Aug. 27, 1963 A. FRANK 3,101,891

HERMETIC RECIPROCATING COMPRESSOR UNIT

Filed Nov. 28, 1960 2 Sheets-Sheet 1

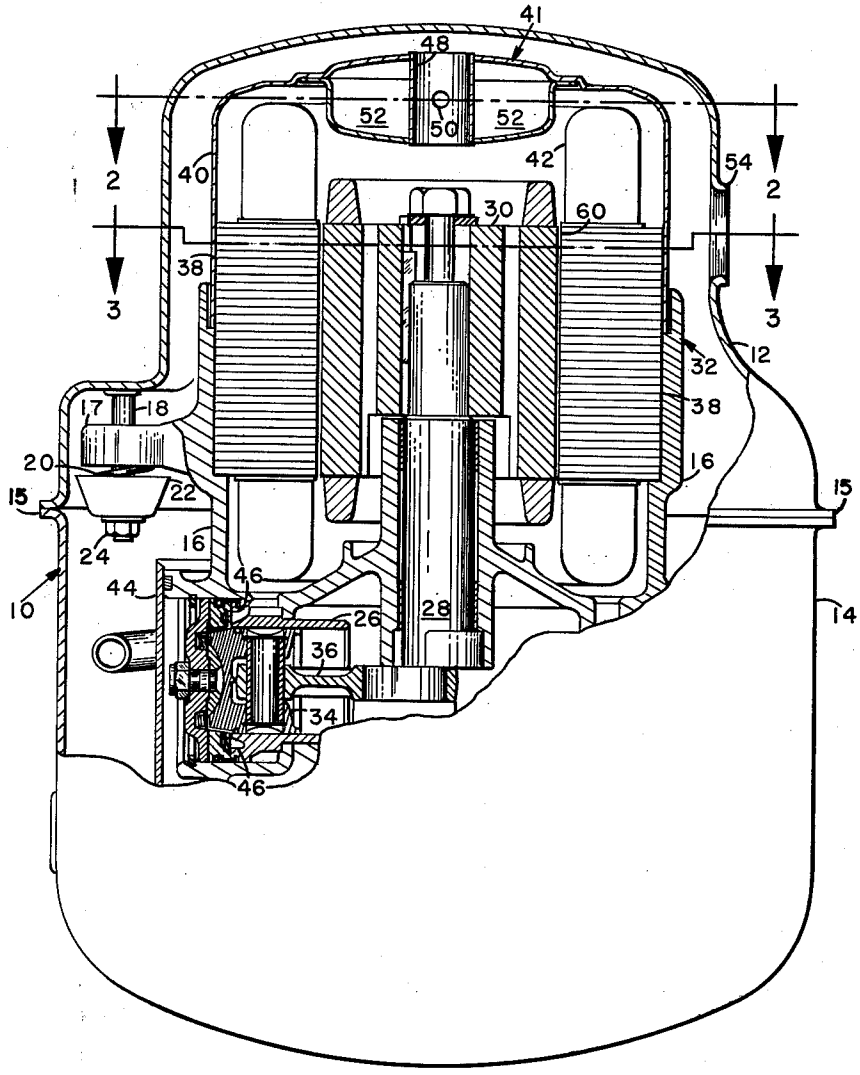

FIG. 1

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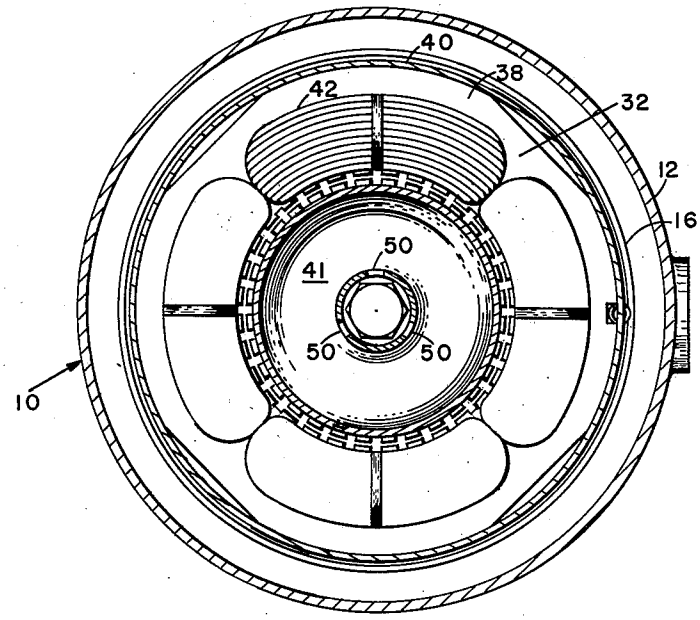

