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1,983,261

PUMP OR COMPRESSOR

Filed March 7, 1931

2 Sheets-Sheet 1

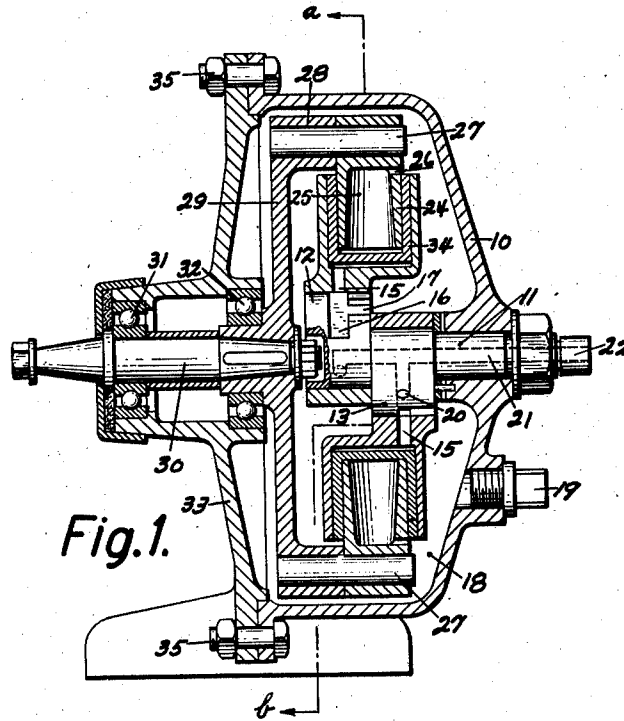


Fig. 1.

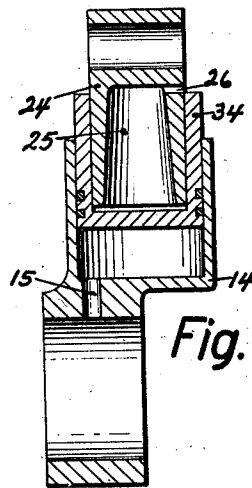


Fig. 5.

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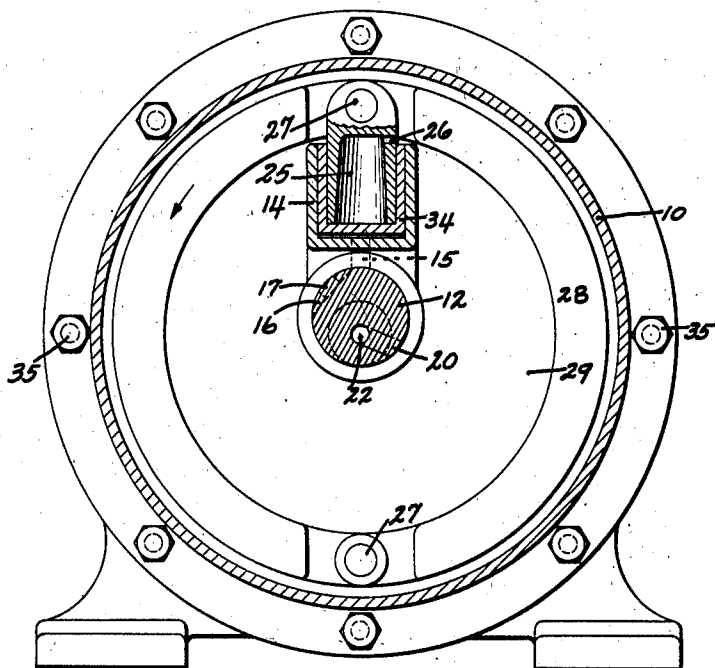


Fig. 2.

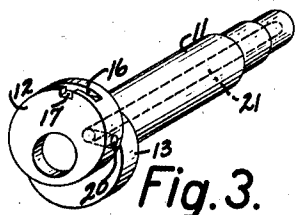


Fig. 3.

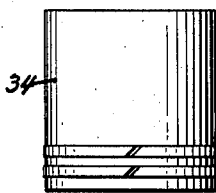


Fig. 4.

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## UNITED STATES PATENT OFFICE

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## PUMP OR COMPRESSOR

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Application March 7, 1931, Serial No. 520,936

5 Claims. (Cl. 103—161)

This invention relates to pumps or compressors and may be used for a variety of purposes where liquids, vapors, gases, or a combination of any two of these are to be moved, pumped or compressed.

