Aug. 14, 1962 R. W. DOEG 3,049,285

REFRIGERATING APPARATUS

Filed Sept. 22, 1959

Fig. 1

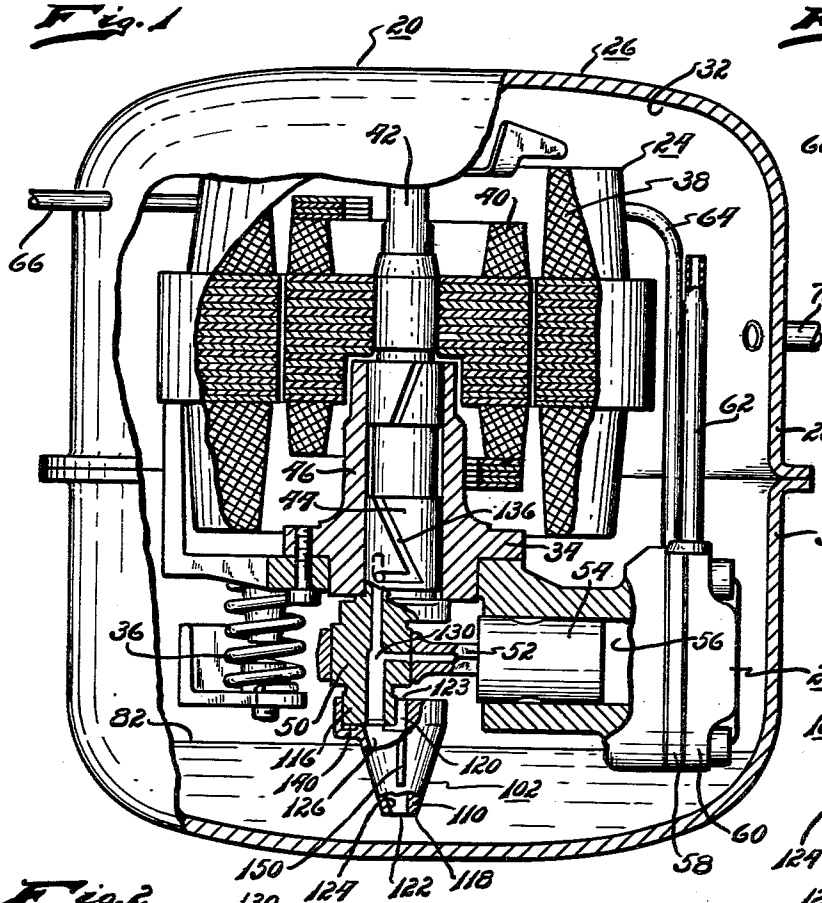


Fig. 5

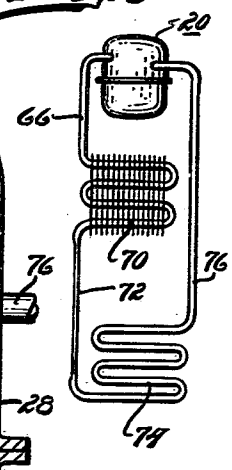


Fig. 4

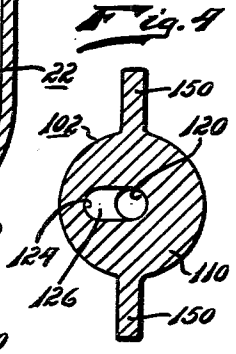


Fig. 2

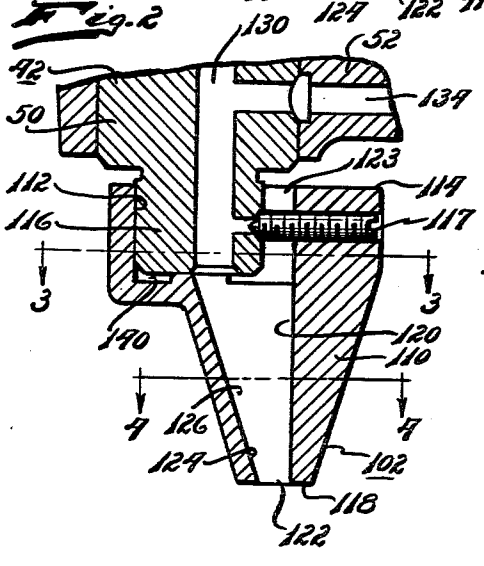
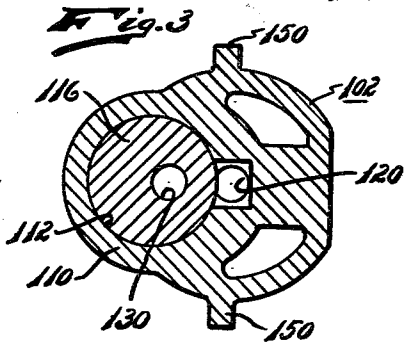


Fig. 3



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3,049,285

REFRIGERATING APPARATUS

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2 Claims. (Cl. 230—206)

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 lifting and circulating lubricant from a reservoir to the motor compressor unit.

Another object of the present invention is to provide an improved arrangement for lifting and circulating lubricant from a reservoir to a motor compressor unit, to separate any refrigerant mixed with the lubricant and to divert such separated refrigerant from entering the lubricant conducting passages in the motor compressor unit with the lubricant.

Another object of the present invention is to provide an improved arrangement for lifting and circulating lubricant from a reservoir to a motor compressor unit, to separate any foreign bodies from the lubricant and to retain such foreign bodies to prevent their entry with the lubricant into the lubricant conducting passages in the motor compressor unit.

