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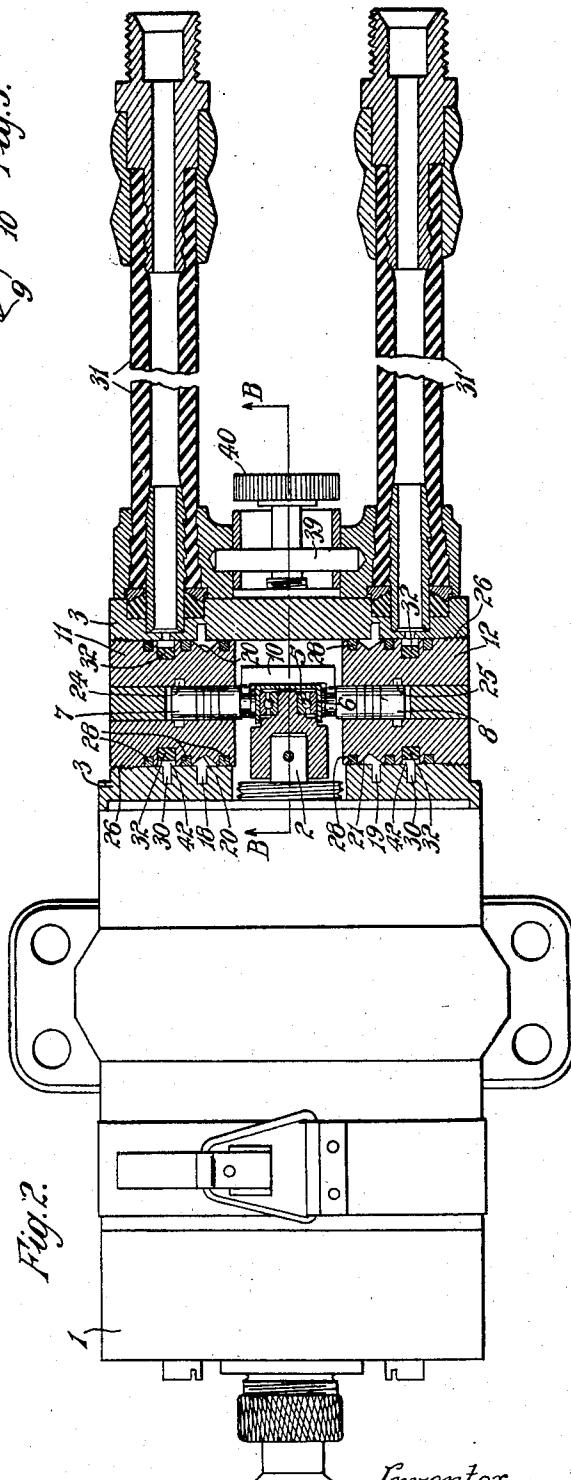
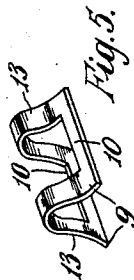
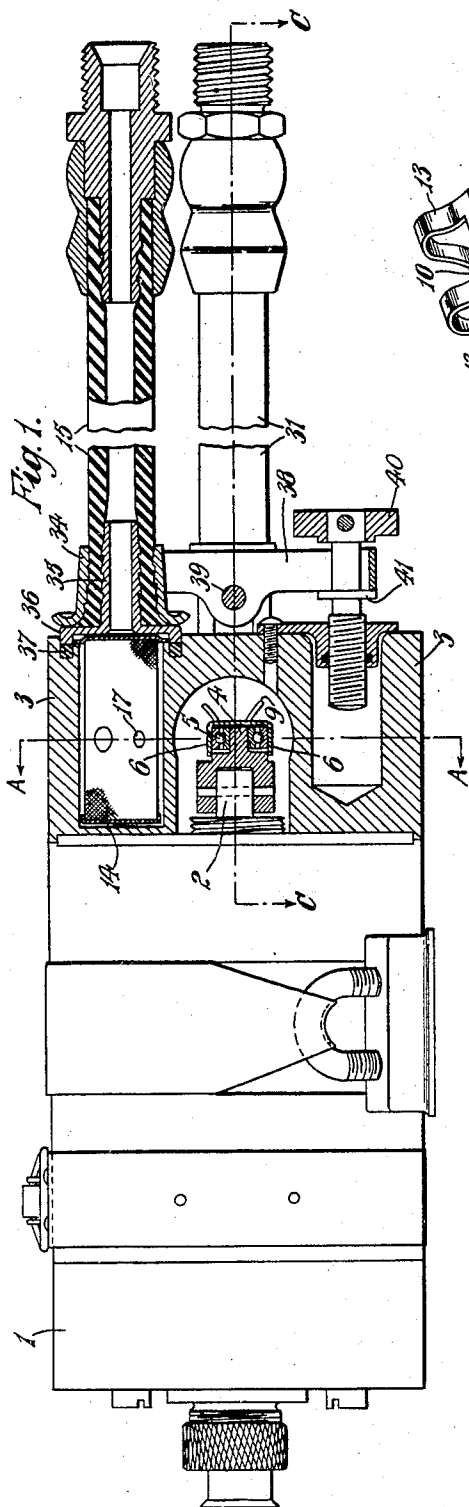
H. TREVASKIS

