

May 12, 1936.

J. D. BINGHAM

2,040,641

REFRIGERATION

Filed Dec. 23, 1932

3 Sheets-Sheet 1

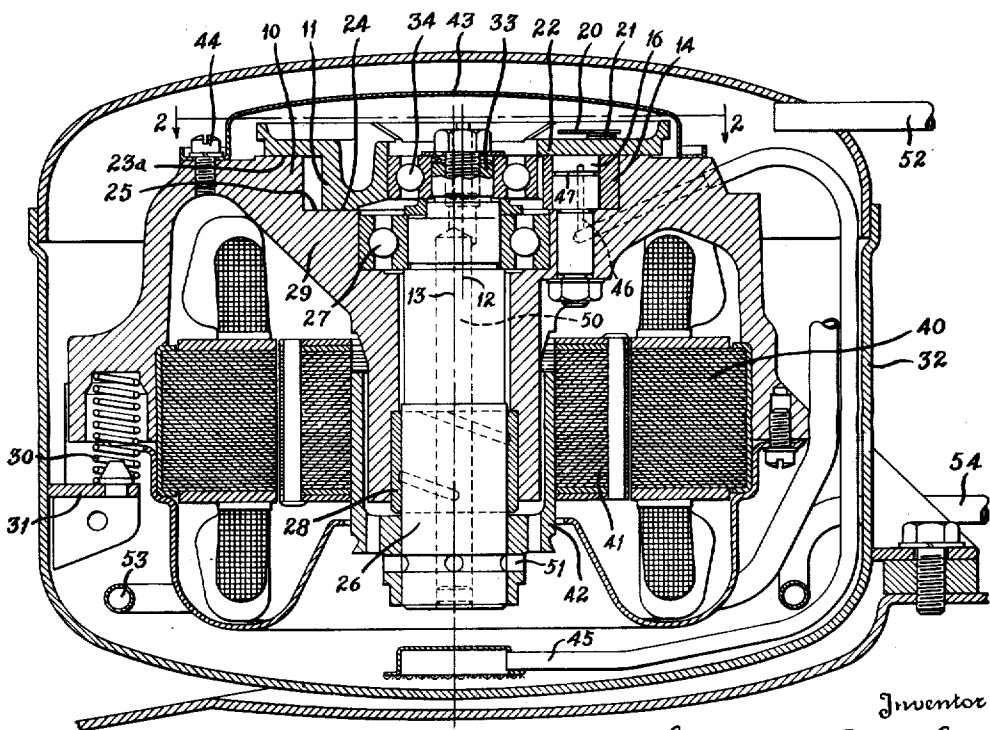
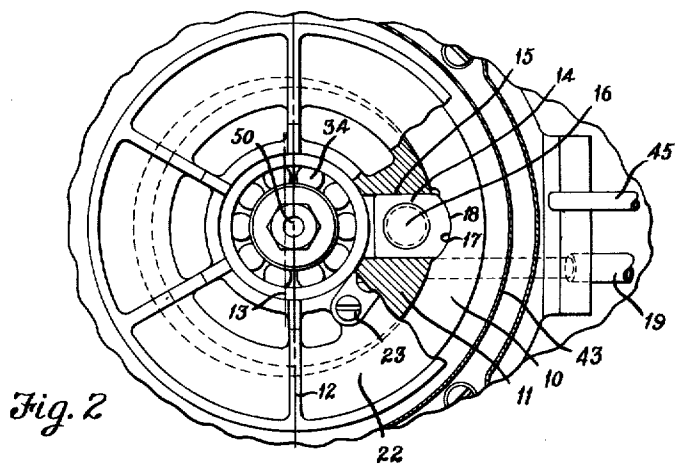


