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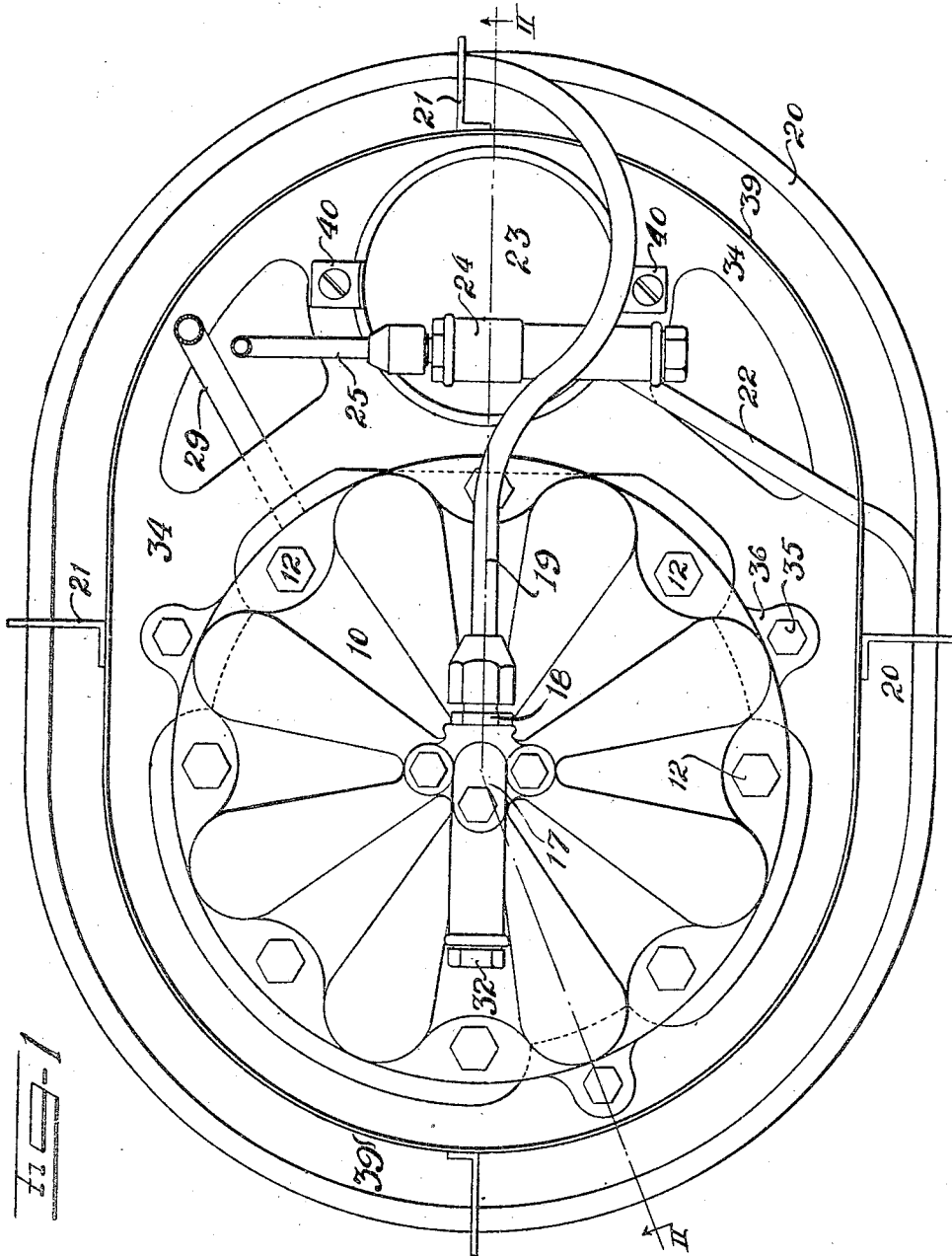
H. E. BLOOD ET AL

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DIRECT CONNECTED MOTOR AND COMPRESSOR