2,337,510

RECIPROCATING PUMP FOR DELIVERING LIQUIDS

Filed April 25, 1941

2 Sheets-Sheet 1



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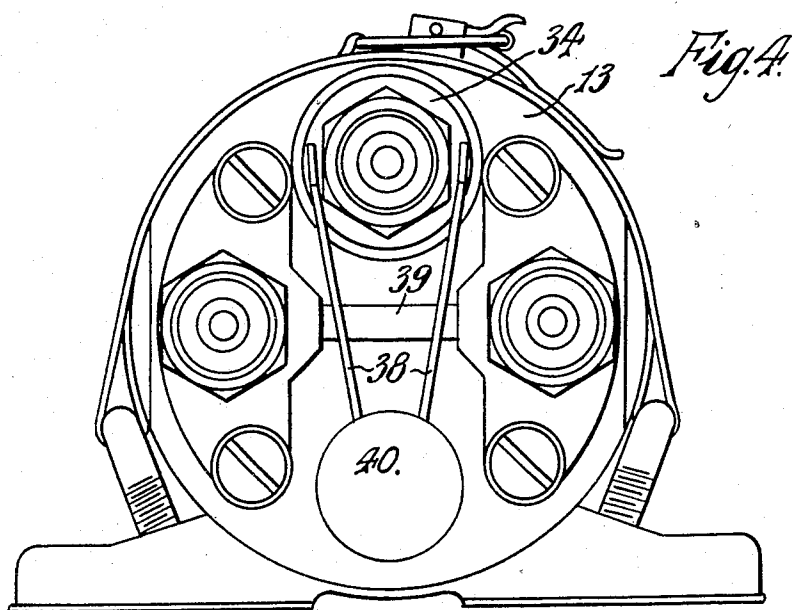
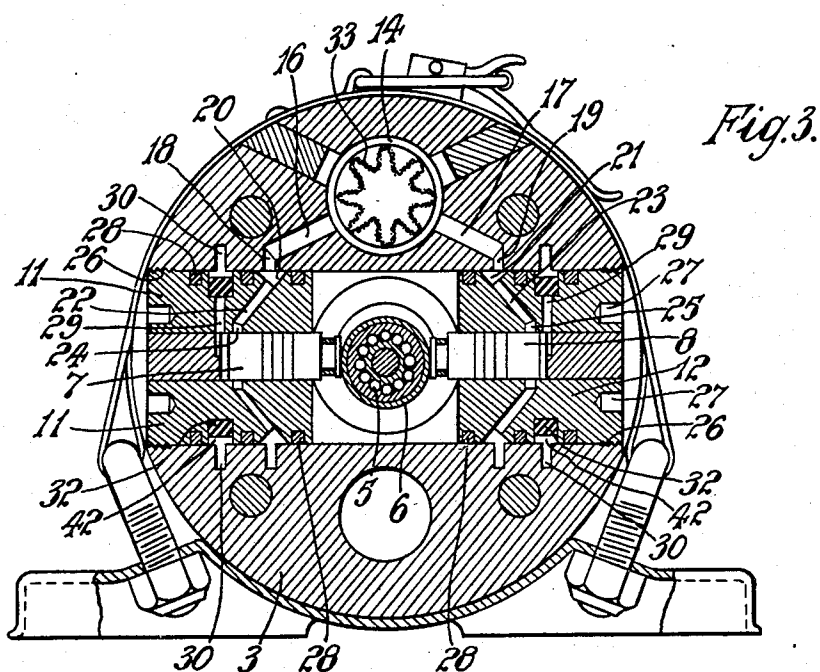
H. TREVASKIS

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UNITED STATES PATENT OFFICE

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RECIPROCATING PUMP FOR DELIVERING LIQUIDS

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Application April 25, 1941, Serial No. 390,251
In Great Britain August 21, 1940

6 Claims. (Cl. 103—171)

My invention relates to improvements in reciprocating pumps for delivering liquids or fluids under pressure, and provides a compact pump mechanism of simple construction and light in weight.