Fig. 1

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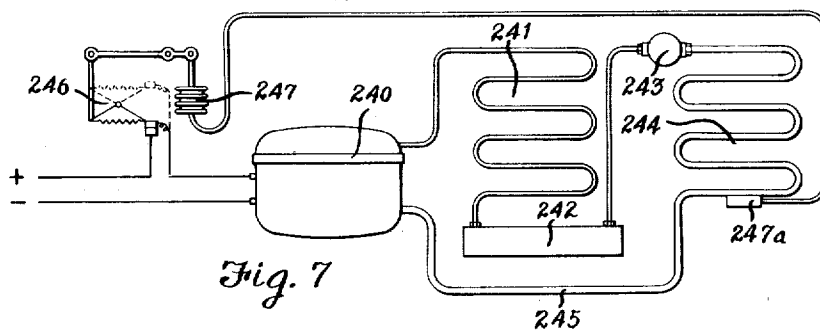
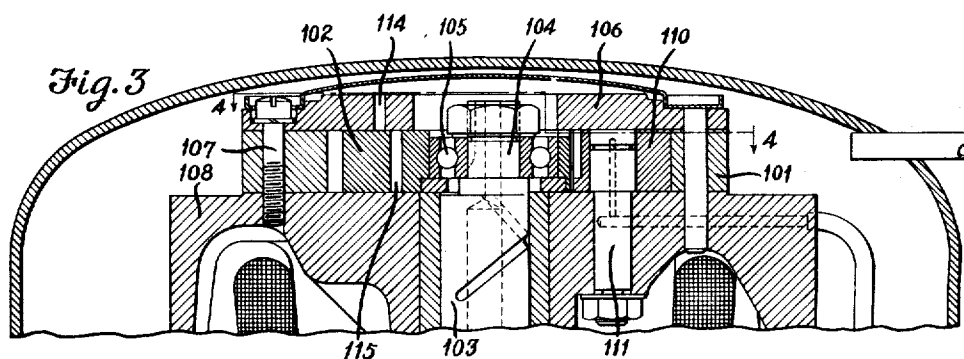
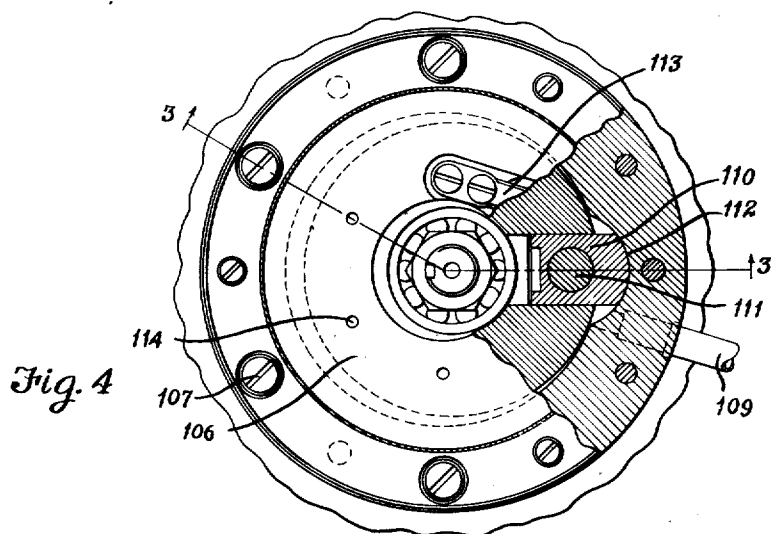
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3 Sheets-Sheet 2



