Oct. 2, 1928. 1,686,339

T. E. MURRAY

PUMP FOR REFRIGERANTS AND THE LIKE

Filed May 12, 1926 2 Sheets-Sheet 1

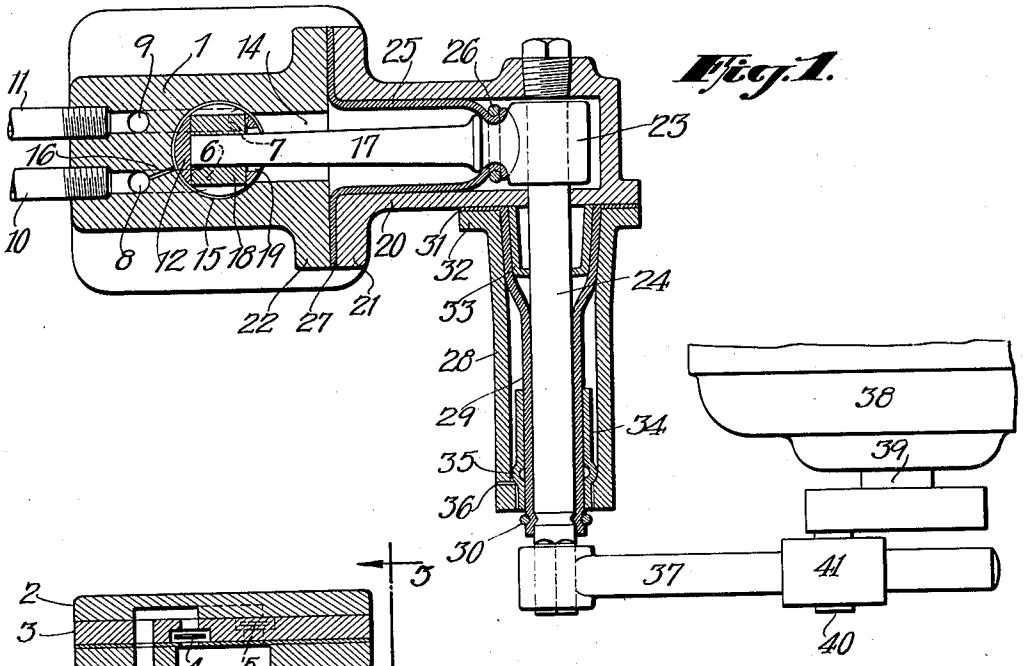


Fig. 1.

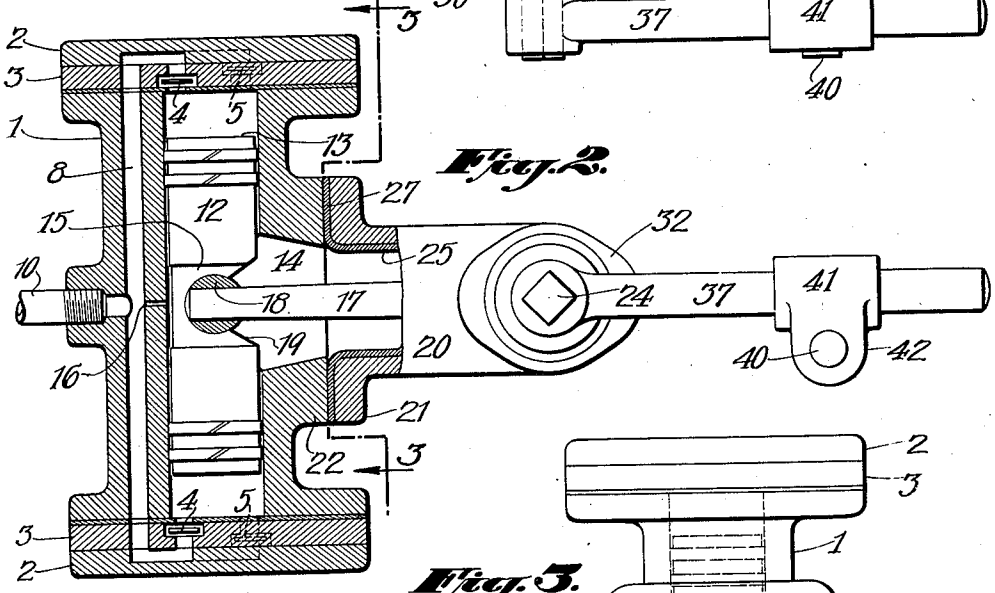


Fig. 2.