FIG. 2

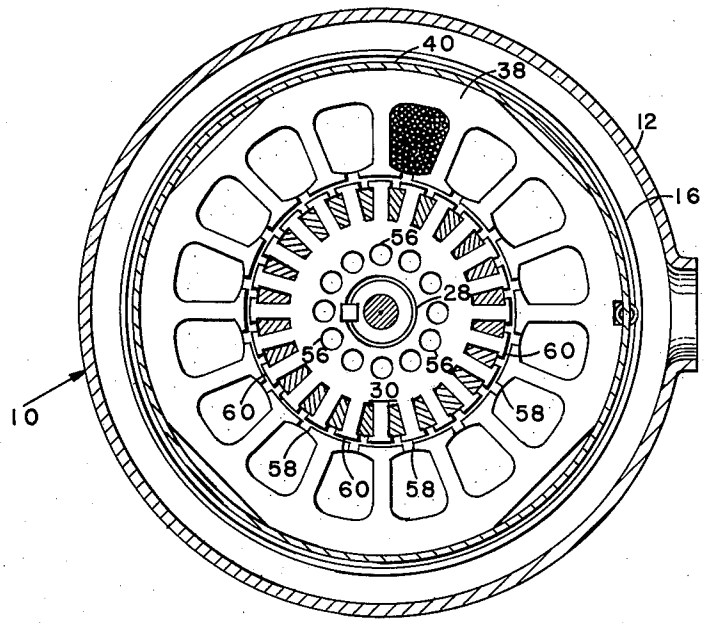

FIG. 3

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HERMETIC RECIPROCATING COMPRESSOR UNIT

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4 Claims. (Cl. 230—232)

This invention relates generally to gas pumps and more particularly to sound deadening and motor cooling for hermetic reciprocating refrigeration compressor units.

One of the objects of the invention is to provide a more compact and quieter hermetic reciprocating compressor unit.

Another object of the invention is to provide a compact reciprocating compressor with a suction muffler located substantially within the confines of the end turns of the stator to attenuates the inherent noise present in reciprocating pumps.

A third object of the invention is to provide a compact reciprocating compressor with a single suction muffler located substantially within the confines of the stator end turns to attenuate the noise level of the compressor and to permit passage of suction gas to the motor for the purpose of cooling the motor before passing to the compressing cylinders.

A still further object of the invention is to provide a hermetic reciprocating compressor unit in which a cover member totally encloses the motor and incorporates a suction muffler to attenuate the noise level of the compressor.

A fifth object of the invention is to provide a hermetic reciprocating compressor unit in which a motor cover member is provided to incorporate a suction muffler to attenuate the noise level and to provide a shock support to protect the motor from damage during shipping or installation.

Another object of the invention is to provide a hermetic reciprocating compressor unit in which the oil foam from the crankcase is prevented from entering the suction passages.

A seventh object of the invention is to provide a compact hermetic reciprocating compressor unit which is readily assembled, inexpensive to manufacture, resistant to shock due to mishandling, and quiet in operation.

A still further object of the invention is to provide a hermetic reciprocating compressor unit in which cooling of the motor is accomplished without any supplementary means such as fans, etc.

A ninth object of the invention is to provide a compact hermetic reciprocating compressor unit which provides a cover member for the motor to prevent oil foam from entering the suction passages, provide a shock absorbing surface to protect the motor in case of mishandling, and to incorporate a suction muffler in order to attenuate the noise level of the compressor and to pass suction gas over the motor for the purpose of cooling the motor.

Other objects and advantages of the invention will be clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings in which:

FIGURE 1 is partial sectional view of my new and improved compressor showing in detail the basic features of the invention;

FIGURE 2 is a view taken on line 2—2 of FIGURE 1; and

FIGURE 3 is a view taken on line 3—3 of FIGURE 1.

Looking now to FIGURE 1, numeral 10 represents a hermetic compressor unit casing consisting of an upper shell 12 and a lower shell 14 welded or otherwise secured at 15. Compressor support body 16 is resiliently supported by a plurality of integral flange members 17 equally spaced around the compressor body 16 which slidably engage pins 18 which are welded or otherwise secured to the upper shell 12. Pin 18 projects through an aperture (not shown) in flange member 17, spring member 20 which resiliently supports the compressor body 16, and spring retaining cup 22. Bolt 24 is secured to the end of pin 18 to secure cup 22, spring 20, and the flange member 17 in assembled relation.

The compressor is supported by the compressor support body and includes a plurality of compressing cylinders 26. The compressor may have any number of desired cylinders and the operation of one is considered typical of all of the cylinders. Crankshaft 28 keyed to rotor 30 of motor 32 is rotatably supported in compressor support body 16 and drives pistons 34 in cylinders 26 through connecting rods 36. Stator 38 of motor 32 is secured in the compressor body 16 around rotor 30.

