Feb. 12, 1935. K. SCHOENE 1,990,618

PUMP

Filed April 15, 1933

Fig. 1

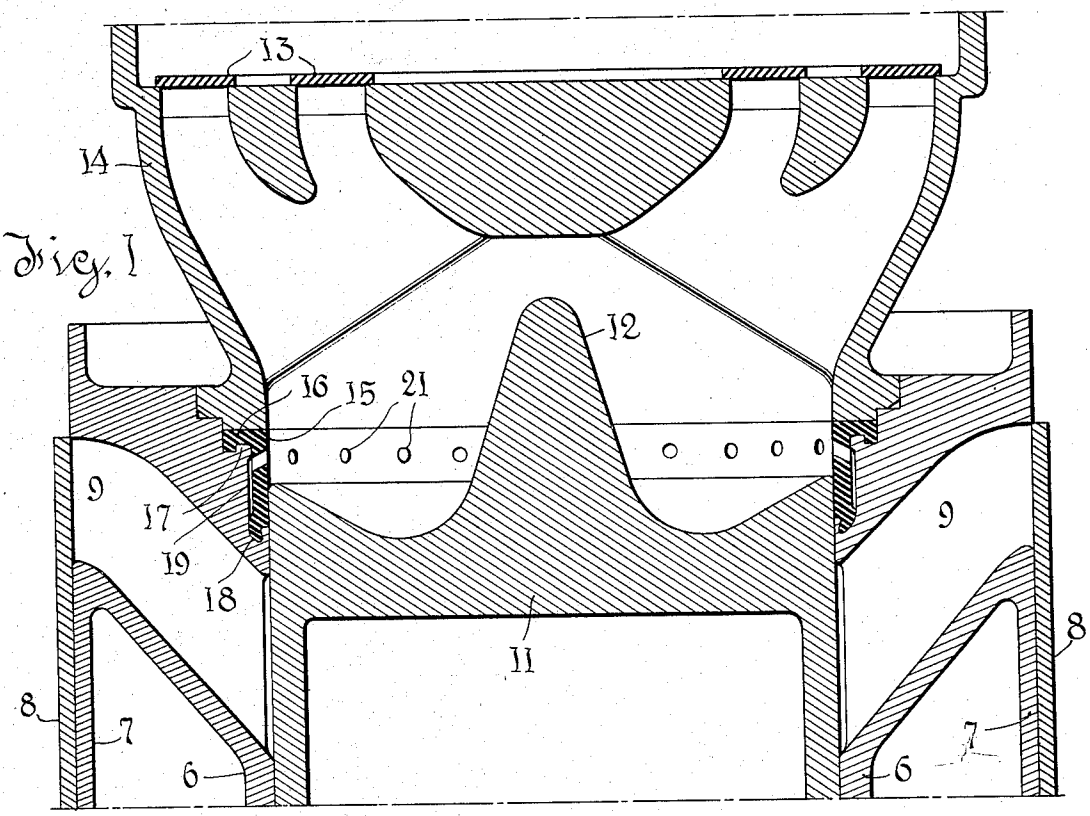


Fig. 2

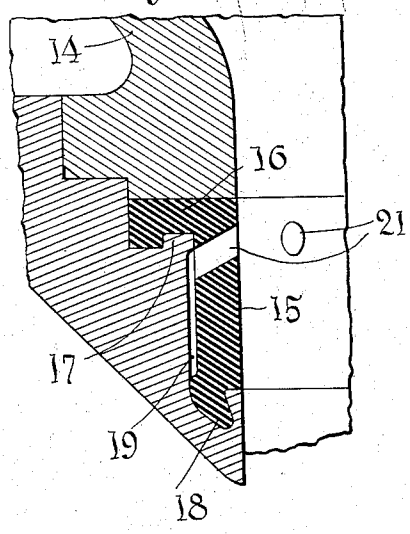
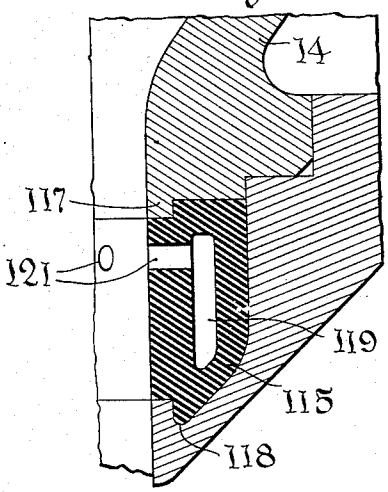


