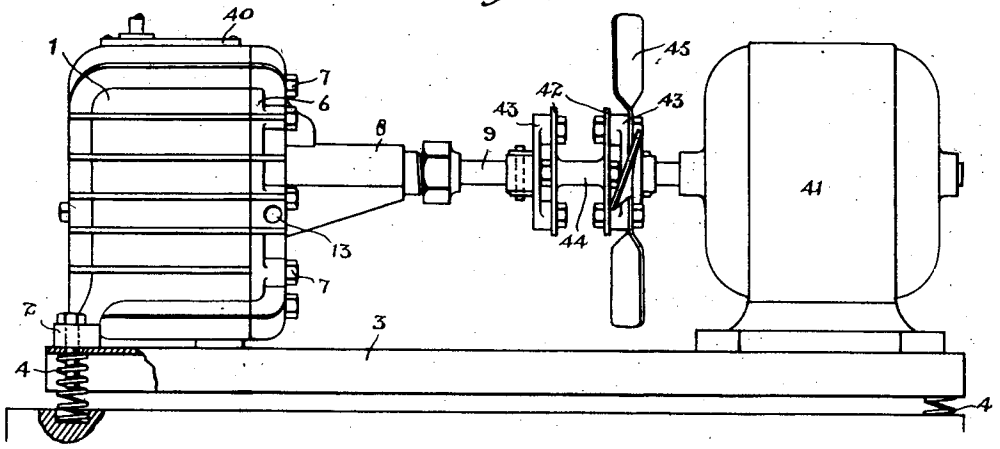
Aug. 20, 1929. W. H. D. BROUSE 1,725,390

PUMP

Filed July 8, 1926

Fig. 1.



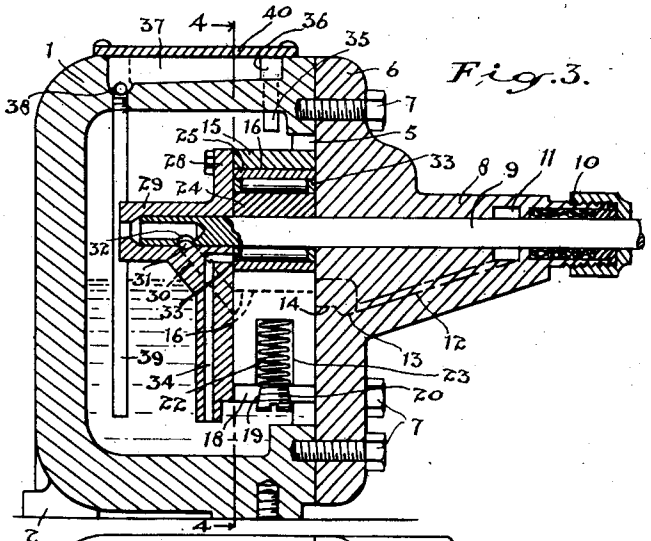


Fig. 3.

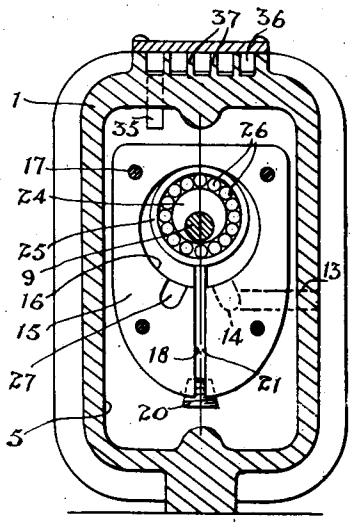


Fig. 4.

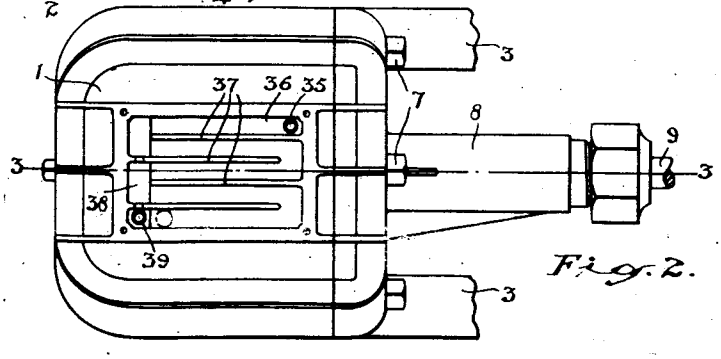


Fig. 2.

