June 27, 1961 N. J. BOHN 2,990,111

REFRIGERATING APPARATUS

Filed Sept. 22, 1959

Fig. 1

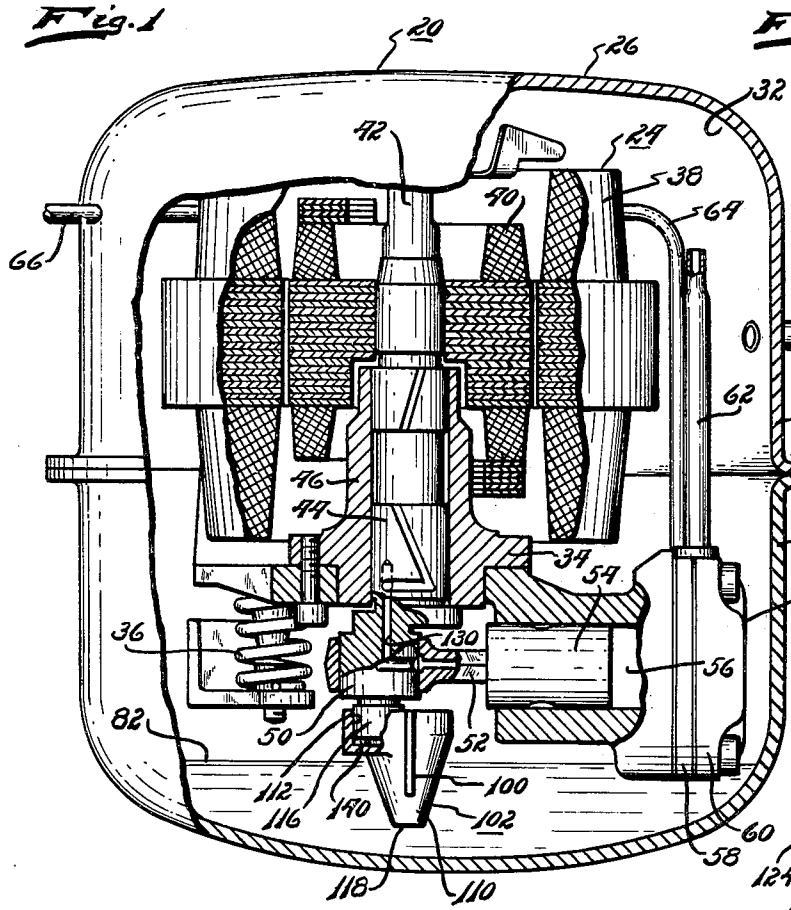


Fig. 6

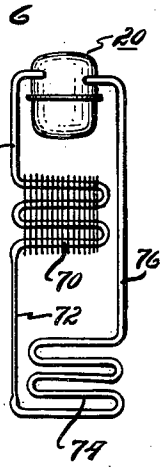


Fig. 5

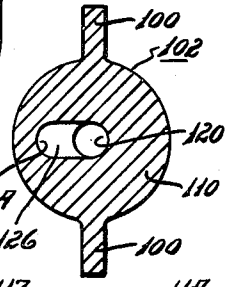


Fig. 2

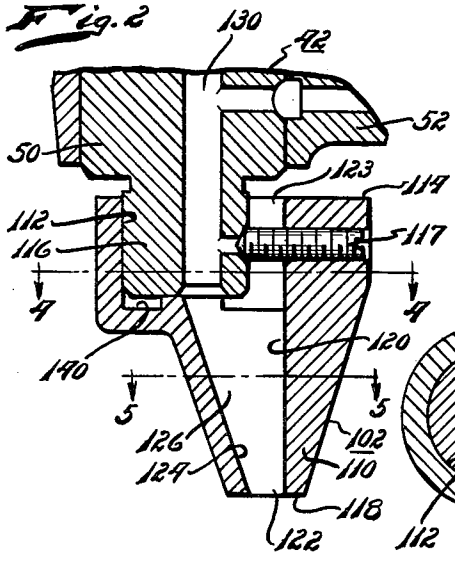


Fig. 4

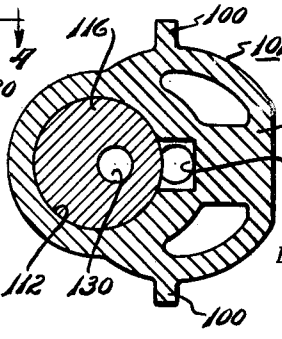
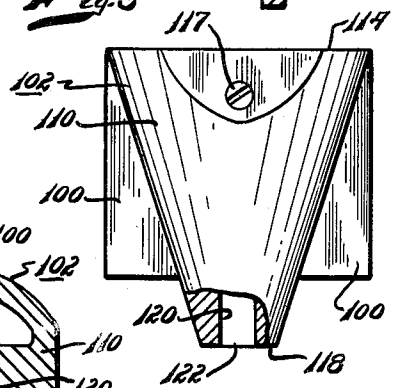


Fig. 3



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United States Patent Office 2,990,111 Patented June 27, 1961

2,990,111
REFRIGERATING APPARATUS

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Filed Sept. 22, 1959, Ser. No. 841,547
3 Claims. (Cl. 230—232)

My invention relates to a refrigerating apparatus and more particularly to hermetically sealed motor compressor units for use in connection with such apparatus.

It is an object of the present invention to provide an improved arrangement for quieting the operation of a hermetically sealed motor compressor unit by reducing the transmittal of the operational noises and sounds to the outside casing.

Another object of the present invention is to provide an improved arrangement for the stirring and agitation of the oil or lubricant stored within the lower portion of the chamber formed by the outer casing that it will become mixed with refrigerant gases forming bubbles throughout the entire body of the oil or lubricant whereby the bubbles will cause to reduce the oil or lubricant's ability to transmit the operational noises and sounds of the motor-compressor unit to the outer casing.

Another object of the present invention is to provide a stirring arrangement for the oil or lubricant which is simple in construction, economical of manufacture and highly efficient in use.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

FIG. 1 is a front view of a refrigerant compressor embodying features of my invention and showing a portion thereof broken away and parts thereof in cross section;

FIG. 2 is a vertical fragmentary view in cross section of my invention and showing it attached to a crankshaft;

FIG. 3 is a side view of my invention with a part broken away;

FIG. 4 is a view taken along line 4—4 of FIG. 2;

FIG. 5 is a view taken along line 5—5 of FIG. 2; and

