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Carter

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[54] **MOTOR COMPRESSOR UNIT**

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[52] **U.S. Cl.** **417/415,** 417/902

[51] **Int. Cl.** **F04b 17/00**

[58] **Field of Search** 417/415, 902

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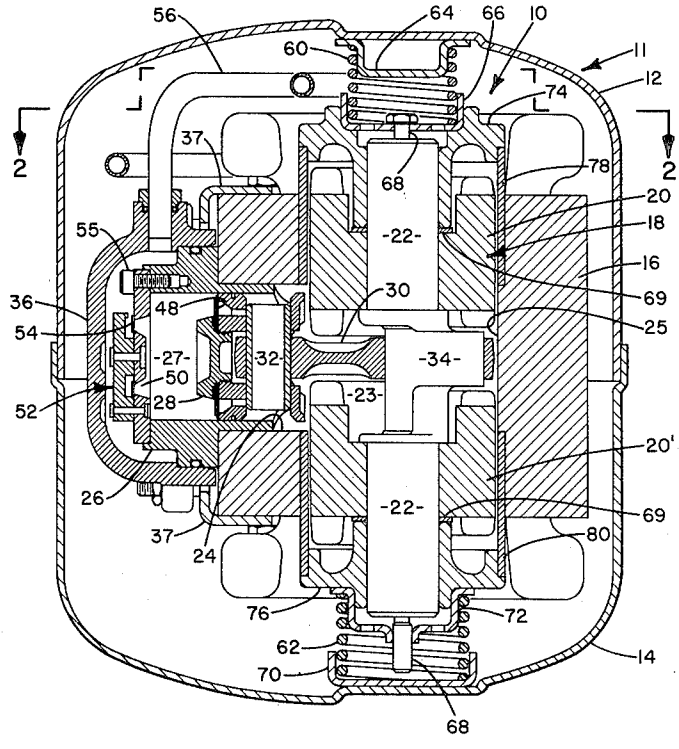
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[57] **ABSTRACT**

An electric motor including a stator and rotor are electrically connected for operation. The stator includes a first portion having a bore provided therein. A member defining a cylinder is disposed in the bore. A shaft is operably connected to the rotor to rotate therewith. A piston, disposed in the cylinder, is operably connected to the shaft, rotation of the shaft causing the piston to reciprocate within the cylinder.