Filed Nov. 28, 1927

3 Sheets-Sheet 1



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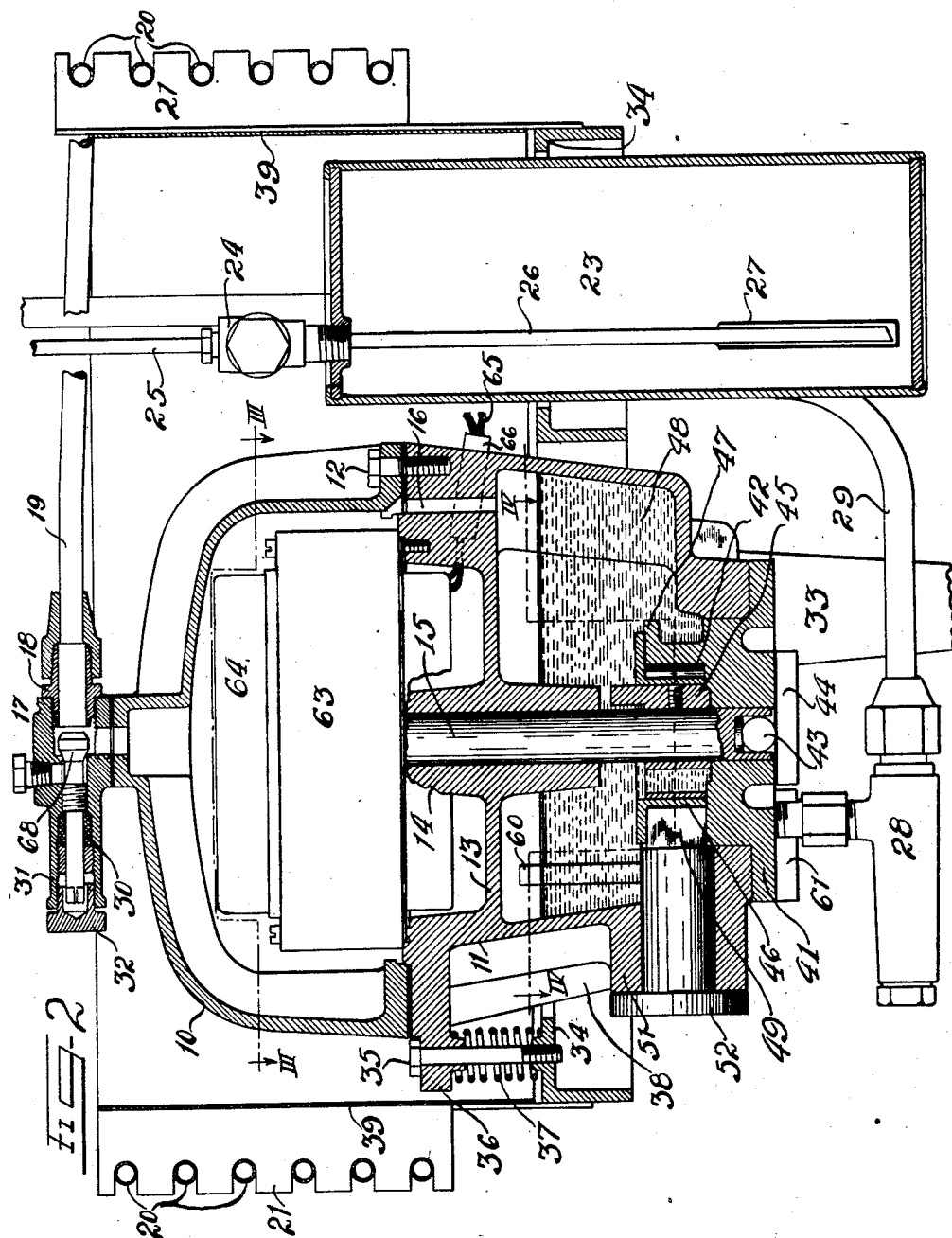
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3 Sheets-Sheet 2