FIG. 6 is a diagrammatic view of a refrigerating system including a compressor embodying features of my invention.

Shown in the drawing is a motor-compressor unit 20 which comprises in general a compressor 22 and an electric motor 24 mounted within a sealed casing or shell 26.

The casing 26 consists of an upper shell 28 and a lower shell 30 which are welded together by their flanges to form a sealed chamber 32.

The motor 24 and the compressor 22 are secured to a common casting 34 to form an assembled unit which is mounted by suitable springs 36 to the inner wall of the casing 26 in a vertically extending position within the sealed chamber 32.

The motor 24 includes a stator 38 that is secured on the casting 34 and a rotor 40 which is mounted upon a crankshaft 42.

The crankshaft 42 has a shaft section 44 that is journaled in a bearing section 46 formed in the casting 34. The shaft section 44 extends upwardly and outwardly from the bearing 46 and supports the rotor 40 thereon. Adjacent the lower end of the bearing 46 the shaft is formed with a crankarm 50 to which is connected one end of a connecting rod 52. The opposite end of the connecting rod 52 connects to a piston 54 which operates in a cylinder 56. The outer end of the cylinder 56 is closed by a valve plate 58 and a cylinder head 60.

The valve plate 58 is provided with a suitable inlet valve (not shown) to admit refrigerant vapors from the

chamber 32 into the cylinder 56. The refrigerant is conducted from the chamber 32 towards the cylinder 56 through a conduit 62. The valve plate is also provided with suitable discharge valves (not shown) to control the flow of compressed refrigerant vapors from the cylinder into the cylinder head. From the cylinder head the compressed refrigerant flows through a conduit 64 for conduction through a connecting conduit 66, external of the casing 26, into a condenser 70 for cooling and condensing. The condensed refrigerant is metered in its flow from the condenser 70 by a small diameter conduit 72 for conduction into the evaporator 74. From the evaporator 74 the heat laden refrigerant vapors are returned to the chamber 32 through a conduit 76. The conduit 72 permits equalization of pressures in the casing 26 and condenser 70 during the off phase of the refrigerating cycle.