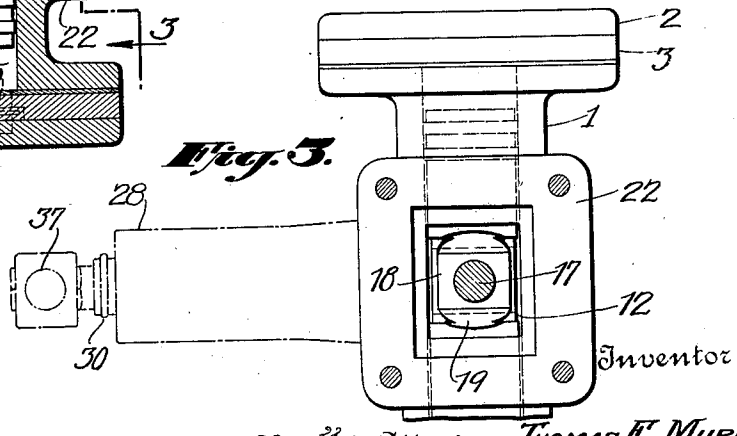


Fig. 3.

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Fig. 4.

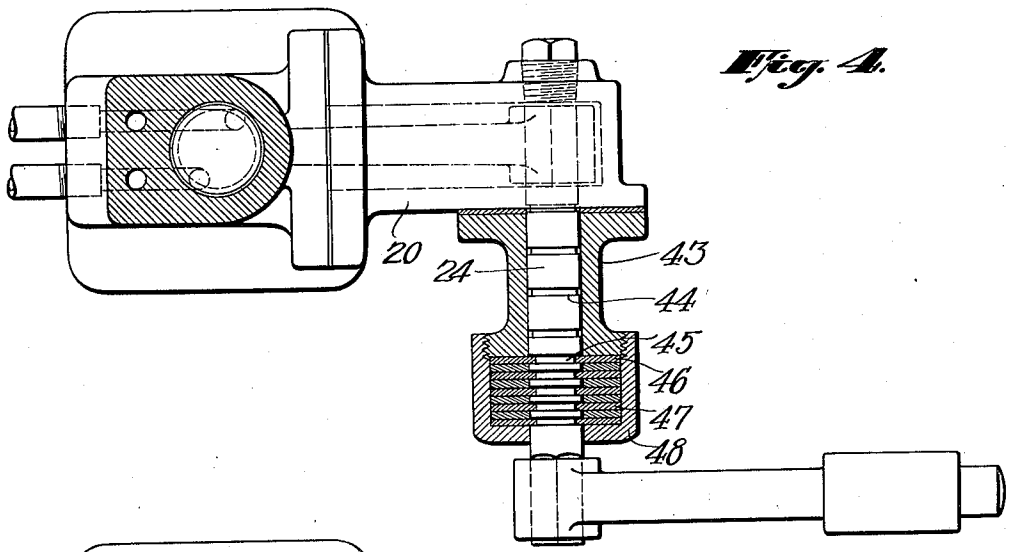


Fig. 5.

