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Remarks:
A request for correction of the claims has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **Compressor with discharge chamber heat sink**

(57) A compressor designed to discharge a refrigerant compressed in the compressor to the outside through a cylinder head and a discharge muffler. The compressor is designed to prevent heat of a refrigerant passing through a discharge chamber and the discharge muffler in the cylinder head from being transferred to a compressing chamber, thereby enhancing efficiency of the compressor. The compressor includes the discharge chamber to contain temporarily a refrigerant compressed in a compressing chamber, and a heat-radiating member to radiate heat from the discharge chamber to the outside.

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Description

[0001] The present invention relates to a compressor for a heat pump comprising a compressed refrigerant discharge chamber means.

[0002] Compressors are used in heat pumps, such as air conditioning systems and freezers, to compress the refrigerant.

[0003] A known linear compressor 1 forces a piston to reciprocate linearly by means of a linear electric motor.

[0004] Referring to Figure 1, the linear compressor 1 is provided with various components, which can be broadly classified into a compressing part for receiving refrigerant from a closed container 14 and discharging the refrigerant after compression and a driving part for driving the compressing part.

[0005] The compressing part comprises a cylindrical cylinder block 9, having a compression chamber 9a therein, and a rod-shaped piston 11 in the compression chamber 9a of the cylinder block 9. The piston 11 linearly reciprocates up and down within the compression chamber 9a. Under the cylinder block 9, the compressing part has a cylinder head 10, which has an intake chamber 10b through which the refrigerant enters into the compression chamber 9a and a discharge chamber 10a through which the compressed refrigerant is discharged. Additionally, a discharge muffler 12 is located on one side of the cylinder head 10 under the cylinder block 9, for reducing noise due to refrigerant discharge from the discharge chamber 10a.

[0006] The driving part is provided with a stator 13 and a mover 3, between which an electromagnetic force is generated to reciprocate the piston 11 within the cylinder block 9. As the piston 11 is reciprocated within the cylinder block 9, the refrigerant is compressed to a high pressure, thereby increasing its temperature, and the compressed refrigerant is then discharged to the outside, through a tube 12a from the discharge muffler 12, after passing through the discharge chamber 10a and the discharge muffler 12.

[0007] However, the conventional compressor has a problem in that, when the refrigerant passes through the discharge chamber 10a and the discharge muffler 12, heat is transferred from the refrigerant to the compression chamber 9a through the cylinder head 10 and the cylinder block 9, thereby lowering the efficiency of the compressor 1.

[0008] A compressor, according to the present invention, is characterised by a heat sink for removing heat from the discharge chamber means.

[0009] Preferably, the compressor includes a pool of liquid and the heat sink is configured transfer heat to the pool of liquid.

[0010] The compressor may include a cylinder block and a cylinder head, mounted to the cylinder block, and the discharge chamber means may then comprises a chamber located in the cylinder head with the heat sink in thermal communication with the cylinder head. Preferably, the discharge chamber means comprises a discharge muffler.

[0011] Additional preferred and optional features are set forth in claims 5 to 16 appended hereto.

[0012] An embodiment of the present invention will now be described, by way of example, with reference to Figures 2 and 3 of the accompanying drawings, in which:

Figure 1 is a cross-sectional view illustrating a conventional compressor;
Figure 2 is a cross-sectional view illustrating a compressor consistent with the present invention; and
Figure 3 is a cross-sectional view illustrating a lower portion of the compressor of Figure 2.

[0013] Referring to Figure 2, a linear compressor 20, according to the present invention, comprises a closed container 24, a compressing part for receiving refrigerant from a closed container 24 and discharge the refrigerant after compression and a driving part for driving the compressing part.

[0014] The compressing part comprises a cylindrical cylinder block 29, having a compression chamber 29a therein, and a linearly, vertically reciprocating rod-shaped piston 31 in the compression chamber 29a. The cylinder block 29 is supported by a support spring 25.

[0015] A cylinder head 30 has an intake chamber 30b therein, through which refrigerant flows into the compression chamber 29a, and a discharge chamber 30a therein, through which compressed refrigerant is discharged, is mounted at the bottom of the cylinder block 29. Additionally, at least one heat radiating fin 26 is provided on bottom of the cylinder head 30 so as to extend into oil in the bottom of the closed container 24. The at least one heat-radiating fin 36 is made of a metallic material in order to enhance heat exchange efficiency. A valve assembly 34 is arranged between the cylinder head 30 and the cylinder block 29 and comprises an intake valve 34a and a discharge valve 34b for controlling the flow of refrigerant into and out of the compression chamber 34 (see Figure 3).