Fig. 3



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1,990,618

PUMP

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In Germany April 29, 1932

3 Claims. (Cl. 103—202)

This invention relates to pumps, and particularly to pumps of the type in which the displacing plunger overtravels inlet ports formed in the side walls of the cylinder.

A typical example of a pump of this type is described and claimed in my prior Patent 1,760,172, May 27, 1930.

In the structure of the prior patent the inlet ports are controlled by a sleeve valve and also by the plunger. On the discharge stroke, the sleeve valve closes the inlet ports until the plunger overtravels the inlet ports and closes them. Shortly thereafter, and before the plunger reaches the head end dead point, the sleeve valve starts to open the inlet ports, arriving at full open position before the plunger commences to overtravel and reopen the inlet ports. From this sequence of operations, it follows that as soon as the plunger has overtraveled and closed the inlet ports, leakage is prevented solely by the joint between the plunger and the cylinder walls. Heretofore this joint has been sealed by packing carried by the piston, and consequently subject to destructive wear in its passage over the grids of the inlet ports.

The present invention provides a packing mounted in the cylinder walls and wholly inert until the plunger comes into engagement therewith. The packing is so designed as to be distended by pressure in the working space as soon as it is partially overtraveled by the plunger.

Another advantageous feature is that when the plunger starts its suction stroke and before the inlet ports are opened, the reduced pressure in the working space renders the packing inactive. In this way wear is minimized.

Two embodiments of the inventions are disclosed in the accompanying drawing, in which,—

Fig. 1 is a vertical axial section of the upper portion of a cylinder and plunger with the invention applied. The plunger is shown approaching the head end dead point, the sleeve valve being about to open.

Fig. 2 is an enlarged fragmentary view showing the packing illustrated in Fig. 1.

Fig. 3 is a similar view, showing a modified form of packing.

Referring first to Figs. 1 and 2, the cylinder wall is shown at 6 and is cast integrally with an outer sleeve 7 forming a seat for the encircling sleeve valve 8. The sleeve valve 8 controls the inlet ports 9 which are located in a circumferential series around the side walls of the cylinder. These ports are inclined downwardly and when exposed by downward motion of the plunger 11, direct the entering liquid against the plunger 11.

The plunger 11 has a special configuration, clearly shown in the drawing, designed to deflect the entering liquid and recover from it a part of its kinetic energy. The particular configuration of the plunger head is not material, but may be described as having a concave annulus with a central projecting cone 12. This serves to reverse the direction of the entering liquid without inducing eddying.

The discharge valves 13 are of the ring type and are mounted in the cylinder head structure 14, over suitable annular ports. So far as the present invention is concerned it is immaterial whether they are provided with springs or not, but springs will commonly be used.

The packing comprises a ring 15, of rubber or like material, substantially L-shaped in cross section, and mounted in a recess provided for it in the upper internal margin of the cylinder 6. This recess is at the junction of the cylinder with the head 14, and the packing ring may be readily removed after removal of the head. The flange 16, which gives the ring 15 its L-shaped cross section, projects outwardly and overhangs the bead 17 which serves to lock the ring in position. It is further held in position by a tongue 18 fitting in an undercut formed in the cylinder wall, as clearly shown in Figs. 1 and 2.

The ring and the recess in which it is mounted are so formed as to afford an annular clearance 19 which extends around the outer side of the ring 15, and which is in communication with the working space of the pump by means of the ports 21 formed through the ring.