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REFRIGERATION

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3 Sheets-Sheet 3

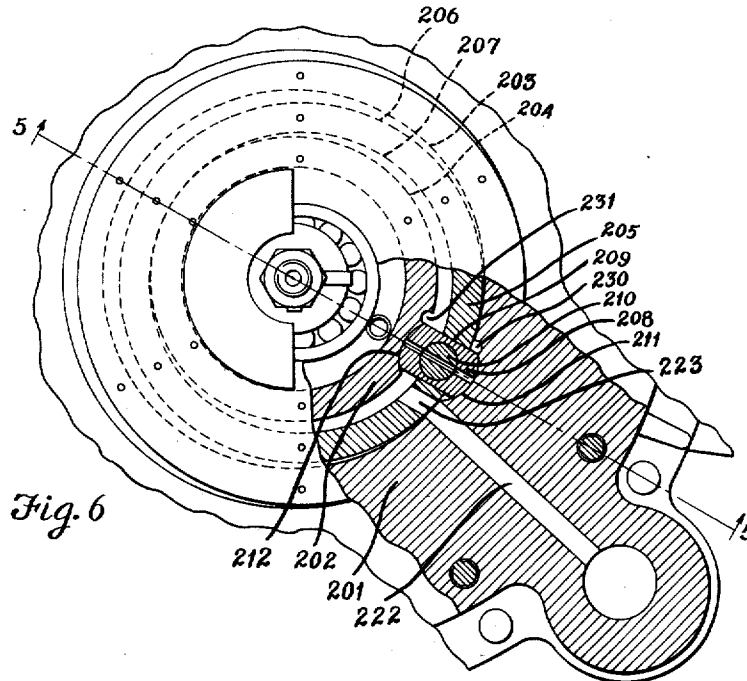


Fig. 6

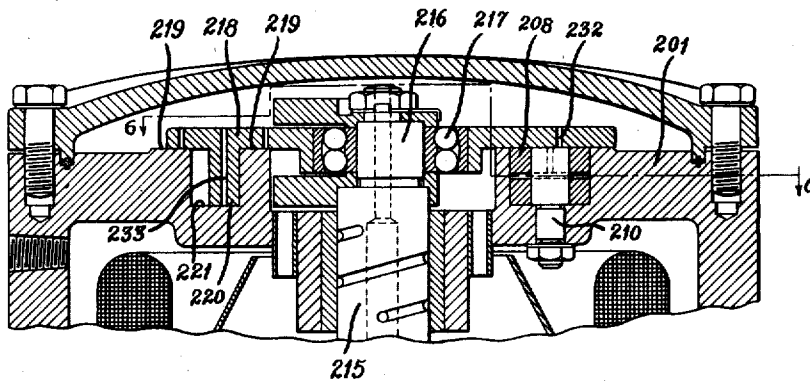


Fig. 5

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UNITED STATES PATENT OFFICE

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REFRIGERATION

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ration, a corporation of Delaware

Application December 23, 1932, Serial No. 648,695

8 Claims. (Cl. 230—147)

This invention relates to refrigeration and more particularly to a compressor adapted to be used with refrigerating systems. It is among the objects of this invention to provide a compressor which is efficient and noiseless and capable of operating for long periods of time without the necessity of attention.

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

In the drawings:

Fig. 1 is a vertical cross sectional view of a compressor embodying features of my invention;

Fig. 2 is a horizontal cross sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a vertical cross sectional view of a portion of a compressor showing a slightly modified form;

Fig. 4 is a horizontal cross sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a vertical cross sectional view of a portion of a compressing mechanism showing still another modification of the compressor;

Fig. 6 is a horizontal cross sectional view, with portions broken away, taken along the line 6—6 of Fig. 5; and

Fig. 7 is a diagrammatic representation of a refrigerating system in which my compressor may be used.

A compressor embodying features of my invention as shown in Figs. 1 and 2 includes in general a cylinder 10, a circular piston 11 of less diameter than said cylinder. Means are provided to impart a circular motion to the axis 12 of the piston 11, this circular motion being about the axis 13 of the cylinder 10. The diameters of the cylinder and piston, and the circular motion are such that the cooperating surfaces of the piston and cylinder form a sealing contact which rotates along the inner working surface of the cylinder. A divider block 14 is provided which is placed in a radially disposed slot 15 in the piston 11. Means are provided to insure proper centering of the block 14 and to reduce the sidewise movement thereof. This means may be in the form of a fixed pin 16 about which the divider block 14 oscillates. The divider block 14 is provided with an arcuate surface 17 and the cylinder 10 is provided with an arcuate surface 18, these surfaces being coaxial with the fixed pin 16 and cooperating with each other to form a sealing surface. Intake means are provided at 19 which lead to one side of the

