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2,743,675

HIGH PRESSURE PUMP

Filed Nov. 5, 1954

2 Sheets-Sheet 1

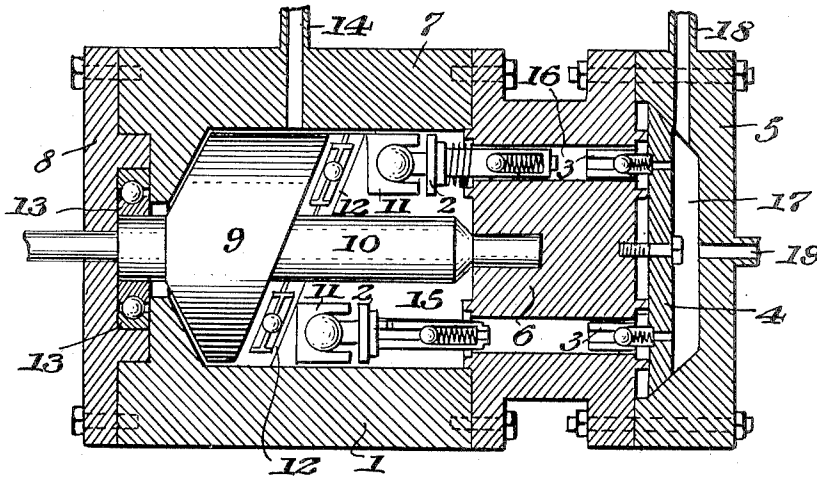


Fig. 1.

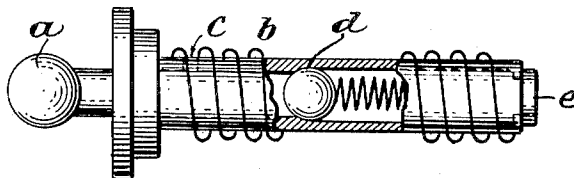
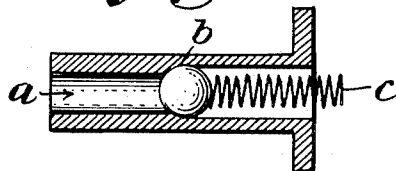


Fig. 2.

Fig. 3.



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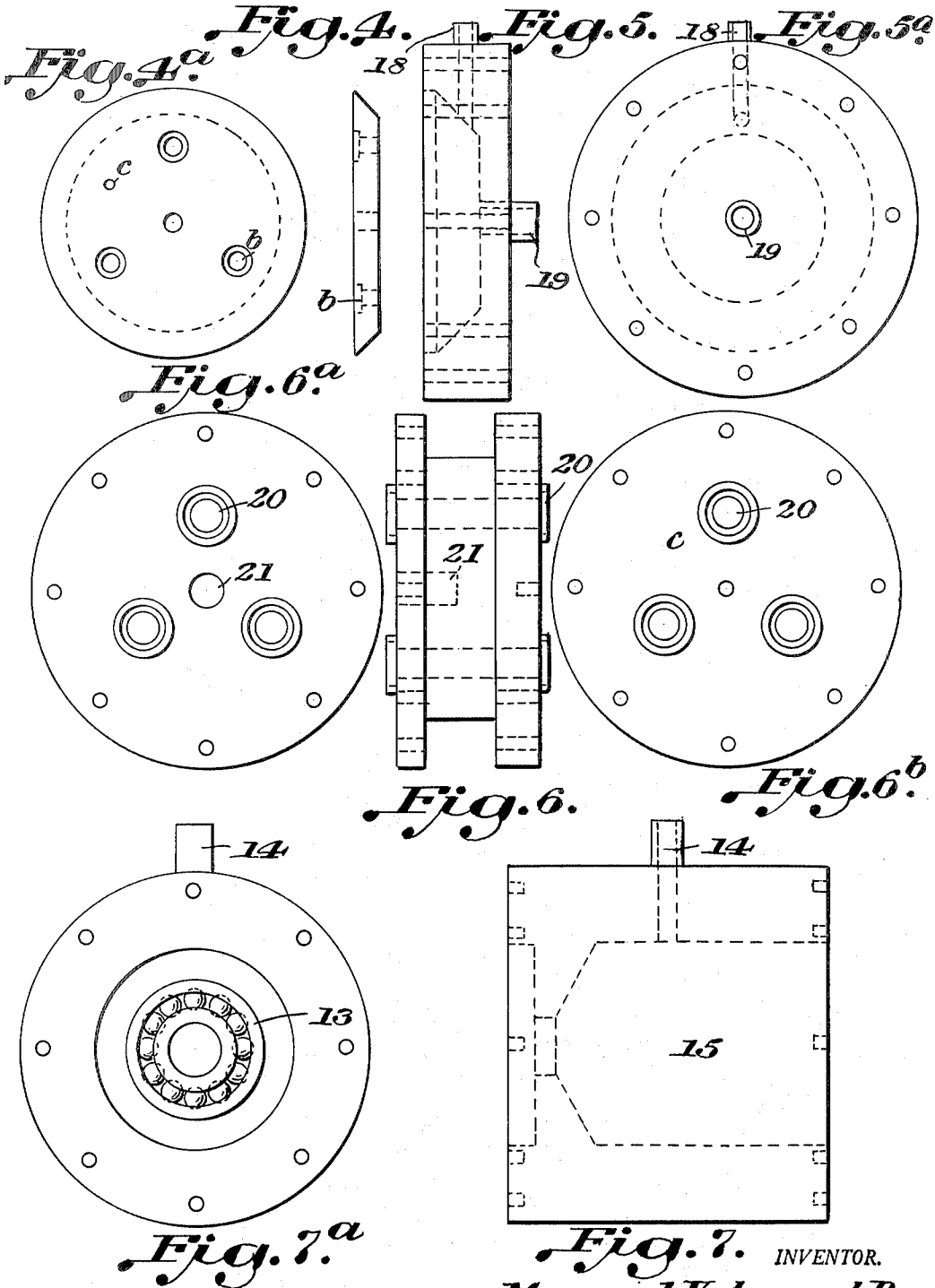
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1