The structure shown in Fig. 3 is essentially similar. The ring is indicated at 115 and is retained at its upper end by bead 117 formed on the head casting 14. It is retained at its lower margin by tongue 118 which enters an undercut in the cylinder casting. The ring 115 is tubular so that the annular passage 119, analogous to the space 19 already described, is formed wholly within the body of the ring 115. This space communicates with the working space of the pump by means of passages 121. The two rings are functionally identical and the purpose of illustrating two types of ring is to make clear the fact that the spaces 19 and 119 are functionally similar, whether formed within the body of the ring, as in Fig. 3, or wholly outside the ring, as in Figs. 1 and 2.

It will be understood that the plunger 11 and sleeve valve 8 may be reciprocated in timed relation by any suitable means. The simplest, and that usually adopted, comprises a crank operat-

ing the plunger 11 and two eccentrics operating the sleeve 8. The crank and eccentrics are carried by the same shaft and are angularly so displaced from each other, that when the plunger is near the head end dead point, and has overtraveled and closed the ports 9, the sleeve 8 will start downward and will have opened the ports 9 completely, or substantially so, when the plunger reaches and starts to open the ports 9. During the remainder of the downward (suction stroke) the ports 9 will be opened by the sleeve valve 8, and will be closed thereby throughout the initial portion of the discharge stroke, that is, until the piston has overtraveled and closed ports 9, and has also moved into sealing engagement with the ring 15. To permit early opening of the valve 8, it is desirable that the ring 15 be mounted as close as possible to the ports 9.

Since the plunger 11 has substantially overtraveled the ring 15 before the valve 8 has started to open, the interval between the ring and the plunger will be at suction pressure, while the space 19, 119, as the case may be, will be at discharge pressure. Consequently the ring will move into close sealing engagement with the plunger. When the plunger starts to move downward the ports 9 will be at suction pressure while the working space above the plunger 11 will be subject to greatly reduced pressure because the plunger 11 then seeks to create a vacuum above it. Consequently, the packing 15 becomes immediately ineffective on the down stroke and is thus relieved of unnecessary wear.

Applicant is aware that flexible packings, distended by cylinder pressure, have been used in cylinder pumps, and does not seek broadly to claim structures of this type. The novelty in the present case resides in the facts, first, that the packing is mounted in the cylinder wall and is engaged by the plunger only at the extremity of motion of the plunger, and, second, that the packing is engaged by the plunger only after the plunger has overtraveled the inlet ports, one effect of which is that the packing is alternately subjected to pressure and to suction while engaged by the plunger. The invention, therefore, contemplates neither the packing per se, nor the pump per se, but the combination and coordination of these elements to produce the peculiar characteristics above described.

Various modifications are possible and are contemplated. For example, pumps having similarly located inlet ports but lacking the sleeve valve 8, are known, and the use of the invention with pumps of this type is desirable and is contemplated.

What is claimed is,—

1. A pump comprising in combination, a cylinder having an inlet port and a discharge port; a discharge valve controlling the discharge port; a plunger arranged to reciprocate in the cylinder and to overtravel and close the inlet port; a packing mounted in the cylinder in position to be engaged by said plunger only when the latter has overtraveled the inlet port; and means responsive to a pressure differential between the cylinder and inlet port when cylinder pressure predominates for forcing said packing into sealing engagement with said plunger.

2. A pump comprising in combination, a cylinder having an inlet port and a discharge port; a discharge valve controlling the discharge port; a plunger arranged to reciprocate in the cylinder and to overtravel and close the inlet port; a mechanically operated valve controlling the inlet port and moving in such timed relation to the plunger as to close the inlet port in the first portion of the discharge stroke and open the inlet port after it has been overtraveled and closed by the plunger; a flexible packing mounted in the cylinder in position to be engaged by the plunger when the latter has closed the inlet port; and means responsive to cylinder pressure and rendered active by the opening of the inlet valve to force said packing into sealing engagement with said plunger.

3. The combination defined in claim 2, in which the last-named means comprises a chamber bounded on its inner side by the packing and subject to pressure in the cylinder.

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