5 Claims, 2 Drawing Figures



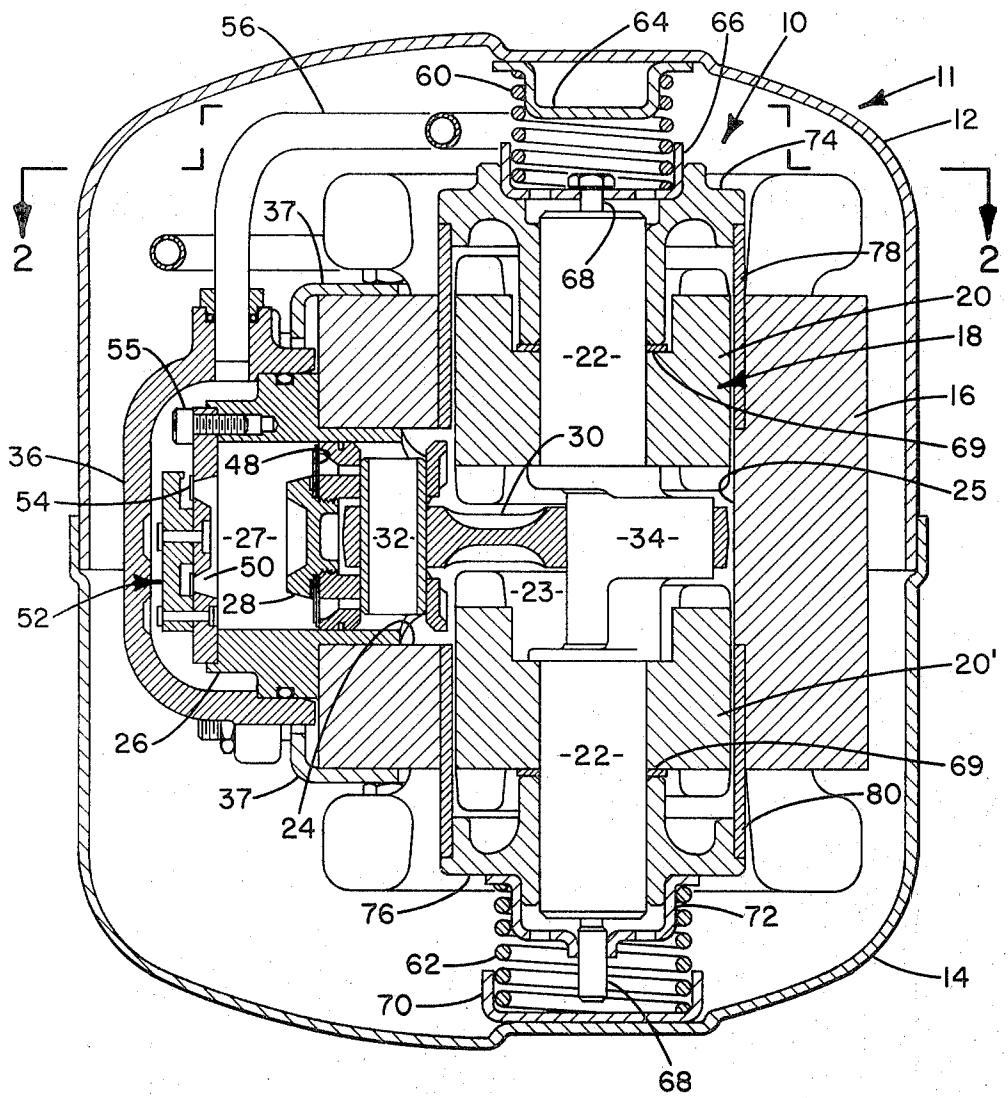

56
64
66
10
60
11
12
74
37
78
2
2
68
20
-22-
18
55
16
69
30
36
48
25
54
-27-
32
-34-
50
-23-
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28
20'
26
-22-
69
37
80
24
76
72
62
14
70
68

