Nov. 27, 1945. C. D. MACGILL 2,389,918

RECIPROCATING PUMP

Filed Aug. 6, 1942

FIG: 1.

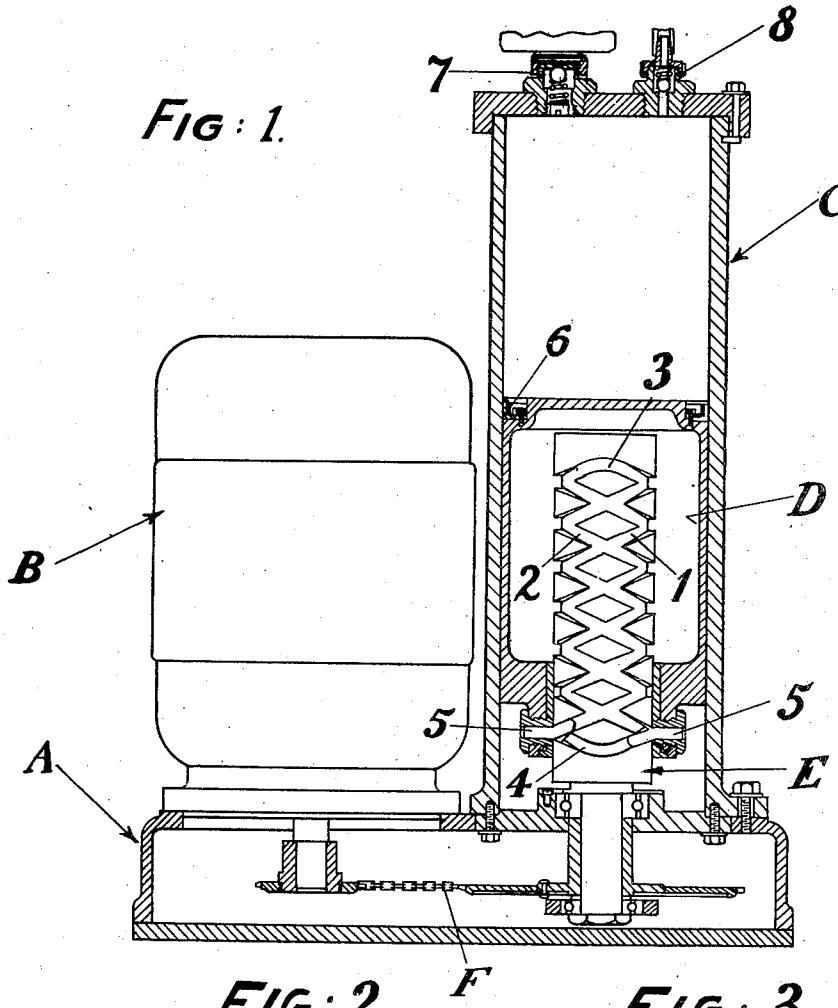


FIG: 2.

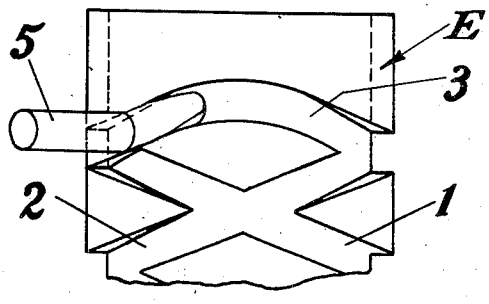
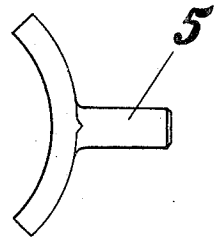


FIG: 3.



Charles Dalrymple Macgill. INVENTOR

BY

Lancaster, Allwine & Rommel

ATTORNEYS.

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RECIPROCATING PUMP

Charles Dalrymple Macgill, Glasgow W. 3, Scotland, assignor to Barr & Stroud, Limited, Glasgow, Scotland

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2 Claims. (Cl. 230—58)

Reciprocating pumps are known in which the reciprocation of a piston element within a cylinder is derived from the rotation of a shaft having a double helical thread arrangement comprising two threads, a right hand thread and a left hand thread, extending over the same part of the axial length of the shaft, with which threads the piston element engages, so that, with the piston held against rotation, rotation of the shaft about its axis causes reciprocation of the piston, the engagement of the piston with the shaft changing from one thread to the other at each end of the travel.

The present invention refers to pumps of this kind and is particularly concerned with a construction of pump such as will give a supply of air under pressure free from contamination by the lubricant used within the cylinder.

According to this invention, a pump of the kind referred to is made single-acting and comprises a cylinder, a double-threaded rotary shaft extending into the cylinder from one end of the latter, and a piston having a pressure end to act on the medium to be compressed and having means whereby the piston is engaged with the threads of the shaft, the said engagement means being separated from the pressure end by an axial distance greater than the travel of the piston, so that the pressure end of the piston reciprocates between the inner end of the shaft and the second end of the cylinder.