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Patented Aug. 20, 1929. 1,725,390

UNITED STATES PATENT OFFICE.

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PUMP.

Application filed July 8, 1926. Serial No. 121,155.

The principal objects of the invention are to provide a small high speed, high pressure pump which will be particularly adaptable for use in small refrigeration plants, such as are required for domestic refrigeration.

A further and important object is to devise a structure which will operate at high speed without noise.

The principal feature of the invention consists in the novel construction and arrangement of parts whereby the full working pressure completely surrounds the compressor member within a closed chamber and such pressure is also applied to the eccentric compressing rotor, maintaining a high pressure seal completely around the compression chamber.

A further important feature consists in the novel manner of lubricating the working parts under full working pressure.

A still further feature of importance consists in the novel construction and arrangement of a separating chamber in the casing of the pump to separate the oil from the compressed air or gas, and a still further feature consists in the novel construction of the drive shaft whereby adverse stresses are eliminated.

In the drawings, Figure 1 is a side elevational view of the pump and direct connected motor for driving same.

Figure 2 is an enlarged plan view of the pump with the cover of the separating chamber removed.

Figure 3 is a vertical mid-sectional elevation on the line 3—3 of Figure 2.

Figure 4 is a vertical cross section through the line 4—4 of Figure 3.

Referring to the accompanying drawings, it will be seen that the pump casing 1 is of rectangular form being a solid casting provided with the supporting feet 2 which are secured to a suitable base 3 which is here shown in the form of a pair of angle irons which are preferably supported on springs 4.

One face of the casing 1 is formed with a rectangular orifice 5 which is sealed by the cap end 6 secured by suitable cap screws 7. The cap 6 is formed with a journal extension 8 in which the operating shaft 9 is journalled. A suitable packing gland 10 is arranged at the outer end of the extension 8 surrounding the shaft.

A circular chamber 11 encircles the journal bearing adjacent to the outer end and is connected by a downwardly and inwardly extending passage 12 which connects with the inlet port 13 which enters the cap from the side edge and connects with the port 14 opening into the inner face of the cap.

The pump cylinder is here shown formed of a solid metal block 15, preferably cast iron, having the cylindrical chamber 16 bored therethrough. This block is secured to the face of the cap 6 within the casing 1 by suitable bolts which pass through the bolt holes 17.

The block 15 is formed with a vertical slot 18 cut completely therethrough from the bottom end into the cylinder chamber. It is found that upon slotting this block the compression stresses in the metal cause the sides of the slot to draw inwardly, tending to close it. A cylindrical hole 19 is bored in the end of the block so that it is bi-sected by the slot 18 and the lower end thereof is threaded with a taper thread to receive the hollow taper plug 20.

A flat blade 21 is inserted in the slot 18 and extends inwardly into the cylinder chamber 16, being spring held inwardly by a coil compression spring 22 enclosed in the hole 19 by the plug 20. The blade is formed with a slot 23 in its lower end to receive the spring.

This construction is very simple and by adjusting the taper plug 20 the desired sliding contact between the blade and the block can be very easily obtained without the necessity of grinding or otherwise fitting the blade.

A cylindrical block 24 which may be made of hardened steel is eccentrically mounted and fixed on the shaft 9 and surrounding this block is a hardened steel ring 25 which is supported from the block by the roller bearings 26. The periphery of the ring 25 engages the inner wall of the cylinder chamber 16 at a point on its circumference and has a rolling contact therewith and the blade 21 is held in spring contact with the periphery of the ring and reciprocates in the slot 18 as the ring is rotated.

The inlet port 14 in the inner face of the cap 6 is arranged at one side of the blade 21 and an outlet port 27 is cut in the cylinder wall at the other side of the blade and at the inward side of the block, that is, at the side of the block opposite to the inlet port 14.