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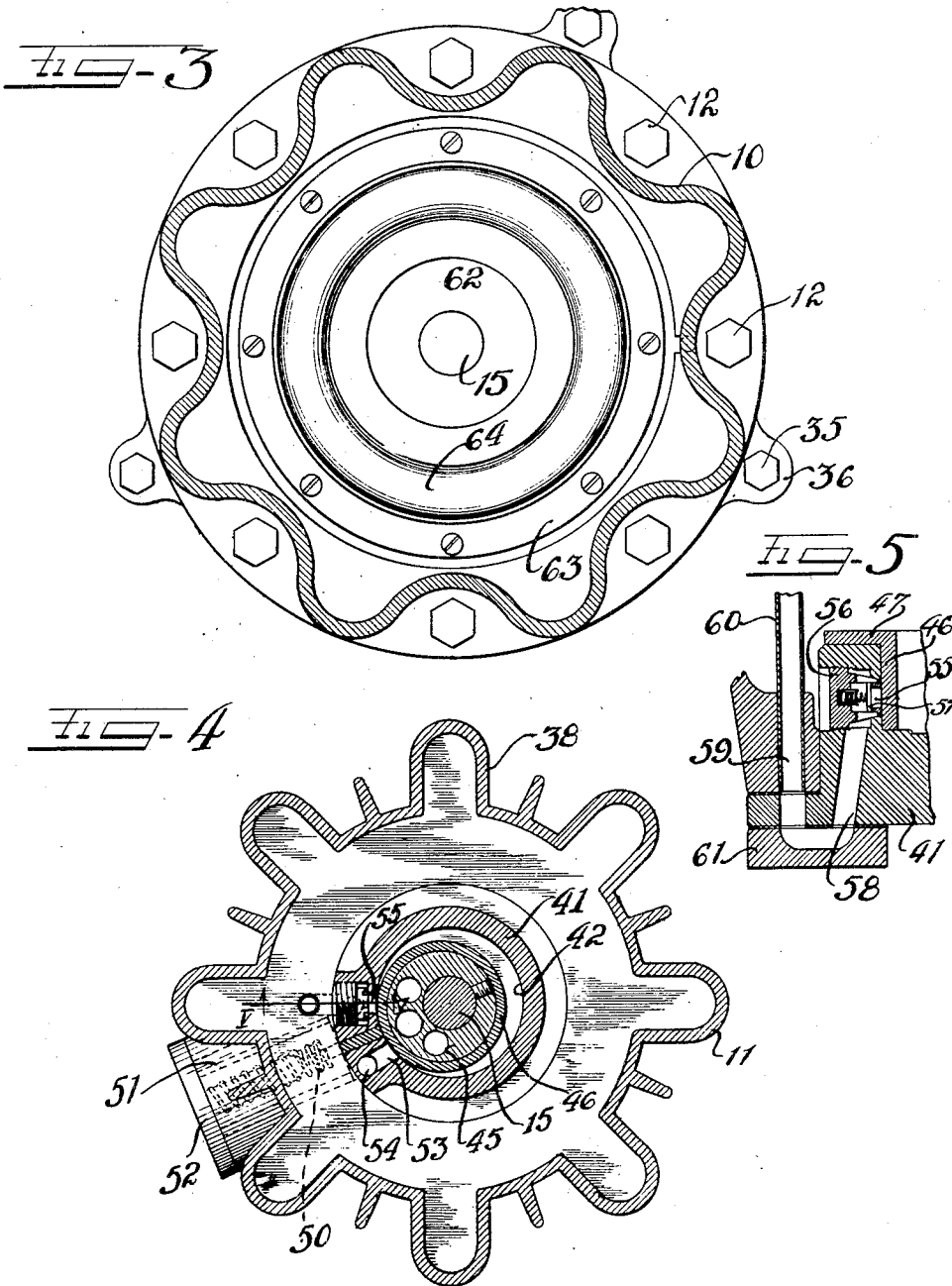
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DIRECT CONNECTED MOTOR AND COMPRESSOR

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3 Sheets-Sheet 3



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DIRECT CONNECTED MOTOR AND COMPRESSOR

Application filed November 28, 1927. Serial No. 236,091.