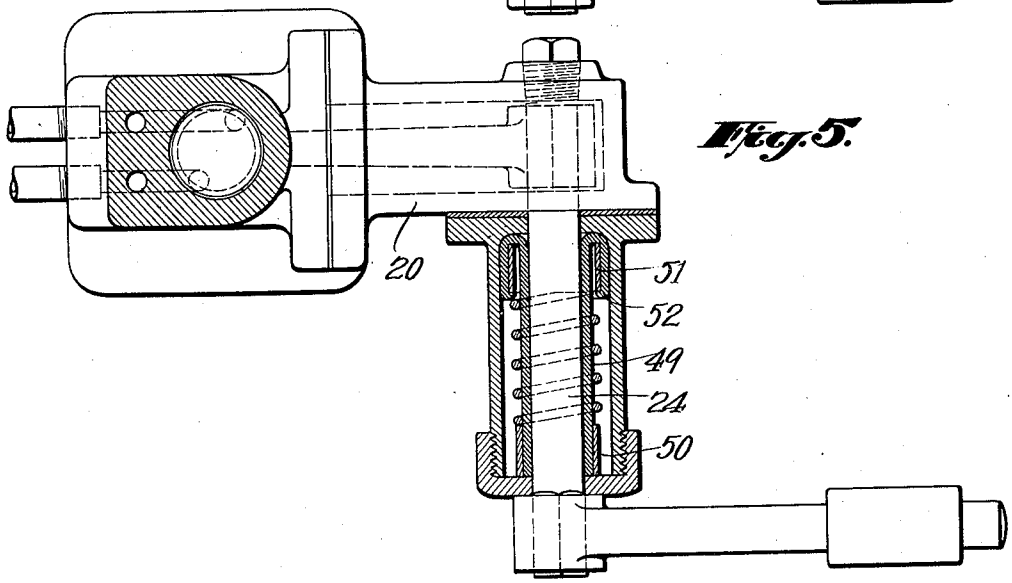
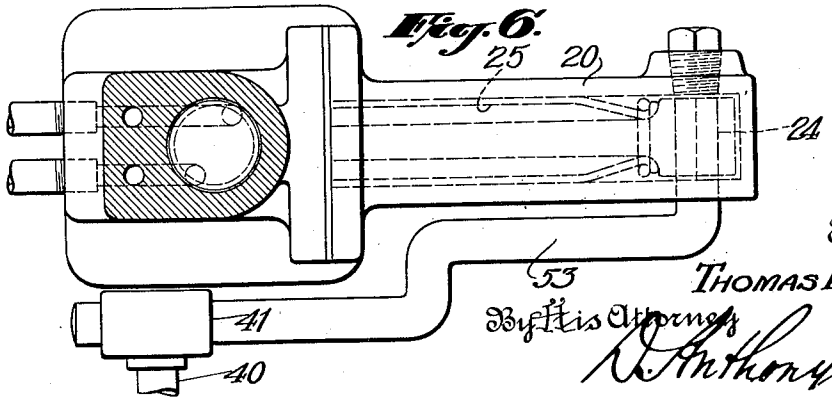


Fig. 6.



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UNITED STATES PATENT OFFICE.

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PUMP FOR REFRIGERANTS AND THE LIKE.

Application filed May 12, 1926. Serial No. 108,489.

In refrigerating apparatus in which sulphur dioxide, ammonia or other refrigerating fluid is pumped through a circulating line, it is important to prevent escape or loss of the fluid or admission of air. The invention aims to provide a pump for this purpose with simple means for making it fluid tight, and provides also a pump which can be made very small and simple in proportion to its capacity. The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a horizontal section of the apparatus partly in plan;

Fig. 2 is a vertical longitudinal section of the same, partly in elevation;

Fig. 3 is a vertical section on the line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 1 showing differences in detail;

Fig. 5 is a horizontal section of another arrangement of the rock shaft;

Fig. 6 is a plan, partly in section, of another alternative arrangement.

The cylinder 1 has heads 2 at opposite ends with interposed plates 3 carrying valves indicated diagrammatically at 4 and 5 for admission and egress of the fluid respectively, leading through ports 6 and 7 and passages 8 and 9 to suction and compression tubes 10 and 11. A piston 12 is provided, with heads 13 at opposite ends, working in the portions of the cylinder which are beyond an opening 14 provided in the side of the latter. The piston is provided with an annular groove 15 around its middle portion which registers with a small duct 16 communicating with the vacuum or suction passage 8; so that any small quantity of the refrigerant leaking past the piston heads will be withdrawn through the duct.

The piston is actuated by an oscillating arm 17 passing through the opening in the side of the cylinder and having its free end in a rocker 18 set in a transverse opening through the middle of the piston. The end of the arm slides in the rocker as the arm is oscillated, thus providing a compact rocking and sliding connection. The side of the piston is cut away to provide a flared opening 19 for the end of the arm to move in.

The rocking arm is carried in a chamber 20 having an open inner end surrounded by a flange 21 which is bolted to the flange 22 surrounding the opening 14 in the side of the cylinder, so that the chamber is in communication with the cylinder and allows the operating arm to move freely. The hub 23 is fixed on a shaft 24 which passes through the outer end of the chamber wall and by which the arm is rocked. A tube 25 of rubber or similar flexible fluid-tight material is arranged to practically close the cylinder and the chamber 20. Its outer end is clamped by a ring 26 about the portion of the arm nearest to the hub and therefore having the least movement and its inner end 27 is flared and clamped between the flanges 21 and 22 so as to make a tight joint with the wall of the chamber. The engagement of the rubber tube may be effected in a variety of other ways, direct and indirect, with the arm and the enclosing wall. The extent of flexing movement is very slight in the length of the tube so that it will have a long life in good condition. Further protection is afforded by the fact that the space within the tube is under a certain degree of suction, so that there is no pressure which would tend to force the vapor through the joints or pores of the tube.