The pump of my invention is suitable for supplying liquid under pressure as in fluid pressure systems used in de-icing apparatus for protecting the surfaces of aircraft against the accretion of ice thereon.

In my invention the pump comprises a cylinder and piston assembly in which the intake port is closed by the movement of the piston and delivers the liquid through an outlet port having a suitable non-return or check valve, preferably of rubber or similar resilient material.

The cylinder and piston assemblies may be arranged symmetrically relative to the driving shaft as, for example, on opposite sides of the shaft and maintained in operative contact with the shaft by a bridge piece engaging the adjacent ends of pistons disposed on opposite sides of the driving shaft.

The driving shaft comprises an eccentrically mounted roller at right angles to the line of movement of the pistons and acting upon the pistons of the bridge piece to move the pistons alternately in forcing and suction strokes.

My invention is more particularly directed to pumps of the above type having a piston throw of a fraction of an inch when driven at high speed.

The cylinder may be adjusted relative to the driving shaft and the throw of the pistons to control the inlet cut-off and thus effect the stroke of the piston.

The various features of my invention are illustrated by way of example in the accompanying drawings in which

Fig. 1 is a part sectional view of the pump. Fig. 2 is a part sectional plan view on the line C—C of Fig. 1. Fig. 3 is a sectional view on the line A—A of Fig. 1. Fig. 4 is an outside end view corresponding to Fig. 3. Fig. 5 is a part perspective view of a portion of the apparatus.

Referring to the drawings the invention comprises a cylindrical casing 1, Fig. 1, and Fig. 2, containing a high speed electric motor, the shaft 2 of which extends axially outward from the motor casing into a pump housing 3 containing the pump mechanism.

The motor shaft 2 has an eccentric portion 4, Fig. 1, to exert a throw of the order of .072 inch.

The eccentric portion 4 exerts its throw through ball bearings 5, and a cup around the

outer races which cup constitutes a roller 6 which contacts on opposite sides of its periphery with the adjacent ends of a pair of substantially co-axial pistons 7 and 8, Fig. 2, the other ends of which are grooved circumferentially and held in contact with said roller by a bridge or connecting piece consisting of a U-shaped frame work, Fig. 5, of which the ends constitute clips engaging with the grooves in the pistons so as to permit of some misalignment between them. The bridge piece may be resilient and may consist of two U-shaped end parts 13 the free ends of which parts are flared apart at 9, Figs. 1 and 5, and which merge at right angles into two parallel bars 10, Figs. 2 and 5, connecting said ends together.

The electric motor may run at about 8000 R. P. M., its shaft and eccentric roller imparting rapid and reciprocating movement to the pistons 7 and 8, Fig. 2, each of which is displaceable in one of a pair of cylinders 11 and 12, Fig. 2, positioned in the circular pump housing 3 which is bored through its diameter to receive them. The housing 3 is formed internally with a liquid inlet chamber 14, Figs. 1 and 3, which is externally connected by a pipe 15, Fig. 1, to a source of de-icing or other fluid not shown. The inlet chamber 14, Fig. 3, is connected by diverging passages 16 and 17, Fig. 3, to annular grooves 18 and 19 which register with larger annular grooves 20 and 21 formed on the greater diameter surfaces of the cylinders from which grooves further inclined channels 22 and 23 conduct the liquid through the body of each cylinder into the bore thereof.

The inclined channels 22 and 23 through the bodies of the cylinders terminate at the bore of the cylinder in annular grooves 24, 25 constituting inlet ports which are closed by the pistons 7 and 8 on their respective working strokes and opened on the return or suction strokes of the respective pistons.

The point of cut-off between each of the pistons 7 and 8 and the annular inlet ports 24 and 25 is finely adjustable by the rotation of the cylinders 11 and 12 which are formed with fine threads 26, Figs. 2 and 3, engaging with similar threads in the circular body of the pump housing, so that by angular movement the position of either cylinder 11 or 12 relative to the housing and to the pistons may be adjusted as, for example, by a tool engaging recesses 27, Fig. 3, in the ends of the cylinders. A locking device, not shown, may be provided for fixing each cylinder in the adjusted position, and may comprise a bar

detachably secured to the end face of each cylinder and having a pair of V-shaped projections which engage a splined hole in a locking plate having its ends engaged in recesses in the housing. The joint between each of the cylinders 11 and 12 and the housing 3 may be sealed by three rubber rings 28 compressed in grooves between the adjacent surfaces.

The fluid admitted to the cylinders during the return or inward strokes of the pistons is expelled on their working or outward strokes from the outer end of each cylinder bore through radial passages 29, Fig. 3, which extend to annular grooves of rectangular section which register with an overlap smaller grooves 30, the latter being each connected to one of a pair of outlet pipes 31, Fig. 2, which may be connected to the de-icing or other apparatus to be supplied with fluid.