A cap plate 28 corresponding in shape to the inner face of the cylinder block 15 is secured to the inward face thereof by the

bolts which extend through the bolt holes in the cylinder block and this cap plate is formed with a journal bearing 29 to support the inward end of the shaft.

A channel 30 is formed in the cap plate 28 to communicate with the outlet port 27 and it leads angularly upward to a port 31 entering the shaft journal. The inner end of the shaft is formed with a hole 32 communicating with the port 31 and opening outwardly at the end through the open end of the journal into the interior of the casing 1.

A pair of rubbing washers 33, preferably of brass, are arranged within the ends of the ring 25 to engage the ends of the rollers to avoid the possibility of cutting the casing and the working end faces of the cylinder. The ends of the ring 25 are a snug working fit between the inner faces of the caps 6 and 28.

A hole 34 is bored in the cap 28 leading upwardly from the bottom end thereof and opening inwardly at the inner periphery of the ring 25. This hole conducts oil under pressure to the interior of the ring and ensures the thorough lubrication of the ring and of the rollers and the full working pressure of the pump is applied to the oil so that the end surfaces of the ring are always lubricated.

It will be seen that as the shaft is rotated the eccentric block causes the ring 25 to roll around the inner periphery of the cylinder compressing air or gas in the cylinder chamber into the port 27 and channel 30 but it is not allowed to escape into the casing 1 until the port 31 is opened by the hole 32 in the shaft registering therewith. This hole can be arranged at any suitable point in relation to the position of the eccentric rotor to accomplish the desired result. This arrangement prevents the stored pressure from flowing back into the compression chamber.

The blade 21 maintains a constant working contact against the perimeter of the ring 25 and leakage past the blade is prevented by the film of oil maintained therein by the working pressure in the casing 1. The casing 1 is filled with oil to a level above the bottom of the cylinder chamber 16 and the air or gas pressure in the top of the casing 1 maintains a constant pressure from the bottom of the slot 18 inwardly towards the cylinder chamber. The oil pressure also is carried through the hole 34 in the cap plate to the interior of the ring 25. It will thus be seen that the pressure in the compression chamber will be opposed by the pressure in the casing and will not force the oil film from between the working edges of the ring 25 and the cylinder cap or from the working surfaces of the blade 21.

This construction produces a highly efficient compressor which may be operated at very high speed and there is no noise and it will produce very high pressure.

The gas or air compressed is forced into the interior of the casing 1 and is discharged therefrom through a pipe 35 which opens through the top of the casing into a chamber 36. This chamber is provided with a plurality of baffles 37 and the bottom wall of the chamber slopes to a trough 38 at one end and any oil vapour carried with the gas will be separated from the gas within this chamber and will flow down the inclined surface to the trough 38 which is connected to a pipe 39 leading into the interior of the casing 1 and to a point close to the bottom and is sealed by the oil in this casing.

The chamber 36 is closed by a suitable cap 40 in which an outlet pipe arranged at the end of the baffle chamber 36 leads.

It will be noted that the application of oil pressure to the centre of the rotor directs a flow of oil around the shaft 9 outwardly through the journal in the extension 8 and also outwardly through the journal in the cap plate 28. The oil forced outwardly through the journal extension 8 is trapped in the ring chamber 11 and flows through the passage 12 to the inlet port where it is drawn back into the cylinder with the inflowing air or gas. Complete pressure lubrication of the entire working parts is thus obtained.

The device is of such a nature that it can be operated at very high speed and is therefore shown directly connected to the motor 41 and the shaft connection is provided with a flexible coupling formed of a pair of flexible discs 42 each secured to a cross arm 43 connected to the shaft end and between the discs are arranged a pair of rigidly coupled spacing spindles 44 diametrically arranged. This coupling eliminates undesirable stresses in the shaft which might be due to inaccuracies of alignment.

One of the coupling members is provided with a fan 45 which creates a draft to ventilate the motor and effect the cooling of the pump casing by rapid circulation of air.

It will be understood from this description that the construction is extremely compact and simple. There are no complex working parts and no valves to get out of order and it can be manufactured at a very low cost and will operate indefinitely without attention.

