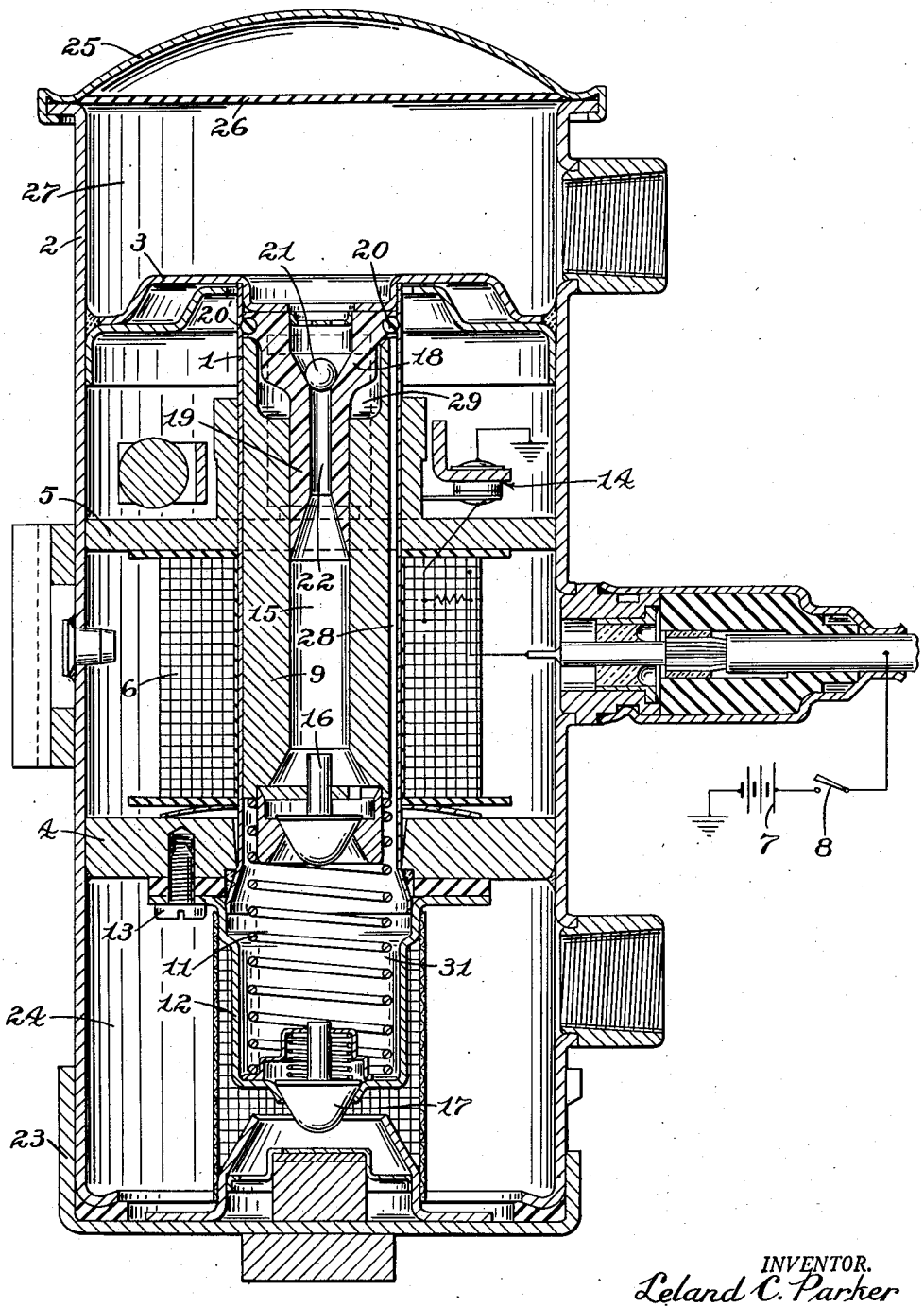
Feb. 16, 1954 L. C. PARKER 2,669,186

RECIPROCATORY ELECTROMAGNETIC PUMP

Filed Nov. 28, 1951



INVENTOR.
Leland C. Parker

WITNESS:
Esther M. Stockton

BY
Clinton L. Janes
ATTORNEY

Patented Feb. 16, 1954 2,669,186

UNITED STATES PATENT OFFICE

2,669,186

RECIPROCATORY ELECTROMAGNETIC PUMP

Leland C. Parker, Elmira, N. Y., assignor to Bendix Aviation Corporation, a corporation of Delaware

Application November 28, 1951, Serial No. 258,573

3 Claims. (Cl. 103—53)

1

The present invention relates to a reciprocatory electro-magnetic pump, and more particularly to a single-stage plunger type of pump arranged to deliver a liquid against higher pressure than usual for this type of pump.

In the co-pending application of Aumick et al., Serial 243,332 filed August 23, 1951, now Patent No. 2,641,188, and assigned to the assignee of the present application, a sub-caliber type of pump is disclosed incorporating a magnetic plunger and a piston of reduced diameter actuated thereby, co-operating with a stationary cylinder to form a high pressure pump. The present disclosure is in the nature of an improvement over the structure shown in the earlier application.