A second chamber 28 is provided enclosing the shaft 24 by which the operating arm 17 is actuated. This chamber is mounted on the side of the chamber 20 making a tight joint with the latter, and a tube 29 of rubber or the like is arranged to give further protection against the escape of the refrigerant. This tube is clamped at its outer end to the shaft by a ring 30 and has its inner end spread in a flange 31 which is clamped between the flange 32 of the second chamber and the wall 20 to which said flange is bolted. The tube 29, as in the case of the tube 25, may be engaged with the parts in various ways, direct or indirect, and a separate packing ring may be used in place of the flange 31. The torsional movement of the outer end of the tube involves little strain on the rubber, being distributed throughout the length of the tube. Consequently the tube will last a long time in good condition.

The use of either tube 25 or 29 may be dispensed with, but I prefer to use them both for greater security.

A sheet metal cup 33 may be arranged around the inner portion of the shaft 24, with its edge against the wall of the chamber 20 to catch any oil and hold it away from the rubber.

A bearing ring 34 of sheet metal is compressed tightly about the outer end of the

rubber tube and has a rib 35 engaging a shoulder near the end of the tubular chamber 28. An oil hole 36 may be provided for lubricating the bearing, the ring 34 extending considerably beyond the bearing point to protect the rubber from the oil.

Fastened on the outer end of the shaft 24 is a lever arm 37. A motor 38 with suitable gearing to secure the desired speed drives a shaft 39 carrying a crank pin 40 by which the lever arm 37 is oscillated. A very simple and efficient connection is provided for this purpose. A driving block is provided comprising a tubular portion 41 sliding on the arm 37 and a lug 42 forming a bearing for the crank pin 40. The crank pin thus is located out of line with the arm and extends entirely across the latter and transmits movement to it most efficiently and smoothly.

Fig. 4 illustrates a case in which the rubber tube is omitted from the first chamber and illustrates also the use of a different arrangement for preventing the escape of the refrigerant. The second chamber 43 is just large enough to fit the shaft 24, the latter being formed of oil grooves 44 to segregate any drops. Near its outer end the shaft is turned to form a number of grooves 45 and is surrounded by plates or discs 46 and 47 of rubber or similar material which are of such thickness that in the positions shown they will make close contact with each other. They thus constitute a sort of sleeve or tube with annular flanges extending into the grooves 45. They are compressed and held in this position by a cap or ring 48 screwed on to the flange on the outer end of the casing 43. The elasticity of the rubber permits of the slight rocking of the shaft required without such strain on the rubber as to seriously affect its tightness or durability.

Fig. 5 illustrates an alternative arrangement in which the shaft 24 is surrounded by a tube 49 of rubber or the like clamped at its outer end by a ring 50 to the shaft and clamped at the opposite end by a ring 51 over which the rubber is folded outward as at 52 so as to bear tightly against the wall of the casing 20.

Fig. 6 illustrates an arrangement in which only the first chamber 20 and rubber tube 25 of Fig. 1 are utilized. It illustrates at the same time a compact disposition of the parts secured by shortening the shaft 24 to the minimum length and operating it by a lever arm 53 which is bent back in the direction toward the cylinder.

Some of the advantages of the invention may be utilized without either of the protective rubber tubes or packings described. For example, the rubber rings of Fig. 4 may be replaced by packings of standard design, and various other schemes may be resorted to for preventing leakage of the refrigerant or other volatile medium being pumped.

In my previous application No. 45,442 filed July 22, 1925, I have described a seal similar in a general way to those described and claimed herein.

Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claim.

What I claim is:—

A pump for refrigerants and the like including a cylinder, a piston, an oscillating arm for actuating the piston, a chamber extending laterally from the cylinder and enclosing said arm, a second chamber extending laterally from the outer end of the first one, a shaft for said arm extending through said second chamber, a flexible fluid-tight tube within the first chamber surrounding said arm and engaging the wall of the chamber and packing means within the second chamber between said shaft and the wall of the chamber.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.