FIG. 1

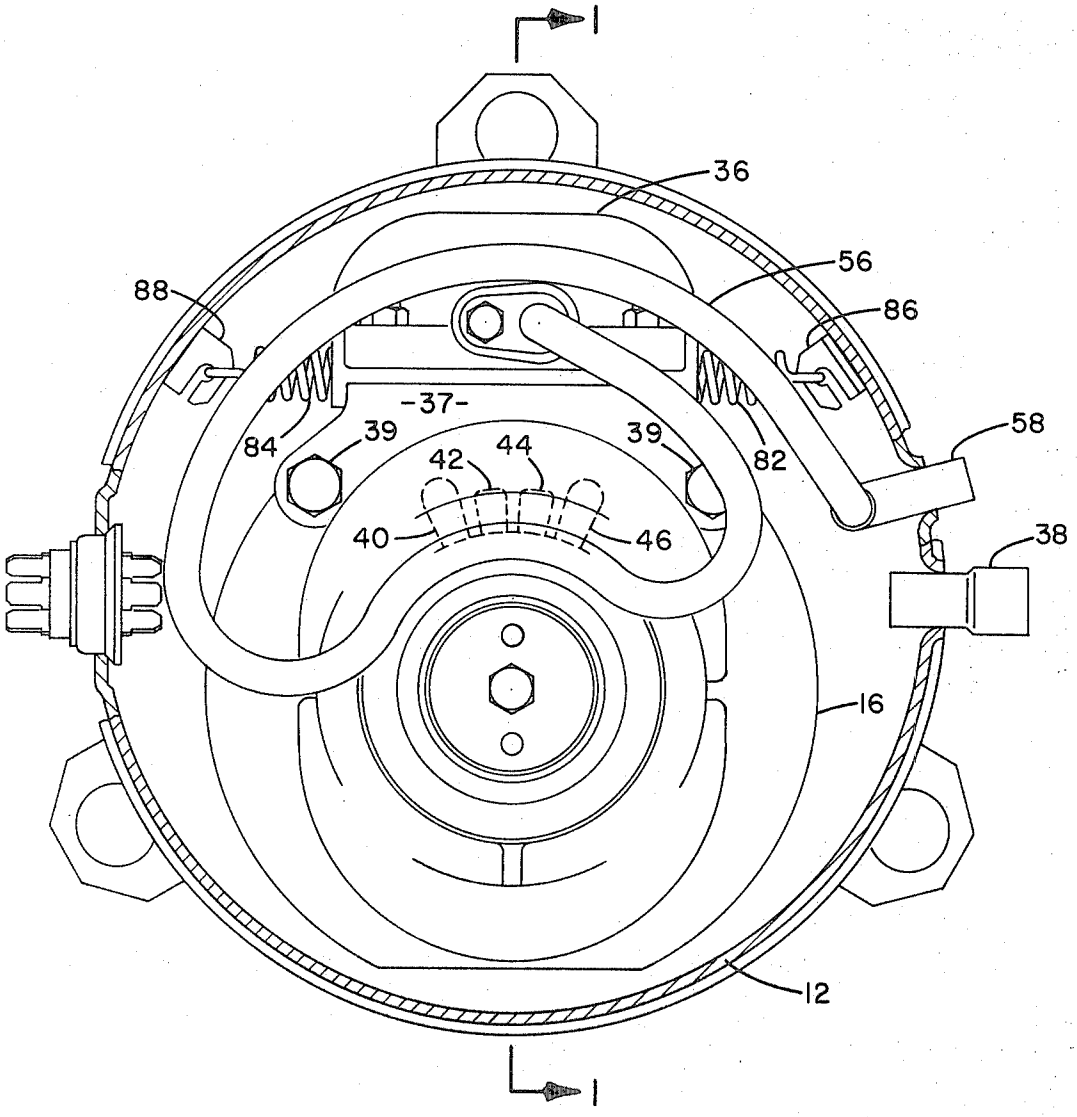


FIG. 2

MOTOR COMPRESSOR UNIT

BACKGROUND OF THE INVENTION

This invention relates to electric motors and motor-driven piston compressors, and more particularly to improvements in the construction of motor compressor units for hermetic compressors used in refrigeration units.

Refrigeration apparatus employing hermetically sealed motor compressor units are utilized in varied applications. For example, such units are employed in the standard household refrigerator. Other such refrigeration apparatus are utilized in air conditioning systems for single and multiple family dwellings. Such air conditioning systems may either be room air conditioners or be of the type known to those familiar in the art as "split" systems. As is known, a split system employs a condenser and compressor generally located in a common housing, and positioned remote from the evaporator of the refrigeration apparatus providing conditioned air to the system.

As is obvious, compressors employed in the varied applications will range in size from those that are able to provide fractional refrigeration tonnage to those that are able to provide a refrigeration output of five tons or even more.

To meet the requirements of the various applications, many compressor designs have heretofore been developed. In some of the applications, limitations on the size of the compressor have resulted in compressor designs that have not been entirely satisfactory from a performance standpoint.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a novel motor-compressor construction.

It is a further object of the invention to provide a motor compressor unit that is of extremely compact size, yet one that does not result in a concomitant reduction in operating performance.

It is yet another object of this invention to provide a novel motor assembly particularly suitable for use in driving a hermetically sealed pump.

It is still another object of the invention to provide an improved hermetic motor-compressor assembly to achieve a reduction in the axial dimension of the compressor, as well as substantial savings in the manufacturing cost and weight of the hermetic compressor assembly.