It is an object of the present invention to provide a novel high pressure type electro-magnetic pump which is simple in construction, effective in operation, and economical to manufacture.

It is another object to provide such a device which involves only slight alteration of commercial structure to adapt it for high pressure service.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing in which the figure is a vertical substantially mid-sectional view of a preferred embodiment of the invention.

In the drawing there is illustrated a cylinder 1 of non-magnetic material which is supported at one end in a cylindrical casing 2 by means of a partition member 3. The lower end of the cylinder is similarly supported in the casing 2 by means of a pole piece 4. A second pole piece 5 is located in the casing at an intermediate point, and an electro-magnet 6 is located between the pole pieces 4 and 5 and adapted to be energized by a battery 7 under the control of a manual switch 8.

A plunger 9 of magnetic material is slideably mounted in the cylinder 1 and is yieldably urged toward its upper position as illustrated by means of a spring 11 bearing against the lower end of the plunger and seated in a cup member 12 attached as indicated at 13 to the pole piece 4. Energization of the electro-magnet 6 draws the plunger 9 downward against the pressure of the spring 11. Means indicated generally by numeral 14 is provided for automatically controlling the energization of the electromagnet to cause reciprocation of the plunger. This controlling mechanism is the same as that illustrated and described in the patent to Dickey and Trout 2,472,067, issued June 7, 1949, so that further description thereof is deemed unnecessary.

The plunger 9 is provided with a centrally

2

located cylindrical bore 15 controlled by a check valve 16 mounted in the lower end of the plunger, and second check valve 17 is mounted in the lower end of the cup 12. The plunger is also provided with one or more channels 28 extending from end to end thereof so as to provide free communication between the spaces 29 and 31 in the cylinder 1 above and below the plunger respectively.

A hollow piston member 18 is mounted in the upper end of the cylinder 1 and has a cylindrical portion 19 which fits closely in the bore 15 of the plunger 9 with freedom for relative sliding movement. The fit of the piston 18 in the cylinder 1 is sufficiently loose to permit the piston to align itself with the bore of the plunger 9, suitable packing or sealing means 20 being provided to prevent leakage past the piston. The cylinder 1 is preferably provided with an annular groove 20' receiving the ring 20 and thus serving to anchor the piston 18 in the upper end of the cylinder. The piston is provided with a check valve 21 which prevents downward flow of liquid through its bore 22.

Casing 2 is provided with a cap 23 on its lower end which forms a closed inlet chamber 24, and also has an air dome member 25 which clamps a flexible diaphragm 26 to the top of the casing so as to provide an outlet chamber 27.

In operation, energization of the electromagnet 6 draws the plunger 9 downward, cocking the spring 11 while the piston 18 remains stationary due to its anchorage 20, 20' in the upper end of the cylinder 1. The liquid in the space 31 below the plunger is prevented from escaping back into the inlet chamber 24 by the check valve 17 so that the portion thereof represented by the volume of the piston member 18 withdrawn from the bore 15 of the plunger, flows past the check valve 16 into said bore, while the remainder flows through the channels 28 into the space 29 above the plunger. When the coil 6 is de-energized, the spring 11 becomes effective to move the plunger upward, whereupon the liquid in the bore 15 of the plunger trapped by the check valve 16 is forced out through the upper check valve 21 into the outlet chamber 27. Simultaneously the liquid in the space 29 above the plunger is free to return through the channels 28 to the space 31 below the plunger. Since the cross-sectional area of the cylindrical portion 19 of the piston 18 is much smaller than the cross-sectional area of the plunger 9, it will be appreciated that the force of the spring 11 which is thus applied against the small area of the piston, is effective to develop

a high unit pressure in the outlet chamber 27. Any desired pressure may readily be attained by suitable reduction in the size of the cylindrical portion 19 of the piston, such increased pressure being of course accompanied by a corresponding reduction in the volume of output of the pump.

Although but one embodiment of the invention has been shown and described in detail, it will be understood that other embodiments are possible and changes may be made in the design and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. In a reciprocatory electromagnetic pump, a casing having an inlet chamber in one end and an outlet chamber in the other, a non-magnetic cylinder connecting said chambers, a hollow magnetic plunger slidably mounted therein, means including an electromagnet for reciprocating the plunger, a hollow piston anchored and sealed in the end of the cylinder adjacent the output chamber, extending into the discharge end of the hollow bore of the plunger and closely fitting therein with freedom for relative sliding movement, a

check valve preventing backward flow from the cylinder and check valves preventing backward flow through the bores of the plunger and the piston.

2. A pump as set forth in claim 1 in which said plunger is traversed by a passage which is separate and distinct from its hollow bore, connecting the space above the plunger in the non-magnetic cylinder with the space in said cylinder below the plunger.

3. A pump as set forth in claim 1 including further means for mounting the hollow piston in the discharge end of the cylinder with freedom for slight universal movement, and packing means preventing the passage of liquid through said mounting means.

LELAND C. PARKER.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,822,242	Schongut	Sept. 8, 1931
2,443,344	Eckleberry	June 15, 1948