The annular outlet grooves 42 in the cylinders are each provided with elastic rubber bands 32 constituting non-return valves, the bands being displaceable by the fluid from their seats during the working stroke to permit the passage of fluid to the outlet pipes 31.

Within the fluid inlet chamber 14 is positioned a metal gauze filter 33 of the sinuous cross-section shown in Fig. 3 which provides the maximum surface area, and the inlet pipe 15 is detachably connected thereto through a pipe coupling comprising an outer flanged sleeve 34, Fig. 1, and an inner flanged sleeve 35 the flange 36 of which is pressed against a sealing washer 37 which is positioned in a recess in the end face of the pump housing 3.

The flange on the sleeve 34 is of concave section and is engaged by the ends of a V-shaped rocking member 38, Figs. 1 and 4, which is pivoted at 39 and is engaged by a threaded turn-screw 40 at its other end. The ends of the V-shaped rocking member 38 as shown in Fig. 4 constitute springs normally tending to fly out of engagement with said flange whereupon the inlet pipe and filter are easily detached for inspection and cleaning.

To secure the inlet pipe 15 to the pump housing 3 the ends of the V-shaped rocking member 38 are pinched together within the flange of the sleeve 34, and the turn-screw 40 is then rotated anticlockwise whereby the collar 41, Fig. 1, causes the outward movement of one end of the rocking member 38 and the inward movement of its opposite ends which engage the flange of the sleeve 34 whereby the flange 36 is pressed into sealing engagement with the rubber sealing washer 37.

In the above invention the pump is of a very simple construction having no inlet valve and only the rubber band 32 as an outlet valve. It, therefore, has a minimum of moving parts that could get out of order and which might offer obstructions to a pump operating at the speed at which the pump of my invention may be driven. The inlet cut-off and effective stroke of the pump may be adjusted very easily and quickly by merely turning the cylinder wall to adjust the longitudinal position of the cylinder relative to the driving shaft. The rate of delivery of fluid may be adjusted by such an adjustment. The construction of the pump is such that it may deliver the liquid or other fluid under a very considerable pressure.

Having described my invention, what I claim is:

1. A high speed, short stroke, pump which comprises a pump casing having a cylindrical bore therethrough, a drive shaft intersecting said bore at a right angle and having an eccentric in said bore, said bore having a pair of outlet grooves on opposite sides of said eccentric and a pair of inlet grooves between said outlet grooves and said eccentric, a pair of cylinders in said bore symmetrically arranged on opposite sides of said eccentric, each cylinder having an inlet groove facing the inlet groove of said bore and communicating with an inlet groove within said cylinder and having a circumferential outlet groove facing the outlet groove of said bore and communicating with the interior of said cylinder, a ring of elastic resilient material in said circumferential groove and yieldably tensioned against the communication with the interior of said cylinder, a pair of plungers, one for each cylinder, engaging and reciprocated by said eccentric to move the end of the plunger past said inner inlet groove and means to adjust the positions of said cylinders toward or from said eccentric.
2. A high speed, short stroke, pump which comprises a pump casing having a cylindrical bore therethrough, a drive shaft intersecting said bore at a right angle and having an eccentric in said bore, said bore having a pair of outlet grooves and inlet grooves on opposite sides of said eccentric, a pair of cylinders in said bore symmetrically arranged on opposite sides of said eccentric, each said cylinder having a circumferential outlet groove facing the outlet groove of said bore and communicating with the interior of said cylinder, and an inlet groove facing the inlet groove of said bore and communicating with the interior of said cylinder between the outlet communication and said eccentric, a ring of elastic resilient material in said circumferential outlet groove and yieldably tensioned against the communication of said groove with the interior of said cylinder, a pair of plungers, one for each cylinder engaging and reciprocated by said eccentric to move the end of the plunger past said inner inlet groove and means to adjust the positions of said cylinders toward or from said eccentric.
3. The pump of claim 1 in which said means to adjust the position of said cylinders comprises screw threads on said cylinders and said bore to move said cylinders lengthwise of said bore when rotated.
4. The pump of claim 1 in which said plungers about the opposite sides of said eccentric and a bridge piece connecting plungers across said eccentric.
5. The pump of claim 1 in which said plungers about the opposite sides of said eccentric and having bridge pieces connecting said plungers across said eccentric, said bridge comprising a pair of lengthwise bars, extending over the ends of said eccentric and yokes engaging said plungers and integral with said bars.
6. The pump of claim 1 having a roller bearing sleeve about said eccentric and a bridge piece connecting said plungers across said eccentric and holding said plungers tightly against said sleeve.

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