These and other objects, features and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings. The hermetic motor compressor assembly in accordance with the invention includes a rotor and stator electrically coupled together. The stator includes a first bore provided therethrough in which the shaft of the compressor is positioned to rotate. The shaft is coupled to the rotor of the motor for rotation therewith. The stator includes a second bore positioned in a first portion thereof and extending transversely to the first bore. Positioned in the second bore is cylinder defining means of the compressor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical sectional view illustrating a hermetic motor compressor unit incorporating the present invention; and

FIG. 2 is a horizontal sectional and top plan view of the compressor illustrated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is illustrated a preferred embodiment of the motor-compressor unit in accordance with the present invention. Such motor-compressor unit is typically employed in a mechanical refrigeration unit.

A hermetically sealed motor-compressor unit is generally indicated at **10.** The unit is housed within a shell generally indicated at **11** having a circular cross-sectional shape. Shell **11** is fabricated of a lower shell section **14** and an upper shell section **12** which are suitably joined together, as by welding.

The motor of the unit includes a stator **16** and rotor **18.** Rotor **18** includes first and second portions **20** and **20'** provided in spaced apart relationship along the longitudinal axis of crankshaft **22** of the compressor. The opposed surfaces of rotor portions **20** and **20'** define crankcase portion **23** of the compressor. Cranksahft **22** is operably connected to rotor portions **20** and **20'.**

Stator **16** includes a bore **24** provided in a first portion thereof. Bore **24** extends transversely to the crankshaft which is rotatably accommodated in a second bore **25** in the stator, the second bore also receiving rotor portions **20** and **20'.** Positioned within bore **24** is cylinder defining means **26.** Cylinder defining means **26** defines cylinder **27** of the compressor. A piston **28** is disposed within cylinder **27** for reciprocal movement therein. Although only a single cylinder is illustrated, any desirable numbers of cylinders may be employed. Connecting rod **30** and wrist pin **32** connect piston **28** to eccentric portion **34** of crankshaft **22.** Reciprocating movement of the piston is obtained by rotation of the crankshaft as is obvious to those skilled in the art.

Cylinder head **36** is joined via bracket **37** and securing means such as bolts **39** to stator **16** and functions to enclose the end of the cylinder.

The hermetically sealed motor-compressor unit embodying the present invention is typically employed in a mechanical refrigeration unit. The refrigerant gas to be compressed enters into the shell of the compressor via inlet **38** (shown in FIG. **2**).

The gas passes through inlet **38** and thereafter passes through axially extending passageways **40–46,** see FIG. **2,** provided in the stator of the motor. Passageways **40–46** are formed by removing a portion of the motor winding. The gas routed through the passageways moves in heat transfer relation with the motor to cool the same for a reason well known to those skilled in the art.

The refrigerant gas, after having cooled the windings of the motor, enters into cylinder **27** of the compressor. Suction valve **48,** provided in the head of piston **28,** controls the flow of refrigerant gas into the cylinder. After the gas is compressed by operation of the piston, the compressed gas is emitted from the cylinder via openings **50** provided in valve plate **52.** The discharge of refrigerant gas from the cylinder is regulated via discharge valve **54.** Valve plate **52** is suitably attached to cylinder defining means **26** via such means as screws **55.**

The compressed discharged gas then flows via discharge tube **56** to discharge outlet **58.** The gas is thence delivered to the condenser of the refrigeration unit.

The motor-compressor unit is suitably suspended within shells **12** and **14** via springs **60** and **62.** Spring **60** provides an upper support for the motor-compressor unit, which restrains axial movement thereof in an upwardly extending direction. Spring **60** is guided between an upper stop **64** and a lower stop **66.** Upper stop **64** is suitably joined to the inner surface of upper shell **12.** Lower stop **66** is attached to the top portion of a dummy shaft **68** about which crankshaft **22** rotates.