[0016] Furthermore, a discharge muffler 39 is located on one side of the cylinder head 30 and a discharge muffler 39 is located on the other side of the cylinder head 30.

[0017] A muffler cover 39b is fastened to one side of the cylinder head 30. A refrigerant pathway 37 is formed between the discharge chamber 30a and the interior of the discharge muffler 39. Noise from the compression chamber 29a is removed while passing through a fluid pathway defined in the discharge muffler 39. A tube 39a extends from the discharge muffler 39 to the outside of the compressor 20 to guide the compressed refrigerant passing through the discharge muffler 39 to the outside of the compressor 20. The discharge muffler 39 is integrally formed with the cylinder head 30 and the dis-

charge muffler 39 and the cylinder head may, for example, be made of aluminium. The discharge muffler 39 is spaced a predetermined distance from the cylinder block 29.

[0018] The driving part is provided with a stator 32 and a mover 23, between which electromagnetic forces are generated to reciprocate the piston 31 within the cylinder block 29.

[0019] The stator 32 includes an outer core 32a having a coil 35 so that, when ac electric power is applied to the coil 35, a varying magnetic flux is generated, according to the electric power, and an inner core 32b aligned with the outer core 32a within the mover 23. The stator 32 is securely supported by means of a holding frame 33 and the cylinder block 29.

[0020] The mover 23 has a cylindrical shape, closed at the top, and has a ring-shaped permanent magnet 28 at the bottom in a space between the outer core 32a and the inner core 32b to generate an electromagnetic force between the stator 32 and the mover 23. A the top of a piston 31 is fixed to the centre of an upper portion of the mover 23 so that the piston 31 reciprocates along with the mover 23.

[0021] A plate spring 22 is fastened to the top of the mover 23 by a bolt 23a which passes through the mover 23. The centre of the plate spring 22 is fixed to the mover 23 and its periphery is fixed to the top of the holding frame 33.

[0022] Operation of the compressor having such a configuration as described above will now be described with reference to Figure 3.

[0023] First, when the piston 31 is moved upward by virtue of cooperation between the stator 32 and the mover 23, refrigerant induced into the compressor 20 passes through the intake muffler 38 and is then guided into the intake chamber 30b of the cylinder head 30. The refrigerant, guided into the intake chamber 30b, passes through the intake valve 34a of the valve assembly 34 and is then guided into the compression chamber 29a.

[0024] Then, when the piston 31 is moved downward by virtue of the cooperation between the stator 32 and the mover 23, the refrigerant in the compression chamber 29a is compressed and then discharged to the discharge chamber 30a, after passing through the discharge valve 34b of the valve assembly 34.

[0025] The high temperature and pressure refrigerant, discharged into the discharge chamber 30a, is pushed through the refrigerant pathway 37, formed in the cylinder head 30, to the fluid pathway in the discharge muffler 39 and is then discharged to the outside through the tube 39a, provided in the discharge muffler 39.

[0026] Since the discharge muffler 39, through which the high temperature and pressure refrigerant passes, is provided on the cylinder head 30 rather than the cylinder block 29, the transmission of heat from the discharge muffler 39 to the cylinder block 29 is avoided.

[0027] Additionally, the heat of the cylinder head 30 and the discharge muffler 39 on the cylinder head 30 is transmitted to the oil through the heat radiating fin or fins 36, formed on the cylinder head 30, and the heat transmitted to the oil is transmitted to the outside of the compressor 20 through the closed container 24. Thus, the heat of the refrigerant passing through the cylinder head 30 and the discharge muffler 39 provided to the cylinder head 30 is prevented from being transmitted to the compression chamber 29a formed in the cylinder block 29.

[0028] As is apparent from the above description, the compressor consistent with the present invention prevents the heat of the refrigerant passing through the discharging chamber from being transmitted to the compression chamber, thereby preventing a reduction of efficiency of the compressor.

Claims

1. A compressor for a heat pump comprising a compressed refrigerant discharge chamber means (30a, 39), **characterised by** a heat sink (36) for removing heat from the discharge chamber means (30a, 39).

2. A compressor according to claim 1, including a pool of liquid, wherein the heat sink (36) is configured transfer heat to the pool of liquid.