divider block 14 and discharge means are provided adjacent the other side of the divider block in the form of a leaf valve 20 which rests on the valve seat 21 and is held to a plate 22 by means of the screws 23. The plate 22 cooperates with the upper surface 23^a of the cylinder 10 and forms a sealing surface therewith. The lower end of the piston is provided with a sealing surface 24 which cooperates with the lower surface 25 of the cylinder 10. The means for imparting the circular motion to the piston may include a rotary shaft 26 provided with a roller bearing 27 and a metallic bearing 28 which are held in the casting 29 which holds, or may be part of, the cylinder 10, this casting riding on springs 30 which are carried by shelves 31 secured to the outer hermetic casing 32. The means for imparting the circular motion also includes the eccentric 33 provided with a ball bearing 34 which drives the piston 11, the eccentric 33 having just sufficient offset to provide the necessary sealing contact between the piston 11 and the cylinder 10, and the shaft 26 being coaxial with the inner cylindrical surface of the cylinder 10.

The compressor above described may be used in any casing and may be driven by any suitable means. As one particular example this compressor has been shown to be used in conjunction with a sealed motor compressor unit which includes the hermetic casing 32. In this casing there is provided an electric motor for driving the compressor, this motor being in the form of a stator 40 and a rotor 41 keyed by means of the sleeve 42 to the shaft 26. A noise dampening casing 43 is placed over the compressor and is held in place by means of screws 44. The lower portion of the casing 32 acts as an oil reservoir and the oil is forced by the head pressure of the refrigerant through the pipe 45 to a passage 46 in the pin 16, this passage having communication with the annular cut 47 which lubricates the surfaces between the divider block 14 and the pin 16.

In operation, the motor rotates the shaft 26 which in turn causes the circular motion of the piston 16. The piston 16 is prevented from rotating by the divider block 14, but the point of contact between the piston and the cylinder rotates clockwise, as shown in Fig. 2, and thus drives the gas from the intake 19 around to the upwardly directed opening adjacent the other side of the divider block 14 which discharges through the valve 20 into the space encased by the cover 43. From thence the gases discharge through the central passage 50 downwardly through the shaft 55

26 and radially through openings 51 into the lower portion of the casing 32. From thence the gases rise and pass through the pipe 52 to the place of use, which in a refrigerating system, is a condenser. In this particular embodiment the intake 19 includes a downwardly directed pipe which spirals at 53 within the casing and passes through the casing and is connected to the intake pipe 54.

By construction above described, including the fixed pin 16, it is possible to maintain efficient sealing surfaces between the cylinder and the piston as well as between the divider block and the cylinder and the piston.

In the modification shown in Figs. 3 and 4, the compressor includes a cylinder 101, a piston 102. The piston 102 is cylindrical and is provided with means for imparting a circular motion to its axis about the axis of the cylinder. In this embodiment this means includes the shaft 103 similar to the shaft 26 and including the offset eccentric 104 and the ball bearing 105 similar in construction and function to the corresponding parts shown in Fig. 1. The cylinder 101 is provided with an end plate 106 which is sealed to the cylinder by means of bolts 107 and which also forms a sealing surface with one end of the piston 102. The casting 108 forms another end plate for the cylinder 101 and is also sealed thereto by the bolts 107 and also forms a sealing surface with the piston 102. An intake is provided at 109 adjacent one side of the divider block 110 which oscillates about the fixed pin 111 in a manner similar to that described with respect to Figs. 1 and 2. In this case the cylinder and the divider block are provided with arcuate surfaces at 112 similarly to the structures shown in Figs. 1 and 2 and a discharge valve 113 is placed on the end plate 106 directly over a downwardly directed passage (not shown) which leads adjacent to the side of the divider block 110 opposite intake passage 109. The method of operation in this modification is similar to that described with respect to Figs. 1 and 2, except that the plate 106 does not move with the piston, and need not be further described except to state that the gases discharged through the valve 113 carry with them a slight amount of lubricant, some of which finds its way through the openings 114 down into the cooperating surfaces between the end plate 106 and the piston 102, and that the piston is provided with openings 115 through which some of the lubricant finds its way to the surfaces between the piston 102 and the end plate 108.