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Claims priority, application Cuba December 8, 1953

1 Claim. (Cl. 103—173)

The present invention is related with high pressure pumps and especially with high pressure pumps to be used with hydraulic presses.

The present invention has as a principal object the provision of a pump of the above mentioned type which is economical, silent, smooth running and absolutely safe.

The invention will be described in conjunction with the annexed drawings representing one of the preferred embodiments and in which:

Figure 1 is a vertical section substantially along the longitudinal axis of the pump.

Figure 2 is a lateral view, partly in section, of one of the pistons.

Figure 3 is a longitudinal vertical section of one of the check valves which cooperate with the piston illustrated in Figure 2.

Figures 4 and 4a are respectively a side and a front view of a circular plate attached to the front face of the pump head, between said front face and the rear face of a front cover plate.

Figures 5 and 5a are similar views of the front cover plate of the pump.

Figures 6, 6a and 6b are respectively a rear view, a side view and a front view of the head of the pump of the instant invention.

Figure 7 is a phantom view of the body of the pump, and

Figure 7a is a rear view of said body.

Referring to Figure 1, the pump is divided longitudinally into the following five sections:

- Front cover plate 5,
- Inner plate 4,
- Pump head 6,
- Pump body 7, and
- Rear cover plate 8.

Front cover plate 5, attached to the front of pump head 6, has its rear face dished to form a substantially annular chamber 17 with bevelled sides for a close fit with the bevelled edges of inner plate 4. In the upper portion of front cover plate 5 is a vertical passage 18 which extends downward into chamber 17, said passage 18 serving to discharge the liquid contained in chamber 17. A horizontal perforation 19 pierces the center of cover plate 5 and is adapted to admit a safety valve (not shown).

As seen in Figure 1, plate 4 occupies a central position between cover plate 5 and pump head 6, being bolted to the latter so that the front face of plate 4 and the rear face of cover plate 5, together define chamber 17. At a predetermined distance from its periphery, plate 4 is pierced by a series of horizontal passages, equally spaced on the circumference of a circle drawn with the axis of the pump as a center, the rear ends of said passages being enlarged to serve as seats for the front end of springs which actuate suitable check valves located in the front ends of passages 16 (in alignment with the passages in plate 4) located in pump head 6. Like the passages in plate 4, passages 16 are horizontal and equally spaced on

2

the circumference of a circle the center of which is the longitudinal axis of the pump.

The central portion of the rear face of pump head 6 has a horizontal perforation of predetermined length in which is journaled the forward end of a shaft 10. As stated before, pump head 6 is pierced horizontally by a series of passages 16 which pass completely through said head. In the forward end of each of said passages 16 is mounted a check valve 3 consisting of a cylindrical tubular member with a flange on its forward end. The inner diameter of the rear portion of said tubular member is smaller than that of the forward portion and the junction of the two is used as a seat for a ball *b* contained in the forward portion and which is forced into said seat by a spring having its rear end resting in a recess in the rear face of plate 4, so that the valve effectively prevents the flow of liquid from chamber 17 into passage 16. In the rear end of each passage 16 moves a piston and valve combination indicated by 2. Said combination, as shown in Figure 2, consists essentially of a hollow cylindrical member, open in the front end and closed in the rear, with the inner diameter of the front portion larger than that of the rear portion, with a ball *d*, located in the front portion, being normally forced against the seat formed by the junction of the two bores by the action of a spring the front end of which is seated against a shoulder formed by the reduction of the inner diameter at *e*. At a short distance from its rear end, the cylindrical member has a small opening *c* which communicates the interior of the cylindrical member with chamber 15 to permit the liquid in said chamber to penetrate into the interior of the hollow cylindrical member. The rear end of the cylindrical member is furnished with an annular flange and with a short central stem which projects backwards and ends in a spherical portion *d* which lodges in a recess formed in the rear face of a guide 11 capable of sliding to and fro on the wall of chamber 15. Pump head 6 is bolted to the front end of pump body 7.