3. A compressor according to claim 1 or 2, including a cylinder block (29) and a cylinder head (30) mounted to the cylinder block (29), wherein said discharge chamber means comprises a chamber (30a) located in the cylinder head (30) and the heat sink (36) is in thermal communication with the cylinder head (29).

4. A compressor according to claim 3, wherein the discharge chamber means comprises a discharge muffler (39).

5. A compressor, comprising:

a discharge chamber to contain temporarily a refrigerant compressed in a compressing chamber; and
a heat-radiating member to radiate heat from the discharge chamber to the outside.

7. The compressor according to claim 5, wherein the heat-radiating member has one end submerged to oil flowing in the compressor.

8. The compressor according to claim 5, wherein the heat-radiating member comprises at least one heat-radiating fin made of a metallic material.

9. The compressor according to claim 5, further

comprising:

a cylinder block;
a piston received in the cylinder block and having the compressing chamber defined in a space between the cylinder block and the piston; and
a cylinder head disposed on the cylinder block and including the discharge chamber.

10. The compressor according to claim 9, wherein the cylinder head is made of aluminium.

11. The compressor according to claim 9, wherein the heat-radiating member is provided to the cylinder head.

12. The compressor according to claim 9, wherein the cylinder head is provided with a discharge muffler to prevent noise from the compressing chamber from being transmitted to the outside.

13. The compressor according to claim 12, wherein the discharge muffler may be formed therein with a fluid pathway communicated with the discharge chamber via a refrigerant pathway.

14. The compressor according to claim 12, wherein the discharge muffler is spaced a predetermined distance from the cylinder block.

15. The compressor according to claim 12, wherein the cylinder head and the discharge muffler are integrally formed.

16. A compressor, comprising:

a cylinder block including a compressing chamber;
a cylinder head disposed on the cylinder block and including a discharge chamber which communicates with the compressing chamber; and

a discharge muffler provided to the cylinder head and which communicates with the discharge chamber, the discharge muffler being spaced apart from the cylinder block, such that heat of the discharge muffler is not directly transmitted to the cylinder block.