In the modification shown in Figs. 5 and 6, an outer cylinder 201 and an inner cylinder 202 are provided, the outer cylinder having an internal working face 203 and the inner cylinder having an outer working face 204. An annular piston 205 is provided, this having an external working face 206 and an internal working face 207, that is, faces cooperating with the faces 203 and 204. A divider block 208 cooperates with the radially disposed slot 209 in the piston 205, and this divider block oscillates about the fixed pin 210. The outer cylinder 201 and the divider block are provided with arcuate cooperating surfaces 211 coaxial with the fixed pin 210 and the inner cylinder 202 and the divider block are provided with cooperating arcuate surfaces 212 coaxial with the fixed pin 210. Means are provided for imparting a circular motion to the axis of the piston about the common axis of said cylinders. This means may include a shaft 215 and an eccentric 216 similar to those heretofore described and provided with ball bearings 217. The piston 205 is provided

with an end plate 218 which cooperates with one end surface 219 of the cylinders while the lower end 220 of the piston cooperates with the lower end 221 of the cylinders. Intake means are provided at 222 adjacent one end of the divider block, and a continuation thereof is provided at 223 in the form of an opening through the piston for the purpose of permitting some of the gases to enter the space between the piston and the internal cylinder 202. Discharge means are provided adjacent the other side of the divider block in the form of valves similar to those heretofore shown, which cover openings directly above the passageways 230 and 231 respectively, these valves being carried by the end plate 218. A certain amount of lubricant is discharged along with the gases and spills over the plate 218, so that some of it finds its way through the passages 232 and 233 to lubricate the working surfaces of the compressor.

My compressor may be used in any structure desired, and the particular motor-compressor casing herein shown is merely one example of many in which it can be used. The specific relationship of the compressor and the casing does not form any part of this invention.

A refrigerating system in which this compressor may be used includes the motor compressor unit 240 which discharges compressed refrigerant to the condenser 241 which in turn discharges condensed refrigerant to the receiver 242. From thence liquid refrigerant passes to an expansion valve 243 and to an evaporator 244 where the refrigerant evaporates and returns through the pipe 245 to the motor compressor unit 240. The motor in the unit is started and stopped by means of the snap switch 246 operated by bellows 247 which forms a part of a thermostatic control including the thermostatic bulb 247 which may be made responsive to any temperature such as the temperature of the evaporator 244.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A compressor comprising an outer stationary cylinder having an internal working face and a vertical axis, an inner stationary cylinder having an external working face coaxial with said internal working face, end plates joining said cylinders, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, means for imparting a circular motion to the axis of said piston about the common axis of said cylinders, a radially disposed slot in said piston, a divider block in said slot, a fixed pin about which said divider block oscillates, said cylinders and divider block having cooperating sealing arcuate surfaces coaxial with said fixed pin, a sealed casing enclosing the foregoing elements and containing a body of lubricant, and means for maintaining a portion of said body of lubricant over said cylinders.

2. A compressor comprising an outer stationary cylinder having an internal working face, an inner stationary cylinder having an external working face coaxial with said internal working face, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, means for imparting a circular motion to the axis of said piston about the common axis of said cylinders, 75

a plate secured to said piston and forming an end closure for said cylinders, a radially disposed slot in said piston, a divider block in said slot, a fixed pin about which said divider block oscillates, discharge means on said plate adjacent one side of said divider block, a check valve on said discharge means, and means to maintain a film of lubricant on said check valve.