This invention relates to an improved direct connected motor and compressor unit together with a condenser and receiver forming a complete self-contained power unit for a compression type of refrigerating system.

It is an object of this invention to provide a compressing and condensing apparatus of the type described that will take up a small amount of space, will be self-contained without requiring a separate mounting or bed common to the different units, and will be capable of efficient operation at the high rotational speeds required in a compressor direct connected to an electric motor.

It is also the object of this invention to provide an improved direct connected motor and compressor mounted in a sealed casing that will include a highly efficient and durable type of rotary compressor operating completely submerged in oil and with the motor hermetically sealed within the same system of casings so as to eliminate stuffing boxes, belts or couplings.

It is also an object of this invention to provide a direct connected motor and compressor mounted in a sealed casing together with an enclosure forming a heat shield which yielding supports the casing and also carries the condenser coils and receiver so that the whole compact unit is carried by the supports without loss of efficiency in the condenser due to the heat generated in the compressor. A further advantage of the yielding support for the compressor casing lies in preventing communication of vibration to the condenser which might cause serious crystallization of the soft copper piping used in the condenser coils and connections.

It is another object of this invention to provide a direct connected motor and compressor unit in a sealed casing wherein the complete compressor can be removed from the casing without dis-assembling the entire machine.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a top plan view of a device embodying the features of this invention.

Figure 2 is a vertical section on the line II—II of Figure 1.

Figure 3 is a section on the line III—III of Figure 2.

Figure 4 is a section on the line IV—IV of Figure 2.

Figure 5 is a fragmentary detail section on the line V—V of Figure 4 showing the discharge connections from the compressor.

As shown on the drawings:

The general arrangement of the mechanism comprises a motor and compressor formed by a motor section 10 and a compressor section 11 bolted together, both sections having fluted side walls to assist in air cooling the casing as well as to provide pockets for the cap screws 12 holding the parts together. The compressor section is separated from the motor section by a passaged partition 13 which contains a central bearing 14 for a vertical shaft 15, the compressor section discharging the compressed gas into the motor section through one or more ports in the partition. The gas then rises between the rotor and stator of the electric motor, the centrifugal action of the rotor forming an efficient oil separator the oil being thrown out against the casing when it drains back to the compressor through ports 16.

A discharge valve body 17 is located at the top of the motor section and comprises an inserted valve seat nipple 18 which also forms a coupling for the end 19 of the condenser coils 20 which are supported in brackets 21, the lower or discharge end 22 of the condenser coils leading into a liquid receiver 23, a liquid discharge valve 24 being shown thereon with an outlet pipe 25 and discharge outlet pipe 26 extending into the receiver to a position near the bottom thereof where a screen 27 is positioned over the open end to prevent dirt going out of the receiver into the freezing unit. A return or suction valve 28 is shown at the bottom of Figure 2 on the end of the return

pipe 29 from the expansion apparatus which is located in the compartment to be refrigerated. All the valves 17, 24 and 28 are constructed in the same way with nipples 18 and double acting valve stem members 68 which seal the stem packing 30 when fully opened. The valve stems are enclosed by projecting sleeves 31 which are normally closed by plugs 32 as an additional insurance against leakage.

Depending legs or standards 33 are provided which also support the condenser coils and receiver by means of a flanged plate 34 which also yieldingly supports the casing 11 by means of springs 37 which are interposed between the casing lugs 36 and the plate 34 so that the casing is yieldingly mounted on the plate to absorb vibration. Bolts 35 are temporarily positioned in the lugs to hold the casing in place during shipment, these bolts being removed when the unit is placed in service. Because of the deep flutes 38 in the lower casing section 11, a relatively large area is provided between the edges of the plate and the casing to permit thermally induced flow of air upwards around the casing. The flanged plate 34 carries a peripheral shell 39 which forms a heat shield and support for the condenser coil brackets 21, the purpose of the heat shield being to separate the cooling air circulation for the condenser coils and for the compressor casing to prevent the heat from the latter flowing out over the condenser coils. The plate 34 also supports the liquid receiver 23 by means of the lugs 40.