A reservoir of oil or lubricant is maintained in the bottom of the chamber 32. As oil is a conductor of sound it is highly desirable that the oil be maintained at a level 82 which is preferably below the major portion of the compressor and particularly the compressor body. With the oil level at 82 there is a minimum of contact with the compressor body so that there is reduced to a minimum the conduction of operational noises of the compressor through the oil or lubricant to the outer casing. However, even with the oil level at 82, particularly in hermetically sealed compressors, the oil or lubricant will be in some direct contact with some projecting portion of the compressor, conduits, mufflers or the like from which undesirable sounds and noises are directly transmitted to the oil or lubricant for conduction thereby to the outer casing.

To reduce this transmittal of sound conduction through the oil or lubricant I have provided a pair of paddle members 100 formed integral with an oil lifting device 102. The oil lifting device 102 is more fully described and is the subject of a co-pending application for U.S. Letters Patent Serial No. 841,546, filed by Ralph W. Doeg on even date herewith and assigned to the assignee of the present application.

Vaporous refrigerant is contained in the casing 26 and during the off-phase of the refrigerating cycle some of the refrigerant vapor becomes absorbed or impregnated in the body of lubricant due to the increase in pressure in said casing.

Briefly the oil lifting device 102 comprises an inverted cone shaped body 110 which is secured to for carry by the crankarm 50. The cone shaped body 110 is formed with a bore 112 extending inwardly from the base side 114 of the cone to receive a downwardly projecting crankarm member 116. The cone is secured to the crankarm member 116 by a screw 117. The bore 112 is off-centered in the cone from the cone's axis, a distance equal to the radius from the center of the crankarm to the axis of the crankshaft, so that when the cone is mounted on the crankarm the axis of the cone is in direct alignment with the axis of the shaft section 44 of the crankshaft. The axis of the cone is a centerline from the truncated apex 118 extending perpendicularly to the base side 114 of the cone.

Extending through the cone body 110 along the axis of the cone is a central passageway 120 which has its inlet opening 122 in the apex 118 and its outlet 123 in the base side 114. The passage 120, from the entrance opening 122, has a side wall that inclines, as at 124, towards the bore 112 to form an inclined or angular passage 126 which communicates with a longitudinally directed passage 130 formed in the crankshaft 42.

In operation as the crankarm rotates in an orbited path it will carry the cone therearound but as the apex 118 of the cone is aligned with the axis of the shaft 44 it will rotate on a stationary axis and minimize any disturbance

to the oil to permit its entrance into the opening **122**. The lower end of the cone body extends below the oil level **82** so that at all times the inlet opening **122** is submerged in the oil. The outlet **123** of the passage **120** is above the oil level **82**. As the cone rotates, the oil entering the opening **122** is centrifugally lifted up the inclined side **124**, or passageway **126**, to enter the passage **130** of the crankshaft from which the oil is distributed to radial passages which further distributes the oil or lubricant to various points in the compressor requiring lubrication.

As the lubricant or oil is subjected to centrifugal force to effect its lifting within the cone's body this force will also cause any refrigerant mixed with the lubricant to become separated therefrom, and after separation the refrigerant will travel vertically upwardly through the axial passage **120** to the outlet **123** for return to the chamber **32**.

A circumferential recess or pocket **140** is formed in the bottom wall of the bore **114** which is in open communication with the inclined passageway **126**. Dirt and other foreign particles that are in the oil will be centrifugally separated therefrom to become trapped and remain lodged in the recess **140**. The inclined side **124** is so arranged that the dirt particles will be centrifuged to pass into the recess **140** before the oil can enter the passage **132**.