Pump body 7 contains a substantially cylindrical chamber 15, which receives the oil or other liquid to be pumped, from any suitable source, by means of passage 14 which, as illustrated in Figure 1 of the drawings, extends vertically upwards from chamber 15 through the wall of the pump body.

Within chamber 15 is horizontally mounted shaft 10 which has its forward end journaled in a centrally located perforation in the rear face of pump head 6, while its rear end passes out of the pump through a suitable opening in a rear cover plate 8 attached to the rear end of the pump body 7. On shaft 10 is mounted a cam 9 the front face of which is cut at a substantial inclination with respect to shaft 10, so that said cam, when rotating, will successively push each piston 2 in the forward direction and then allow it to be moved backward by the action of its corresponding spring *b*. To facilitate this cam action a ball bearing 12 is attached to the front or active face of cam 9.

To the rear end of pump body 7 is bolted a rear cover plate 8 which has a centrally located opening to allow the rear portion of shaft 10 to pass out of the pump so that it may be connected to any suitable source of power. The inner face of rear cover plate 8 has an annular flange surrounding and concentric with said central opening and containing ball bearing 13 which supports shaft 10.

The operation of the present pump is as follows:

Assuming that the pump is assembled and suitably mounted, with shaft 10 coupled to a source of power, passage 14 connected to a source of the liquid to be pumped, with chamber 15 and the piston 2 in the uppermost position both full of liquid, with opening or passage 18 connected to the cylinder of a hydraulic press, and assuming also that the parts of the pump occupy the

3

positions shown in Figure 1; when power is applied to shaft 10, cam 9 will start to rotate and, in doing so, will gradually relieve guide 11 and piston 2 (in upper portion of Figure 1) of the pressure exerted against them and thus allow spring *b* to push piston 2 and guide 11 backward. As piston 2 moves outward from passage 16 a vacuum is created in the portion of said passage lying between piston 2 and valve 3. This vacuum increases with the outward movement of piston 2 till it is sufficient to unseat ball valve *d* against the pressure of its spring and the liquid in the portion of the piston 2 back of ball *d* will pass around said ball to occupy the space in passage 16 where the vacuum was created and at the same time liquid from chamber 15 will pour into piston 2 through opening *c* in the same. This section continues while cam 9 is rotating through an arc of 180° but ceases instantly as soon as the 180° is passed because then cam 9 starts to press guide 11 and piston 2 forward, forcing the latter to penetrate more and more into passage 16 and so forcing the liquid in said passage against ball valve *b* till the pressure is sufficient to force ball *b* forward overcoming the pressure of its spring and forcing the liquid into chamber 17 from which it passes to the cylinder of the hydraulic press by way of passage 18. This cycle is repeated as soon as cam 9 starts a new revolution. The cycle just described is the same for the three pistons 2 comprised in the incorporation of the invention illustrated in the drawings, therefore, for each revolution of cam 9 liquid is discharged, under pressure, three times into chamber 17. Since the vacuum created by the backward movement of piston 2 aids the spring of check valve 3 in seating said valve more firmly, the liquid in chamber 17 cannot flow back into passage 16 during said movement. Obviously the number of pistons employed in any particular pump may be increased or diminished as desired.

It is also obvious that changes and modifications may be made in the specific design of the parts described, provided said changes and modifications are within the scope of the following claim.

I claim:

An improved pump comprising in combination a front

4

cover plate with a depression in one face thereof and having a discharge opening in the periphery thereof communicating with said depression, a pump head to which said cover plate is firmly attached with the depression facing the pump head, a circular disk in said depression centrally attached to the pump head and having a plurality of perforations therethrough, said perforations being equally spaced on the circumference of a circle having the longitudinal axis of the pump as a center, said pump head having a plurality of passages extending therethrough, said perforations in said disk being longitudinally aligned with said passages through the pump head, a spring actuated check valve in the end of each of said passages adjacent said disk and a hollow cylindrical piston having a check valve therein slidably mounted at the other end of each of said passages, a pump body having an inner and substantially cylindrical chamber therein, the end of each of said pistons being closed and projecting into said chamber, spring means around said pistons urging said pistons to the projecting position, and each piston having a small opening in the end thereof which projects into said chamber, a centrally located horizontal shaft in said chamber, said pump head having a recess in the face adjacent the pump body in which one end of said shaft is journaled, a rear cover plate attached to the opposite end of said pump body from said pump head and having an opening therein through which the other end of said shaft passes out of said chamber, a cam mounted on said shaft within said chamber, a ball bearing attached to the face of said cam towards said pistons, a plurality of guides reciprocally slidable on the wall of said cylindrical chamber against which said ball bearing bears and into which the ends of said pistons projecting into said chamber are received, said pump body having an opening in the wall thereof communicating with said chamber.

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