Another object of the present invention is to provide an improved oil or lubricant lifting device 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;

FIG. 2 is a vertical fragmentary view of my invention;

FIG. 3 is a view taken along line 3—3 of FIG. 2;

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

FIG. 5 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**. 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** toward 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** and 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 is returned to the chamber **32** through a conduit **76**.

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 compressor body. With the oil level at **82** there is a minimum of contact with the compressor body which reduces to a minimum the conduction of operational noises of the compressor through the oil to the outer casing. To provide lubricant for the compressor from the spatially distanced reservoir I have provide a lubricant lift or oil lifting device **102**.

During the off-phase of the refrigerating cycle the conduit **72** permits equalization of pressures in the casing **26** and the condenser **70**. When the pressures equalize there will be an increase in pressure in the chamber **32** and this results in the refrigerant becoming absorbed in the lubricant. During the on-phase of the compressor the refrigerant will leave the lubricant due to the reduction of pressure in the chamber **32**. This causes foaming and the result is that the lubricant lift **102** separates the lubricant from the refrigerant.

The oil lifting device **102** comprises an inverted cone shaped body **110** which is secured upon for carry by the crankarm **50**. The cone shaped body **110** is formed with a bore **112** extending inwardly from the base side **114** to receive a downwardly projecting crankarm member **116**. The cone is secured to the crankarm member **116** by a locking 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 an imaginary centerline from the truncated apex **118** extending perpendicularly to the base side **114**.

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 orbital 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 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 passage **126**, to enter the passage **130** of the crankshaft from which the oil is distributed to a radial passage to lubricate the crankarm to connecting rod connection, and for conduction through a passageway **134** formed in the connecting rod for flow to the piston for lubricating the cylinder walls and also the wrist pin connection (not shown). The passage **130** also connects to a radial pas-

sage for conducting lubricant to the circumferential grooves **136** formed on the shaft section **44**.

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 lubricant mixed with the refrigerant 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 **112** 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 **130**.

Though the oil level **82** is below the compressor body there still remains direct contact by the oil with conduits, mufflers and some projecting parts of the compressor through which operational sounds are carried and conducted to the oil for transmittal to the outer casing. To reduce this transmittal of objectionable sounds the cone body **110** is provided with a pair of paddles **150** which extend radially outwardly from the axis of the cone in diametrically opposed relation. These paddles are more fully described and are the subject of a co-pending application for U.S. Letters Patent, Serial No. 841,547, filed by Nicholas J. Bohn on even date herewith, now Patent No. 2,990,111, and assigned to the same assignee as this application.

The paddles **150** are preferably formed integral with the cone's body and terminate at their lower end a spatial distance above the apex **118**. The paddles serve to agitate the oil so as to mix into the oil refrigerant vapors from the chamber **32**. The refrigerant vapors are so mixed and dispersed into the oil as to form small bubbles throughout the entire body of oil maintained in the reservoir to reduce the conductivity of sound through the oil to the outer casing. By terminating the paddles a spatial distance from the apex **118** the oil is not disturbed by the paddles to interfere with its entrance into the inlet opening **122**.

Although only a preferred form of the invention has been illustrated and that form 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 forming a sealed chamber, a body of lubricant stored in the lower portion of said chamber, a compressor including a vertically extending crankshaft within said chamber, said crankshaft terminating a spatial distance from the lubricant, a motor within said chamber operatively connected to drive said crankshaft, a lubricant conducting means secured to said crankshaft for conveying lubricant stored in said chamber to said crankshaft including a body having a passage with an inlet below the level of lubricant and an outlet above the level of the lubricant, said body being secured to said crankshaft for rotation therewith with said passage extending in axial alignment with the axis of said crankshaft, said passage being inclined to diverge from the opposing side thereof as it extends from said inlet opening, said crankshaft having a passage and an opening in said terminated end thereof, and said inclined side terminating in alignment with said opening in said crankshaft to direct thereinto the flow of lubricant from said inclined side, a recess formed in said body, and said recess being extended about within said body and terminating in opposed and open communication with said passage whereby said recess is adapted to receive and trap foreign matter centrifuged from the liquid lubricant as it is conveyed through said body prior to said lubricant entering said crankshaft.

2. Refrigerating apparatus comprising a casing, a sealed chamber formed by said casing, a body of liquid lubricant stored in the lower portion of said chamber, a compressor including a crankshaft within said chamber, said crankshaft extending in a vertical position within said chamber, said crankshaft having a crankarm at its lower end, a projecting member on said crankarm extending downwardly therefrom and terminating a spatial distance from the liquid lubricant, a motor within said chamber operatively connected to drive said crankshaft, a lubricant conducting means for conveying lubricant stored in said chamber to said crankshaft including a body secured to said projecting member, said body having an inwardly extended bore to receive said projecting member, a vertical passage extending through said body having its inlet below said level of liquid lubricant and its outlet above said level of liquid lubricant, said vertical passage being formed in said body to extend axially in alignment with the axis of rotation of said crankshaft, a side of said vertical passage being inclined from adjacent said inlet opening to and into said bore to form an inclined passage from said opening into said bore, a passageway in said crankshaft extending to an opening in said projecting member, said opening in said projecting member being in open communication with said inclined passage, a horizontally extended recess formed in and extending about said body, and said recess being extended to terminate in opposed and in open communication with said inclined passage to receive foreign matter being centrifuged from the lubricant as it is lifted by centrifugal force up said inclined passage.

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