Frictionally secured to the stator 38 and located between the compressor body 16 and stator 38 is a sheet metal cover member 40. Cover member 40 incorporates a suction muffler 41 in the top thereof located between the end turns 42 of the stator 38. It should be noted that suction muffler 41 projects into the space between the end turns of the stator 38 thereby employing an area not heretofore used thereby producing a more compact compressor arrangement. It should be also noted that cover member 40 totally encloses the motor 32 in a motor chamber and in conjunction with compressor body 16 and discharge manifold 44 provides an enclosed compressor which does not allow the oil foam from the crankcase (not shown), at the bottom of the lower shell 14, to enter the suction passages 46. This is a very important feature since oil foam in the refrigeration cycle will not only cut the capacity of the compressor but may harm other parts of the refrigeration system such as the condenser or evaporator. It is also within the scope of the invention to provide additional suction mufflers within the end turns of the stator, if necessary.

Suction muffler 41, preferably, is of the type which provides a gas passage conduit 48 having holes 50 therein to afford communication to reactive side branch 52. The reactive side branch 52, other than through openings 50, is closed. Reactive side branch 52 is proportioned to attenuate a certain group of sound frequencies. In this particular application the frequency group to be attenuated is fairly low but obviously reactive side branch 52 can be proportioned to attenuate any undesirable noise frequency. As pointed out above the particular suction muffler shown is only typical and it is obvious that other types of suction mufflers could be used within the scope of the claims.

It should be noted at this point that the vertical distance between the top of upper shell 12 and the top of suction muffler 41 is less than the vertical distance between the top of flange member 17 and the top of pin 18. Obviously this difference in distance allows the compressor to be turned upside down without damage to the motor. Applicant's novel cover member 40 and suction muffler 41 provide this protection.

In operation, suction gas enters the suction inlet 54 and passes into suction muffler 41 where certain low frequencies are attenuated. The suction gas then passes through openings 56 in the rotor, grooves 58 in the stator, and in the gap 60 between the rotor and the stator to the suction passages 46. Obviously, this passing of all the suction gas through the motor provides for cooling of the motor without any artificial means to cause such circulation. If desired, or necessary, further openings can be provided around or through the stator, or both. The gas is compressed, discharged, and manifolded as shown

in co-pending application Serial No. 707,291, filed January 6, 1958 in the name of E. T. Neubauer.

My new and novel cover member **40** and suction muffler **41** provide a refrigeration compressor unit which is more compact and less expensive to manufacture since the suction muffler is located within the confines of the stator end turns, attenuates the noise level of the compressor since all the suction gas passes through a suction muffler before passage to the cylinders, and provides for motor cooling without the expensive and space-wasting addition of extra components to perform this necessary cooling of the motor. Further, my novel design affords protection for the compressor motor due to mishandling of the compressor. A still further advantage of my compressor unit is that the inner working components of the compressor unit are completely separated from the crankcase chamber so that it is not possible for oil foam to enter the refrigeration cycle.

Although I have described in detail the preferred embodiment of my invention, it is contemplated that many changes may be made without departing from the scope or spirit or my invention and I desire to be limited only by the claims.

I claim:

1. A hermetic compressor unit comprising: a casing, a suction gas inlet in said casing, a support body means mounted within said casing for supporting a motor and a compressor, crankshaft means rotatably mounted on said support body means, a motor supported on said support body means for rotatably driving said crankshaft means, said motor including a stator and a rotor disposed within said stator, said rotor being mounted on one end of said crankshaft means for rotation therewith, a reciprocating compressor supported by said support means adjacent to and operatively connected to the end of said crankshaft means remote from said motor, said stator having end turns projecting axially with respect to said crankshaft means beyond said rotor in a direction away from said compressor thereby defining a cavity between said end turns adjacent the end of said rotor remote from said compressor, cover means disposed between said casing and said end turns and between said rotor and said casing for encapsulating said motor in a motor chamber within said casing defined by said cover means and said support body means, a suction gas muffler supported by said cover means and projecting into said cavity between said end turns, means affording fluid communication between said compressor and said motor chamber, and means for sealing the suction side of said compressor from said suction gas inlet except through said suction gas muffler.

2. A hermetic compressor unit as defined in claim 1 wherein a resilient mounting means is provided for resiliently mounting said support body means within said casing, said resilient mounting means permitting the support means freedom of movement relative to the casing in a direction axially with respect to said crankshaft means, said resilient mounting means resiliently limiting the relative movement of said support body means in a direction toward said compressor, and said cover means limiting said relative movement in the opposite direction.

3. A hermetic compressor unit as defined by claim 1 wherein said cover means is sheet metal and is in frictional engagement with said motor stator.

4. A hermetic compressor unit as defined in claim 1 wherein said fluid communicating means makes fluid connection to said motor chamber at an end of said motor chamber remote from said cover means whereby all the suction gas will pass axially through said motor to afford maximum cooling.

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