It has for its object the production of a pump or compressor of few parts of simple construction, easy to machine and assemble and long lived in service.

Another object is to produce a pump or compressor of the so called rotary type in which wear on the piston actuating mechanism is reduced to a minimum.

Another object is the provision of fluid cushioning means between the piston actuating mechanism and the piston, whereby noise and shock are eliminated.

A further object is to provide an easy starting pump or compressor for use with single phase fractional horse power electric motors that will enable the motor to start without load.

Other objects will be apparent from the following specification wherein, for the sake of illustration, is shown a pump or compressor for a small refrigerating machine "high side" as more fully shown and described in the co-pending application for patent, Serial No. 443,604, filed April 11, 1930, of which this application is a continuation in part.

While the device here shown is a compressor for handling gaseous refrigerant, the modifications necessary to make it suitable for handling liquids are obvious to those skilled in the art and are therefore not described in detail, it being understood that the terms "pump" and "compressor" as used herein are synonymous.

In the accompanying drawings:

Figure 1 is a vertical sectional view of the compressor;

Figure 2 is a sectional view on the line *a-b*, Figure 1;

Figure 3 is a view of the stationary shaft or trunnion supporting the cylinder or cylinders;

Figure 4 is a detailed view of one piston of the compressor, and

Figure 5 is the cylinder for the piston shown in Figure 4.

In the support 10, which may form a casing for the compressor, is secured in any suitable manner the fixed shaft or trunnion 11 having on its inner end one or more eccentrics 12, 13.

As both eccentrics and the cylinders, pistons and other parts associated therewith, are the same in construction and operation, only one set of these parts will be described in detail,

it being obvious that any reasonable number of cylinders can be used provided care is taken to preserve proper balancing of the moving parts. When only one cylinder is used, balancing is obtained by placing a dead weight (not shown) on the flywheel opposite the cylinder in the usual manner.

The cylinder casting 14 is shaped as shown in Figure 5. The bottom portion is bored to fit the eccentric 12 and the cylinder casting revolves about this eccentric as hereinafter described. A port 15 connects the cylinder bore or chamber with the bearing aperture which surrounds the eccentric supporting the cylinder and as the cylinder revolves, this port passes over the intake port 16 which communicates via aperture 17 with the chamber 18 in casing 10. This chamber is connected via pipe 19 to the suction side of any apparatus, for example, in a refrigerating machine, to the suction side of an evaporator. When ports 15 and 16 are in line, the free piston 34 is at the bottom of the cylinder as shown in Figure 1 and is at the beginning of the suction stroke.

As the cylinder revolves, the gaseous refrigerant will be drawn into the cylinder from the chamber 18 via aperture 17 and port 16 (which may be a circumferential slot in the face of eccentric 12). While port 15 is passing over port 16, the piston finally reaches the outermost point in its travel and the cylinder is filled with refrigerant. By this time ports 15 and 16 are out of register and the cylinder is sealed. As the piston descends on the compression stroke, the refrigerant is compressed in the cylinder.

The cylinder, continuing to revolve on the eccentric, finally reaches the point where the port 15 registers with the exhaust port 20 which connects with duct 21 in the trunnion 11. The piston is now at the bottom of the compression stroke and the compressed refrigerant is now discharged through duct 21, which connects via pipe 22—in the case of a refrigerating system—with a condenser.

The free piston 34 is hollow, as shown in Figure 5, and is provided with a sleeve 24 which fits the chamber within the piston. This sleeve is also hollow, having an internal chamber 25 which is closed by the head of the sleeve except for the port 26. The sleeve is held in position in the piston by suitable means, such as the pin 27, on which the sleeve is free to oscillate. Pin 27 is secured in any suitable manner to the rim 28 of the flywheel 29 which is suitably secured to shaft 30 supported in bearings 31, 32 supported in the

plate 33 secured in gas tight relation to the casing 10, by the bolts 35.

The shaft 30 may be provided with a suitable stuffing box or gland (not shown) or may be connected to the rotor of a motor, said rotor being enclosed in gas tight relation to the chamber 18 as described in the co-pending application hereinbefore mentioned.