The paddles **100** are preferably formed integral with the cone body **110**. The paddles are formed to extend radially outwardly from the cone's body in diametrically opposed relation and preferably in alignment with the axis of the cone. The paddles extend from the base of the cone downwardly to terminate at a point a short distance above the apex **124** of the cone. The paddles extend above and below the oil level **82**. Though the paddles are shown as being widest in width at the lower end and taper or narrow in width as they approach the cone's base it will be apparent that other shapes and designs may be had. However, the paddle must terminate a spatial distance above the opening **124** to prevent oil disturbance about the opening **124** which would interfere with the entrance of oil thereinto.

During the operation of the compressor the paddles will rotate about the stationary axis of the cone. The rotation of the paddles will agitate the oil or lubricant in manner to beat and trap refrigerant vapors from the chamber **32**. The refrigerant vapors through the stirring action of the paddles will be dispersed as bubbles throughout the body of the stored lubricant. As the paddles keep stirring and agitating the lubricant there will be a continuous mixing and releasing of refrigerant bubbles which will cause foaming on the surface of the lubricant. Also foaming takes place by the reduction in pressure during the on-phase of the refrigerating cycle. The more refrigerant bubbles stirred into the oil the greater will be the reduction in the oil's ability to transmit sound by conduction to the casing.

By keeping the oil level whereby it is in minimal contact with the compressor body, and keeping the oil stirred whereby refrigerant gases will mix as bubbles with the oil it has been found that there is a minimal of sound transmission through the oil body to the casing. By this reduction of sound transmittal through the oil the objectionable noise transmittal from the casing is reduced to a minimum providing for a quieter operating unit.

Although only a preferred form of the invention has been illustrated and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. Refrigerating apparatus comprising a casing, a sealed chamber formed by said casing and adapted to receive and to conduct refrigerant vapors therethrough, a body of liquid lubricant stored in said chamber, a compressor including a crankshaft mounted within said chamber, a motor within said chamber operatively connected to drive said crankshaft for operation of said compressor, paddle means extending vertically from above said body of liquid lubricant downwardly into said body of liquid lubricant, and means for operatively connecting said paddle means externally to said crankshaft whereby the operation of said crankshaft will rotate said paddle means to agitate the vaporous refrigerant contained lubricant and to mix therewith refrigerant vapors from said chamber and which vapors will be dispersed throughout the body of liquid lubricant as bubbles.

2. Refrigerating apparatus comprising a casing, a sealed chamber formed by said casing and adapted to receive and to conduct refrigerant vapors therethrough, a body of liquid lubricant stored in the lower portion of said chamber, a compressor including a crankshaft mounted to extend vertically within said chamber, said crankshaft having its lower end terminating a spatial distance above the level of liquid lubricant stored in said chamber, a motor within said chamber operatively connected to drive said crankshaft, a lubricant conducting member secured to said crankshaft, said member extending from the lower end of said crankshaft into and below the level of liquid lubricant and adapted to conduct lubricant towards said crankshaft during the operation of said crankshaft, paddle means carried by said member, said paddle means extending vertically from a spatial distance above and downwardly into the body of liquid lubricant stored in said chamber and adapted to agitate the liquid lubricant to mix therewith refrigerant vapors from said chamber and which vapors will be dispersed throughout the body of liquid lubricant as bubbles.

3. Refrigerating apparatus comprising a casing, a sealed chamber formed by said casing and adapted to receive and to conduct refrigerant vapors therethrough, a body of liquid lubricant stored in the lower portion of said chamber, a compressor including a crankshaft mounted to extend vertically within said chamber, said crankshaft having a crankarm at its lower end and positioned a spatial distance above the level of liquid lubricant stored in said chamber, a motor within said chamber operatively connected to drive said crankshaft, a lubricant conducting member adapted to conduct lubricant during the operation of said crankshaft and including a vertically extending body section having an axis in alignment with the stationary axis of said crankshaft and a section extending laterally from said vertical body section, means for securing said laterally extending section of said lubricant conducting member to the lower terminable end of said crankarm, said vertical body section extending below said level of lubricant, an inlet opening in said vertical body section below the level of lubricant, means provided in said lubricant conducting member to conduct lubricant towards and into said crankarm from said inlet opening, paddle members carried by said vertical body section, said paddle members extending radially outwardly from said body section, and said paddle members extending from above the level of lubricant to below said level of lubricant to terminate a spatial distance above said inlet opening.

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