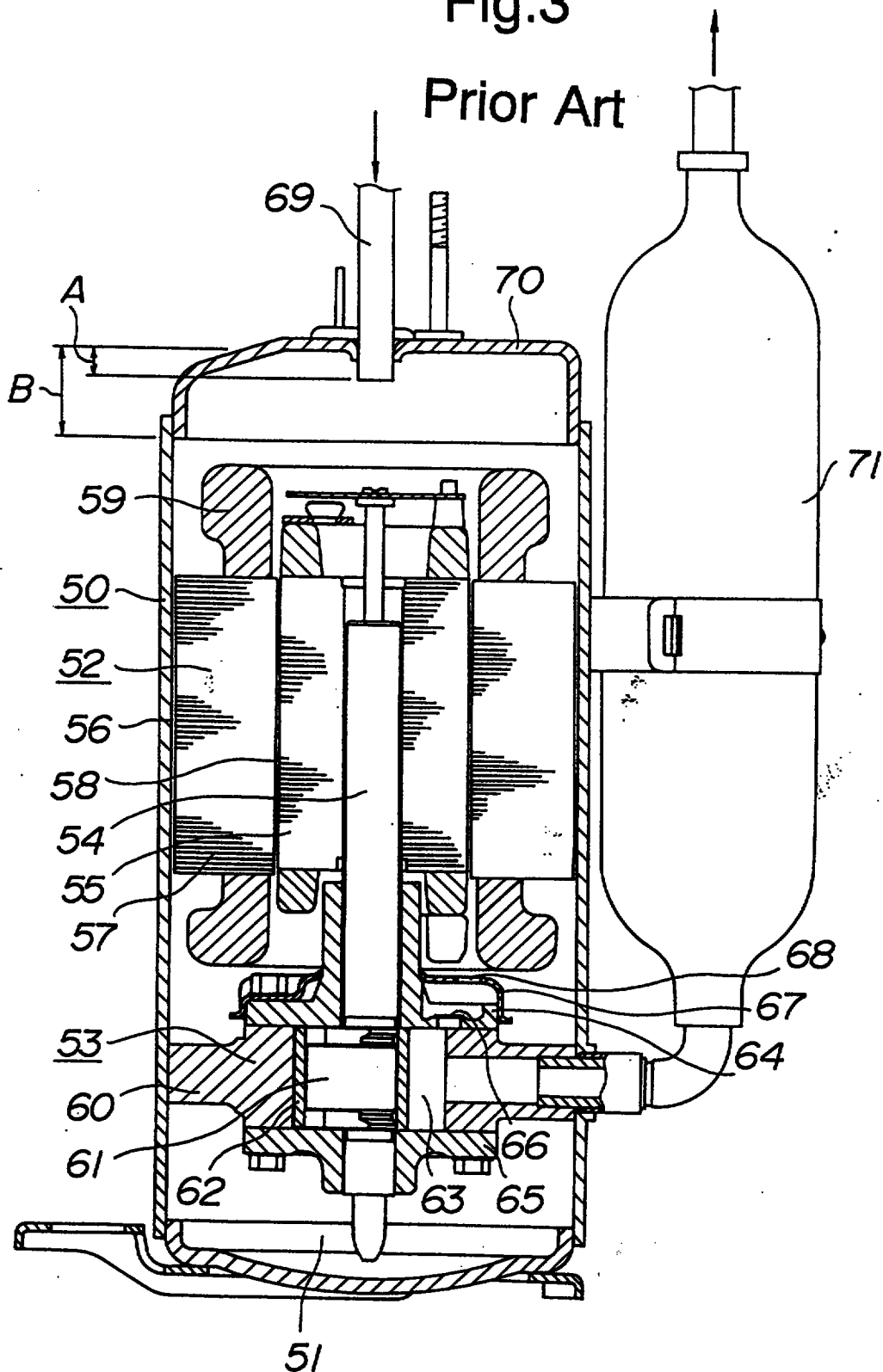


Fig.3

Prior Art



**WHAT IS CLAIMED :**

1. A hermetically sealed type compressor in which an electric element (3) having a rotary shaft (4) is housed in an upper portion of a hermetically sealed container whose top portion is covered by an end cap (27) having a refrigerant discharge pipe (26) and a compression element (5) driven by the rotary shaft (4) of the electric element (3) is housed in a lower portion of the hermetically sealed container, and an absorbed refrigerant is compressed by this compression element (5). discharged into the hermetically sealed container and then discharged from the refrigerant discharge pipe (26), wherein

the distal end of the refrigerant discharge pipe (26) is made equal to or lower than a lower end of the end cap (27) and

the distal end of the refrigerant discharge pipe (26) is provided to the higher position than an upper end of coil end (11) of a stator (6) of the electric element (3).

2. A hermetically sealed type compressor according to claim 1, wherein a separation plate (29) is provided on an upper end portion of the rotary shaft (4) to separate between the refrigerant and oil.