3. A compressor comprising a cylinder, a circular piston of less diameter than the diameter of said cylinder, a plate secured to said piston and forming an end closure for said cylinder, means to impart a circular motion to the axis of said piston about the axis of said cylinder, a radially disposed slot in said piston, a divider block in said slot, a fixed pin about which said divider block oscillates, said plate limiting axial movement of said divider block, and a lubricant passage in said divider block and passing through said pin.

4. A compressing unit comprising a sealed casing, a body of lubricant in said casing, an outer stationary cylinder having an internal working face and a vertical axis, an internal stationary cylinder having an external working face coaxial with said internal working face, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, means for imparting a circular motion to the axis of said piston about the common axis of said cylinders, a radially disposed slot in said piston, a divider block in said slot, a pin about which said divider block oscillates, said cylinders and divider block having cooperating sealing arcuate surfaces coaxial with said pin, a refrigerant inlet on one side of said divider block, a refrigerant outlet on the other side said divider block, a check valve on said outlet, and means maintaining a film of lubricant from said body of lubricant on said check valve.

5. A compressing unit comprising a sealed casing, a body of lubricant in said casing, an outer stationary cylinder having an internal working face and a vertical axis, an internal stationary cylinder having an external working face coaxial with said internal working face, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, an electric motor in said casing connected to an eccentric for imparting a circular motion to the axis of said piston about the common axis of said cylinders, a radially disposed slot in said piston, a divider block in said slot, a pin about which said divider block oscillates, said cylinders and divider block having cooperating sealing arcuate surfaces coaxial with said pin, a refrigerant inlet on one side of said divider block, a refrigerant outlet on the other side said divider block, a check valve on said outlet, and means maintaining a film of lubricant from said body of lubricant on said check valve.

6. A compressing unit comprising a sealed casing, a body of lubricant in said casing, an outer

stationary cylinder having an internal working face and a vertical axis, an internal stationary cylinder having an external working face coaxial with said internal working face, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, means for imparting a circular motion to the axis of said piston about the common axis of said cylinders, a radially disposed slot in said piston, a divider block in said slot, a pin about which said divider block oscillates, said cylinders and divider block having cooperating sealing arcuate surfaces coaxial with said pin, a refrigerant inlet on one side of said divider block, a refrigerant outlet on the other side of said divider block, a check valve on said outlet, a horizontal plate on said piston extending over said cylinders, said check valve being exposed at the upper surface of said plate.

7. A compressing unit comprising a sealed casing, a body of lubricant in said casing, a stationary cylinder having a working face and a vertical axis, an annular piston having a cylindrical working face cooperating with the working face of said cylinder, means for imparting a circular motion to the axis of said piston about the axis of said cylinder, a radially disposed slot in said piston, a divider block in said slot, a pin about which said divider block oscillates, said cylinder and divider block having a cooperating sealing arcuate surface coaxial with said pin, a refrigerant inlet on one side of said divider block, a refrigerant outlet on the other side said divider block, a check valve on said outlet, a horizontal plate on said piston extending over said cylinder, said check valve being exposed at the upper surface of said plate, a lubricant retaining ring on said plate, and means for transferring lubricant from said body to the upper surface of said plate.

8. A compressing unit comprising a sealed casing, a body of lubricant in said casing, an outer stationary cylinder having an internal working face and a vertical axis, an internal stationary cylinder having an external working face coaxial with said internal working face, an annular piston having external and internal cylindrical working faces cooperating with the working faces of said cylinders, an electric motor in said casing connected to an eccentric for imparting a circular motion to the axis of said piston about the common axis of said cylinders, a radially disposed slot in said piston, a divider block in said slot, a pin about which said divider block oscillates, said cylinders and divider block having cooperating sealing arcuate surfaces coaxial with said pin, a refrigerant inlet on one side of said divider block, a refrigerant outlet on the other side said divider block, a check valve on said outlet, a horizontal plate on said piston extending over said cylinders, said check valve being exposed at the upper surface of said plate.

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