What I claim as my invention is:—

1. A pump comprising a cylinder, a hollow eccentric rotor arranged in said cylinder, a casing connected with said cylinder and receiving the full working discharge pressure from the pump and enclosing a quantity of sealing lubricant, and a passage leading from the casing below the lubricant

level and communicating with the hollow interior of said eccentric rotor within said cylinder.

2. A pump, comprising a cylinder, a hollow eccentric rotor arranged in said cylinder, a casing enclosing the cylinder and housing the pump and receiving the full working discharge pressure from the pump, said casing containing a quantity of a sealing lubricant, and a passage leading through the cylinder walls from the interior of said casing below the level of the lubricant to the hollow interior of the rotor and to the rotor cylinder.

3. A pump, comprising a block having a cylinder chamber therein, a slot opening to the cylinder chamber through said block, a blade slidably arranged in said slot and extending into the cylinder chamber, an eccentric rotor arranged in the cylinder and operatively engaging said blade, means for spring holding said blade in engagement with the rotor, said block having an inlet port arranged at one side of the blade and an outlet port arranged at the opposite side of the blade, means closing the end of the cylinder, and a pressure casing enclosing the cylinder block.

4. A pump, comprising a block having a cylinder chamber therein, a slot in the block radially entering the cylinder, a blade slidable in the slot, a shaft extending through the cylinder, an eccentric mounted on the shaft, roller bearings surrounding the eccentric, a ring encircling the roller bearings and engaging the wall of the cylinder eccentrically and operatively engaging said blade, a pressure casing enclosing the cylinder block, said block having an inlet port therein leading to the cylinder chamber at one side of the blade, a port leading from the chamber at the opposite side of the blade, and a lubricating port connected with the pressure chamber and leading to the interior of the eccentric ring.

5. A pump, comprising a casing having an open side, a cap closing said open side and having a journal bearing, a shaft journalled in said bearing, an eccentric rotor mounted on the shaft, a cylinder block secured to said cap, a blade slidably arranged in the cylinder block and engaging said rotor, and a cap closing the inward side of the cylinder block having a journal bearing for the shaft, said former cap having an inlet port therein leading to the cylinder chamber in the cylinder block, the other cap having a port therein leading from the cylinder chamber, said shaft having an opening in the end adapted to register with the outlet port at regular intervals.

6. A pump, comprising a casing having an open side, a cap closing said side and having a journal bearing, a shaft journalled in said bearing, an annular groove in the bearing at the outer end thereof encircling the shaft, a passage leading from said annular groove, said cap having an inlet port communicating with atmosphere and connected with the passage from said annular groove, a cylinder secured to the inner side of the cap and communicating with the inlet port, a reciprocable blade arranged in the cylinder at one side of the inlet port, a rotor eccentrically mounted on the shaft operating in the cylinder and engaging said blade, and a cap closing the inner side of the cylinder and having an outlet port arranged at the opposite side of the blade to the inlet port, said cap having a journal bearing for the end of the shaft, and said shaft having an opening in the end thereof communicating with said outlet port.

7. A pump, comprising a closed casing having a journal bearing in one side thereof and an inlet port opening into the face of the casing adjacent to the bearing, a cylinder block formed of a solid block of metal slotted radially from its cylinder chamber through to its outer side and having a cylindrical orifice intersecting the outer end of the slot, a blade slidably arranged in said slot, said blade having a slot therein registering with the cylindrical orifice, a spring enclosed in said cylindrical orifice and arranged within the slot in the blade, a hollow taper threaded plug threaded into the bottom end of the cylindrical orifice, a shaft in the journal bearing, and an eccentric rotor mounted on the shaft and engaging said blade and operating eccentrically within the cylinder chamber, and an outlet passage leading from the cylinder chamber.

8. A pump, comprising a closed pressure casing, a pump casing sealed within said casing and enclosing a pumping element, a discharge outlet leading from said pump casing into the pressure chamber, an outlet from the pressure casing, a baffled chamber in the top of the pressure casing communicating with said outlet, said chamber having a sloping bottom, an oil return to the interior of the pressure casing leading from the bottom of the baffle chamber and oil sealed at the inner end, and an outlet from the end of the baffle chamber.

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