In this way the compression chamber between the end of the cylinder and the pressure end of the piston will remain clean and free of lubricant. The parts which principally require lubricant, viz. the screw-threaded shaft and the means whereby the piston engages with the threads, being separated from the compression chamber.

The piston may be in the form of a cylindrical body, closed at one end to constitute a pressure end and engaging at the other end with the threads of the shaft, the shaft extending into the interior of the piston.

In one example of construction, the threads are cut in the shaft and the thread-engaging means of the piston are in the form of two inwardly directed pins to engage with the threads, each pin having an arcuate cross-piece at its inner extremity curved to correspond with the curvature of the threads and being rockable about the axis of the pin so that the cross-piece can follow the inclination of the threads.

A pump in accordance with the invention may form part of a system for cleaning rain, spray, soot or the like from the windows of rangefinders and other optical observation instruments, the pump being arranged to supply air under pressure in puffs for direction on to the windows.

The invention will now be described with reference to the accompanying drawing, in which:

Figure 1 is a side elevation, partly in section, showing one example of pump, and

Figures 2 and 3 are views showing a detail.

Referring to the figures, the pump comprises a base A, an electric motor B mounted on the base, a pump cylinder C, also mounted on the base A, a piston D within the cylinder C, a shaft E cut with a double helical thread, and chain and sprocket wheel gearing F by means of which the motor B drives the shaft E.

The threaded shaft E extends upwards from the base A into engagement with the piston D. The right and left hand threads, which are denoted by 1, 2, respectively, are connected at the top and bottom at 3 and 4. Actually there are two left hand and two right hand threads, viz. the right and left hand threads shown in Figure 2, and a similar pair of threads at the rear of the shaft E and not seen in Figure 2. The arrangement is such that the start of one right hand thread and the start of one left hand thread are diametrically opposite the start of the other right hand thread and the other left hand thread.

Engagement of the piston D with the shaft E is effected by means of two pins 5 carried by the lower end of the piston and projecting inwardly into the threads 1 and 2 at diametrically opposite positions. Each pin 5 is freely rockable about its diametrical axis and is of the approximately T-shape shown in Figure 3, having a stem engaging with the piston D and an arcuate cross-piece engaging with the thread 1 or 2. Figure 2 shows one of the pins 5 changing over from one thread to the other at the top of the stroke.

The piston at its top has a leather ring 6.

At the top of the cylinder C there is an air induction valve 7 and an air delivery valve 8, both of the spring and ball type.

When the motor is running, the shaft E is caused to rotate. The cross-pieces of the two pins 5 enter, say, the two starts of the right hand thread and travel up the right hand thread to the top, where they are changed over into engagement with the left hand threads and travel down again, and so on. On the down stroke, air is drawn in through the vavle 7 and on the up stroke is delivered under pressure through the valve 8, the pump being single acting.

An advantage of a pump as described is that

the air compression chamber between the top of the cylinder and the top of the piston will remain clean and free of lubricant. The parts which principally require lubrication, viz. the pins 5 and the threads 1 and 2, are enclosed in the piston D and are thus separated from the air compression chamber.

The threads have been described as helical grooves or channels in the surface of the shaft; they may, however, be in the form of helical ribs or ridges on the surface of the shaft, the right and left hand threads crossing one another.

I claim:

1. A single acting reciprocating pump comprising a base, assumed to be horizontal, an electric motor mounted on the base with the motor shaft vertical, a vertical rotatable shaft supported by the base and having a double helical thread cut in it over part of its length, a cylinder mounted at the base with its axis vertical, a piston reciprocating within the cylinder and into which the threaded shaft extends axially, the piston having a pressure end to act on the medium to be compressed and a part engaging with the threads of the shaft, the said shaft-engaging part being separated from the pressure end by a distance greater than the travel of the piston, gearing connecting the motor shaft with the threaded shaft, and induction and delivery valves fitted to the cylinder, the pressure end of the piston reciprocating between the inner end of the shaft and the second end of the cylinder.

2. A single acting reciprocating pump comprising a base, assumed to be horizontal, an electric motor mounted on the base with the motor shaft vertical, a vertical rotatable shaft supported by the base and having a double helical thread cut in it over part of its length, a cylinder mounted on the base with its axis vertical, a piston reciprocating within the cylinder and into which the threaded shaft extends axially, the piston having a pressure end to act on the medium being compressed and a part engaging with the threads of the shaft, the shaft-engaging part being in the form of two inwardly directed pins to engage with the threads, each pin having an arcuate cross-piece at its inner extremity curved to correspond with the curvature of the threads and rockable about the axis of the pin so that the cross-piece can follow the inclination of the threads, the pressure end being separated from the shaft-engaging part by an axial distance greater than the travel of the piston and reciprocating between the inner end of the shaft and the second end of the cylinder, gearing connecting the motor shaft with the threaded shaft, and induction and delivery valves fitted to the cylinder.

CHAS D MACGILL.