FIG. 1

PRIOR ART

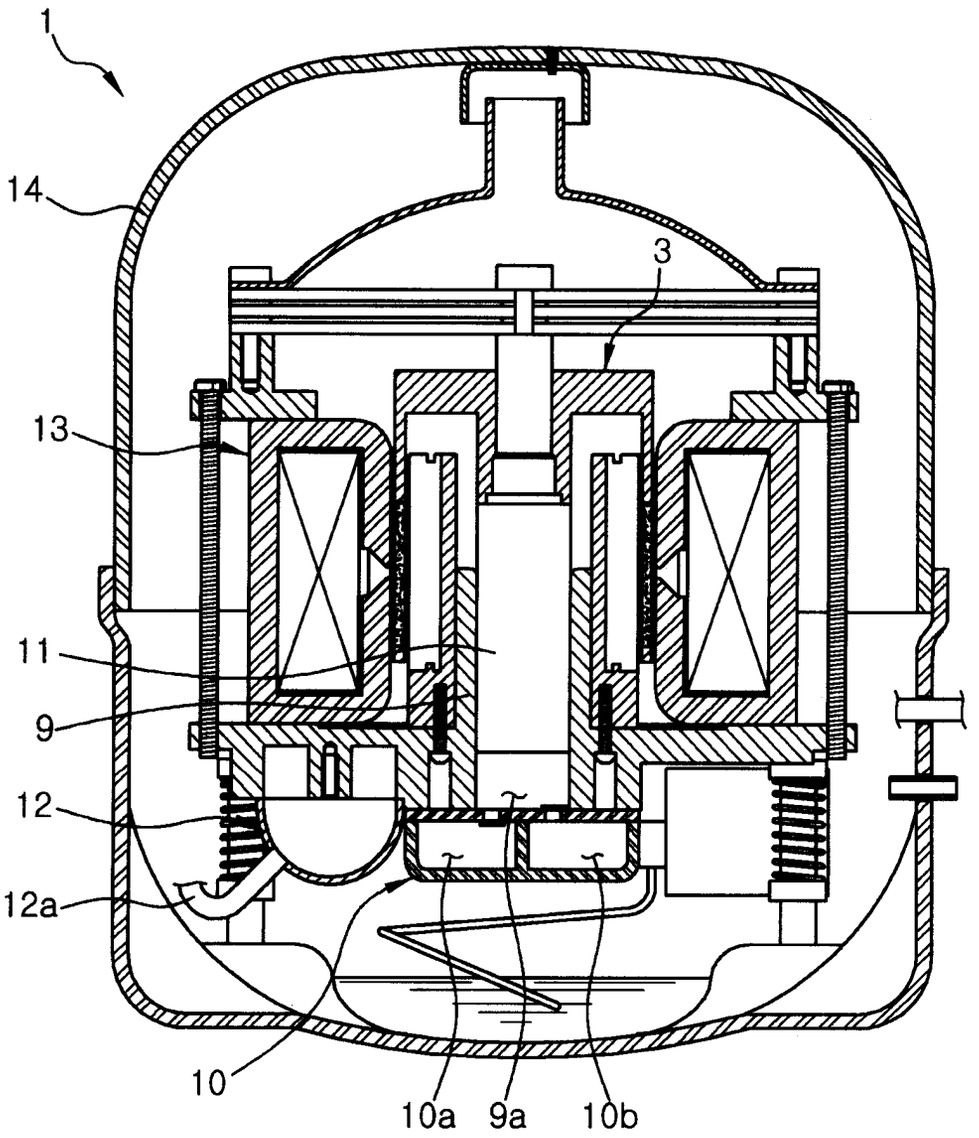

FIG. 2

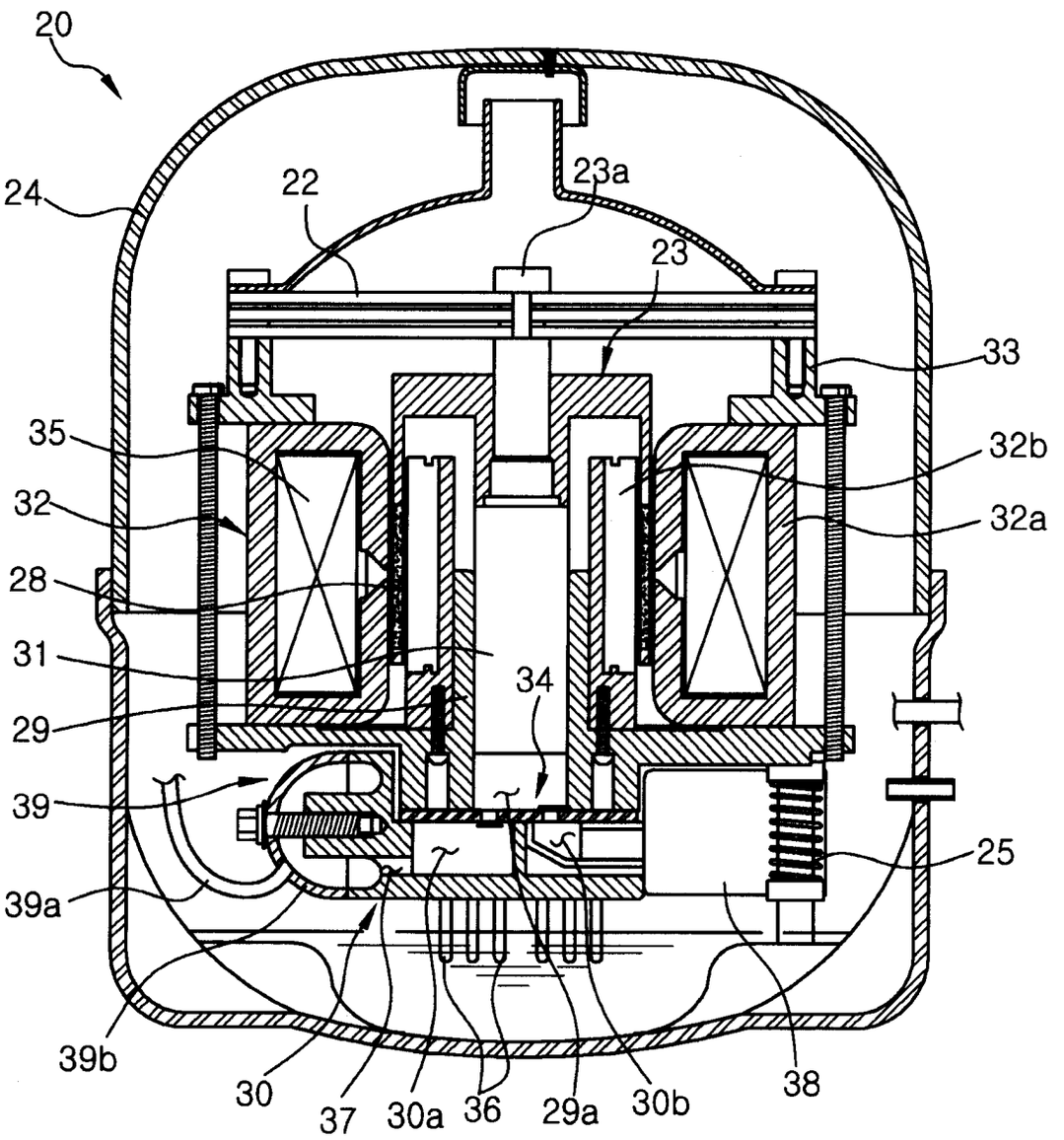
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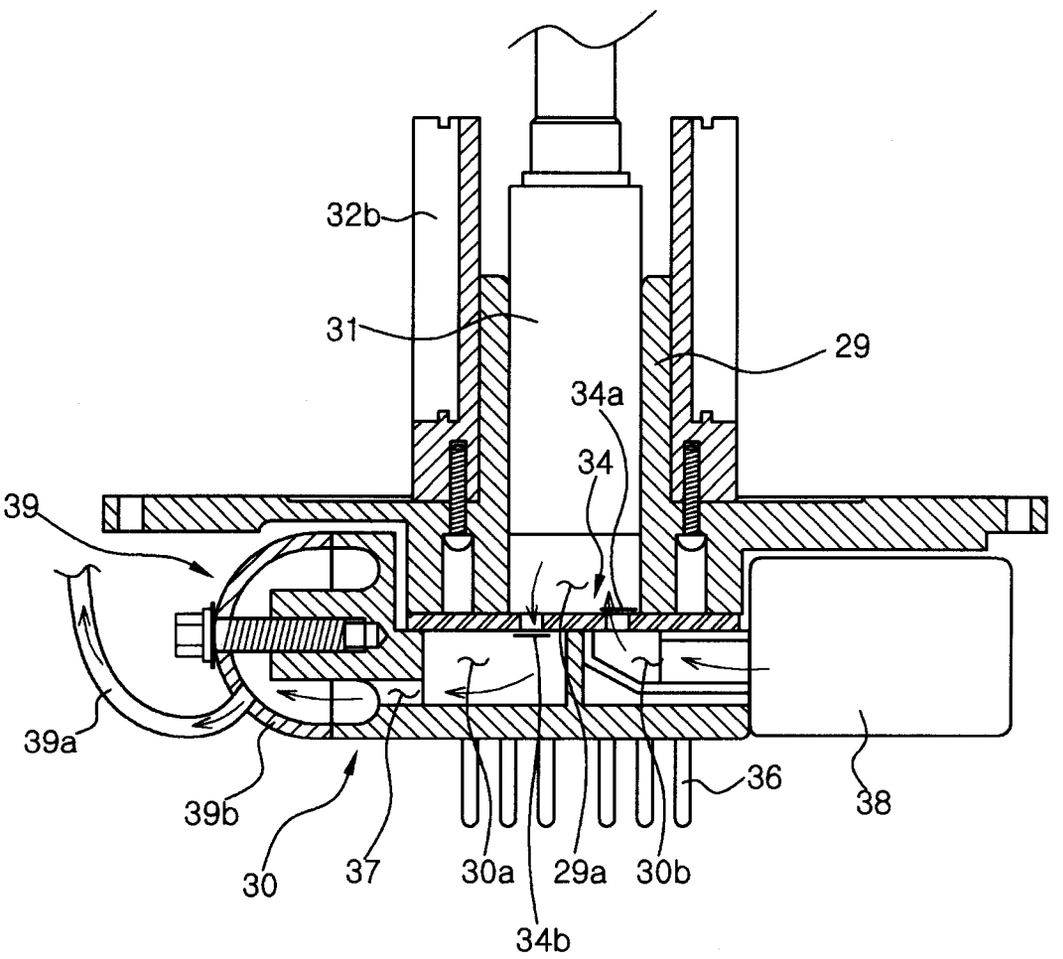
FIG. 3



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Application Number
EP 05 10 1503

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 July 2005	Kolby, L

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X : particularly relevant if taken alone
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