Spring **62** supports the motor-compressor unit at its lower surface and restrains the axial movement of the motor-compressor unit in a downwardly extending direction. Spring **62** is suitably guided between a lower stop **70** and an upper stop **72.** Lower stop **70** is suitably joined to the inner surface of lower shell **14.** Upper stop **72** is suitably attached to the lower portion of dummy shaft **68.**

Springs **82** and **84,** shown in FIG. **2,** are employed to limit movement of the motor-compressor unit produced by torsional forces. Such forces are generally developed upon the starting and stopping of the unit. Springs **82** and **84** are each suitably attached at one end to the motor-compressor unit, and are attached at their other ends to brackets **86** and **88.** Brackets **86** and **88** are joined, as by welding, to the inner surface of shell **11.**

Lubricating oil is preferably stored in the lower portion of shell **14.** The oil is pumped to the various wear points and bearings of the compressor via suitable means not shown.

The motor-compressor unit further includes upper and lower bearing heads **74** and **76** which are held in place by sleeves **78** and **80.** Bearing heads **74** and **76** journal crankshaft **22.** Thrust washers **69** are provided between bearing heads **74** and **76** and rotor portions **20** and **20'**.

By employing the stator of the motor to define the cylinder of the compressor, an intricately machined and cast cylinder block is no longer required. In addition, a motor-compressor unit in accordance with this invention may be particularly employed in applications having limitations on the size of the unit that may be utilized. By employing the split rotor construction to define the crankcase of the compressor, additional reductions in casting and machining costs are also obtained. The motor-compressor unit, illustrated in the preferred embodiment, is of compact size and requires only minimal amounts of machining to produce a finished product.

While a preferred embodiment of the present invention has been described and illustrated, the present invention should not be limited thereto, but may be otherwise embodied within the scope of the following claims.

I claim:

1. A motor-compressor unit comprising:

a. rotor means;

b. a stator electrically coupled to said rotor means and having means defining a bore provided in a first portion thereof, energization of said stator causing said rotor means to rotate;

c. means defining a cylinder disposed in said bore of said stator;

d. shaft means operatively connected to said rotor means for rotation therewith, said shaft means extending transversely to said bore; and

e. piston means disposed in said cylinder means and connected to said shaft means, rotation of said shaft means causing said piston means to reciprocate in said cylinder means.

2. An electric motor provided to motivate a pump having a shaft comprising:

a. rotor means coupled to said shaft; and

b. a stator electrically coupled to said rotor means and having means defining first and second bores, the shaft of said pump being rotatably positioned in said second bore, said first bore extending transversely to said second bore, energization of said stator causing said rotor means and shaft to rotate.

3. A hermetically sealed electric reciprocating motor-compressor unit comprising:

a. rotor means;

b. a stator electrically coupled to said rotor means and having means defining a bore provided in a first portion thereof, energization of said stator causing said rotor means to rotate, said stator further including longitudinally extending passage means;

c. means defining a cylinder disposed in said bore means;

d. means to supply a gas to be compressed to said passage means, said gas passing through said passage means in heat transfer relation with said rotor means and stator, said gas thence being supplied to said cylinder means;

e. shaft means operatively connected to said rotor means for rotation therewith, and extending transversely to said bore means;

f. piston means disposed in said cylinder means and connected to said shaft means, rotation of said shaft means causing said piston means to reciprocate in said cylinder means to compress said gas provided therein; and

g. discharge means connected to said cylinder means to receive said compressed gas therefrom.

4. A motor-compressor unit in accordance with claim **1** wherein said rotor means includes first and second portions, spaced apart along the longitudinal axis of said shaft means, the opposed surfaces of said first and second rotor portions defining therebetween a crankcase portion of said compressor.

5. The combination in accordance with claim **3** wherein said rotor means includes first and second portions, spaced apart along the longitudinal axis of said shaft means, the opposed surfaces of said first and second rotor portions defining therebetween a crankcase portion of said compressor.

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