The compressor proper is of the rotary type, a body member 41 forming a bottom closure for the lower casing section 11 and having a cylindrical recess 42 in its upper side concentric with the vertical shaft 15, this recess 42 forming the cylinder of the compressor. The shaft 15 passes through the body 41 and is supported by a single ball 43 forming a ball thrust bearing, the ball being supported by a plate or cover 44 secured to the exterior of the body 41. The vertical shaft carries counterbalanced 45 within the recess 42, this eccentric operating within an annular sleeve 46 which rolls around in approximate contact with the cylinder and forms the rotor element of the compressor. This rotor has a slight clearance in the cylinder which clearance is sealed by the lubricant fed to the compressor. The sleeve 46 is formed with an outstanding flange 47 which overlaps the cylindrical recess 42 in the body so that this flange forms an end seal for the compressor, being held down against the body by its weight aided by the gas pressure above a body of lubricant 48 which nearly fills the entire compressor casing section 11. A partition blade 49 extends through a suitable slot in the compressor body into contact with the sleeve 46, the blade being backed by a spring 50 in a hollow boss 51 closed by a cage and cap 52 as shown, partly in dotted lines, in Figure 4. With this rotor

moving anti-clockwise in this figure, a suction or inlet port 53 is provided below the blade, this port connecting by means of a vertical passage 54 with the suction valve 28. On the upper side of the blade, a discharge port 55 is provided in which is mounted a cage 56 for a check or non-return valve disc 57, the port 55 opening into a nearly vertical passage 58 which leads to an exterior surface of the compressor body. A vertical passage 59 alongside the passage 58 and located in the wall of the casing 11 terminates in a tube 60 extending above the lubricant level in the casing, the exterior openings of the two passages 58 and 59 being connected by a cored plate 61 bolted to the bottom of the compressor body. This structure is provided both to simplify the compressor body to permit withdrawal thereof and to provide a compressor discharge opening accessible from the outside so that a pipe connection can be connected thereto if it is desired to pump the refrigerating fluid out of the system by means of the compressor.

The motor section 10 forms a cover for an induction motor comprising a rotor 62 secured to the vertical shaft 15 and a stator comprising a field core 63 bolted to the top of the lower casing section 11 and field winding 64 on the core 63. The lead-in wires 65 for the field windings are sealed in a plug 66 extending through the wall of lower casing section into the space above the partition. In the operation of the device of this invention, the pressure in the compressor quickly equalizes with that of the suction line upon stoppage, a check valve in the suction line, not shown in the drawings, being provided to prevent the high pressure that leaks past the pump from backing up into the suction line behind the check valve. This equalization of pressure is due to the high pressure oil above the compressor oozing in past the blade and around the flanges of the rotor when the compressor is not in operation, and thus filling up the low pressure space in the cylinder and the suction line as far back as the suction check valve. As a result of this equalization of pressure restarting of the motor is made easier due to the unloading of the compressor and the need for an overload release or other electrical protection for the motor is obviated.

Upon starting, the compressor draws in a charge of expanded gas from the suction line and delivers it above the lubricant level through the discharge pipe, the large gas space in both casing sections providing ample opportunity for the separation out of any oil working its way into the compressor. From the outlet valve on top of the motor casing section, the compressed gas flows through the condenser coils, reaching the receiver in liquid form.

It will thus be seen that we have produced

a very compact and self-contained compressor and condenser unit wherein the heat generated in the compressor does not affect the condenser efficiency and wherein any motor vibration will be dampened before it affects the condenser coils. A further advantage of this structure lies in the accessibility of the compressor and the ability to use the compressor to empty the system of refrigerant by connecting a suitable vessel in place of the cover 61 and operating the compressor.