As the flywheel 29 revolves, it carries with it pin 27, sleeve 24, piston 34, and the cylinder 14. As the cylinder 14 is eccentric to the shaft 30, the piston is caused to reciprocate in its cylinder and alternate suction and compression occurs therein as previously described.

When starting, the free piston 34 will, by reason of friction and the pressure condition that exists on top of it, remain in the bottom of the cylinder in the position as shown in Figure 1. The sleeve 24 is however free to reciprocate within the piston and does so, as it is positively driven but is cushioned by reason of the cushioning effect caused by the presence of the chamber 25 and limiting port 26. This effect also prevents the piston 34 from operating during the first few revolutions of the compressor. This enables the motor to start without the initial load due to the operation of the compressor. As the speed increases, the piston 34 by reason of centrifugal force and because of the lessening of the cushioning effect, gradually goes into action and regular operation ensues.

Where a plurality of cylinders are employed, they may be oppositely disposed radially so as to have all moving parts in balance. In this case the eccentrics 12, 13 are then oppositely disposed as shown in Figure 1, which shows a two-cylinder arrangement. Here the pistons, being opposed, and the cylinders always at an equal distance from the true center of the trunnion 11, balance is obtained and smooth, even operation attained.

As all the wearing surfaces such as the pin 27 in sleeve 24, the opposed surfaces of sleeve 24 and the piston 34 are of ample bearing size and may be properly lubricated by a quantity of lubricant placed in the bottom of chamber 18, wear and friction is reduced to a minimum; thus one of the difficulties heretofore met with in compressors of this general type is overcome. This is especially true where the means for reciprocating the piston consists of a ball or pin which has a point or ball contact at its piston end, the outer end of the pin bearing upon a fixed or movable eccentric track, the present construction is such that all moving parts freely slide on each other without bind or twist, and the reciprocating parts are cushioned by reason of the fluid cushioning means interposed between the rotating means, the flywheel, and the piston and cylinder. Should slight wear occur this cushioning means will take it up by reason of oil entering the chamber 25 and being held between the sleeve 24 and the

inner wall of the piston 34. Should wear occur between the piston 34 and the cylinder 14, the rotation of the compressor as a whole tends to automatically compensate for it.

What is claimed is:

1. In a pump or compressor, the combination of a support, a trunnion having a passage there-through and secured to said support, an eccentric carried by said trunnion, a cylinder carried by said eccentric, a free piston in said cylinder, a hollow sleeve adapted to reciprocate in said piston and forming therewith a pressure chamber at sub-normal speeds and adapted to reciprocate the piston in the cylinder at normal speed, and a rotating member secured to said sleeve and adapted to rotate the aforesaid cylinder, piston and sleeve about said eccentric.

2. In a pump or compressor having a free floating piston wherein the cylinder rotates about a fixed axis, means for rotating the cylinder and fluid cushioning means including a limiting port interposed between said rotating means and cylinder, said cushioning means adapted to operate at sub-normal speeds and adapted to be disabled by centrifugal force at normal speed.

3. In a pump or compressor, the combination with a rotary cylinder having a free piston therein, of a hollow vented sleeve within said piston in contact with the inner wall thereof throughout a substantial portion of its length and adapted to sufficiently trap air to form a cushion therebetween adapted to be nullified by centrifugal force, and means connected with said sleeve for moving said piston and cylinder.

4. In a pump or compressor, in combination, a housing forming a support, a trunnion secured thereto having an eccentric integral therewith, a cylinder pivotally supported on said eccentric, a floating piston in said cylinder, a hollow sleeve in said piston and forming a chamber therebetween, a vent in said sleeve forming a bleeder between said chamber and the interior of said housing, a rotating member secured to said sleeve for rotating the cylinder, piston and sleeve about said eccentric and adapted to reciprocate the sleeve in said piston below a predetermined speed and adapted to reciprocate the sleeve and the piston as a unit within the cylinder when rotating above said predetermined speed.

5. In a pump or compressor of the character described in which a cylinder is rotated, a piston in said cylinder stationary relative thereto at sub-normal speeds, and a vented hollow sleeve in said piston adapted to reciprocate therein at sub-normal speeds, said piston adapted by centrifugal force to become fixed relative to said sleeve and to reciprocate in said cylinder at normal operating speed, the vent in said sleeve serving to substantially restrain the entrance and exit of gas into and out of said hollow at subnormal speeds.

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