We are aware that many changes may be made, and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and we therefore do not purpose limiting the patent granted hereon, otherwise than necessitated by the prior art.

We claim as our invention:

1. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, a heat shield surrounding the casing, means yieldingly supporting said casing, condenser coils mounted on said heat shield, and a liquid receiver connected to said coils.
2. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, a heat shield surrounding the casing, means yieldingly supporting the casing, condenser coils mounted on said heat shield, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap positioned over the exterior surface of the compressor body adjacent said passages.
3. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing, a heat shield surrounding said casing, means yieldingly supporting the casing, condenser coils mounted on said heat shield, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap over the exterior surface of the compressor body adjacent said passages.
4. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable

compressor body forming a bottom closure for said casing, a heat shield surrounding said casing, condenser coils mounted on said heat shield, and a liquid receiver connected to said coils.

5. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, a heat shield surrounding said casing, condenser coils mounted on said heat shield, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap positioned over the exterior surface of the compressor body adjacent said passages.

6. A compressor unit for refrigerating apparatus, including a condenser, a sealed casing containing a body of lubricant therein, a direct connected motor and rotary compressor vertically mounted in said casing with the compressor submerged in the lubricant, and discharge connections passing to the exterior of the casing and back thereinto above the lubricant level and thence to the condenser.

7. A compressor unit for refrigerating apparatus comprising a sealed casing containing a body of lubricant therein, a direct connected motor and rotary compressor vertically mounted in said casing with the compressor submerged in the lubricant, means yieldingly supporting said casing, and condenser coils supported by said means and separated from the casing whereby the casing and condenser will be separately cooled.

8. A compressor for refrigerating apparatus comprising a rotary compressor, a vertical shaft extending upwards from the rotor of said compressor, an electric motor mounted above the compressor with its rotor secured to said vertical shaft, a casing surrounding said compressor and motor, the compressor body forming a removable bottom closure for said casing, a shelf supporting said casing, standards supporting said shelf, condenser coils and a receiver supported by said shelf whereby the entire unit is carried by the standards.

9. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, means yieldingly supporting said casing, a base, and a condenser and receiver supported by said base.

10. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor

unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, means yieldingly supporting the casing, condenser coils mounted on said supporting means, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap positioned over the exterior surface of the compressor body adjacent said passages.

11. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing, means yieldingly supporting the casing, condenser coils mounted on said supporting means, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap over the exterior surface of the compressor body adjacent said passages.

12. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, means supporting said casing, condenser coils mounted on said means, and a liquid receiver connected to said coils.

13. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit mounted in said casing with a removable compressor body forming a bottom closure for said casing, means for supporting said casing, condenser coils mounted on said means, a liquid receiver connected to said coils, a discharge passage in the compressor body leading to an exterior surface thereof, a second passage adjacent thereto leading from the exterior surface into the interior of the casing above the lubricant level therein, and a passaged cap positioned over the exterior surface of the compressor body adjacent said passages.

14. A direct connected motor and compressor unit for refrigerating apparatus comprising a casing, a motor and compressor unit sealed in said casing, a heat shield surrounding said casing, means yieldingly supporting the casing relative to the heat shield to prevent the transmission of vibrations thereto, condenser coils mounted outside said heat shield whereby the heat shield provides separate cooling paths for the air flowing past the casing and the condenser coils, and a liquid receiver connected to the condenser coils.

15. A direct connected motor and compres-

sor unit for refrigerating apparatus comprising a casing, a motor and compressor unit sealed in said casing, a heat shield surrounding said casing, condenser coils mounted outside said heat shield whereby the heat shield provides separate cooling paths for the air flowing past the casing and the condenser coils, and a liquid receiver connected to the condenser coils.

In testimony whereof, we have hereunto subscribed our names at Detroit, Wayne County, Michigan.

HOWARD E. BLOOD.
ROYAL G. NELSON.

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