

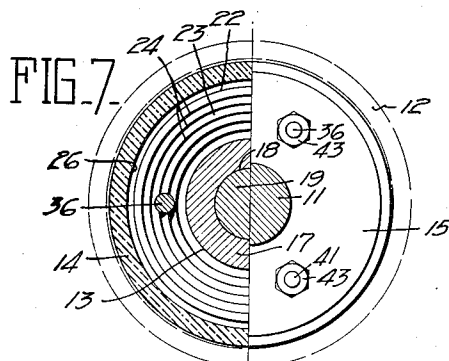
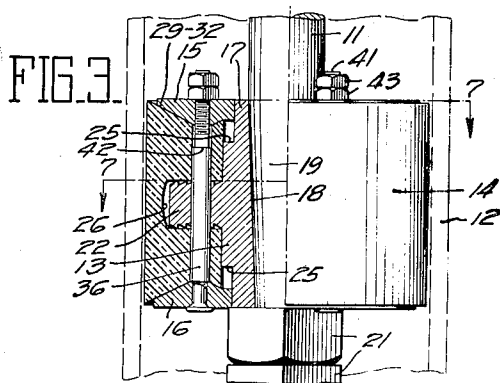
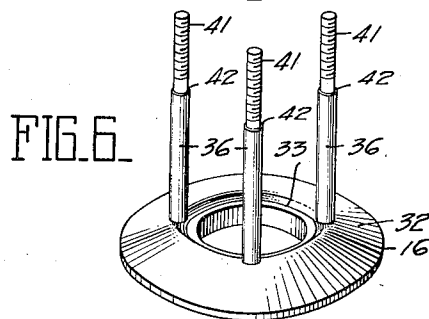
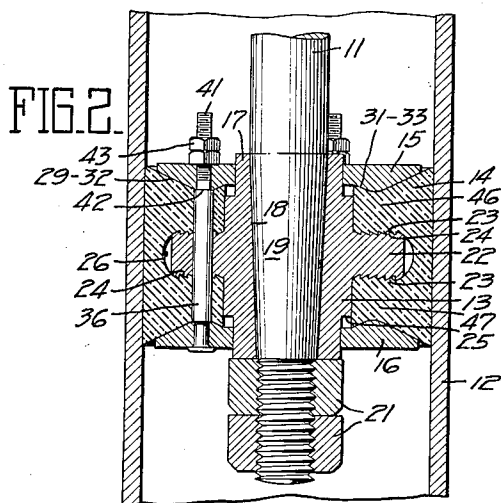
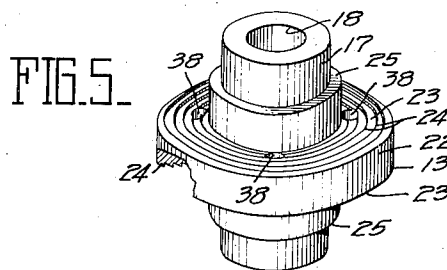
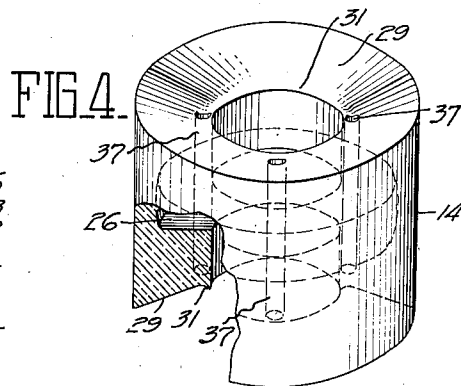
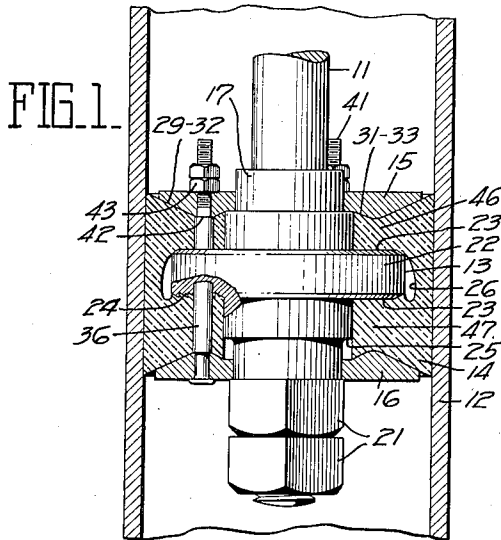
Jan. 12, 1932.

L. C. BLACK

1,840,880

PUMP PISTON

Filed May 6, 1929



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PUMP PISTON

Application filed May 6, 1929. Serial No. 360,713.

This invention relates generally to the construction of pistons used in fluid pumps. It is of particular value for use in pumping fluids containing abrasive material.

It is a general object of this invention to devise a novel form of pump piston which will automatically expand against the inner walls of the associated pump barrel or liners.

It is a further object of this invention to devise a novel form of automatically expanding pump piston utilizing a piston body of resilient material, such as vulcanized rubber, which is arranged so that fluid pressure on one side of the piston compresses the body in the general direction of movement of the piston rod, to effect radial expansion.

It is a further object of this invention to devise an automatically expanding pump piston utilizing a resilient piston body having two different portions which are adapted to be compressed by fluid pressure to effect radial expansion.

It is a further object of this invention to devise an automatically expanding pump piston of relatively simple construction, having a minimum number of parts, and which can be readily assembled and taken apart for repairs or replacement.

Further objects of the invention will appear from the following description in which I have set forth the preferred embodiment of my invention. It is to be understood that the appended claims are to be accorded a range of equivalents consistent with the state of the prior art.

Referring to the drawings:

Figure 1 is a side elevational view in cross section, illustrating an assembled pump piston constructed in accordance with my invention, with one portion of the piston body compressed.

Fig. 2 is a view similar to Fig. 1, but illustrating the piston parts in normal position.

Fig. 3 is a view similar to Fig. 2, illustrating the manner in which the parts of my piston are assembled.

Fig. 4 is a detail illustrating the preferred form of the resilient piston body utilized in my device.

Fig. 5 is a detail illustrating the piston carrier utilized in my device.

Fig. 6 is a detail illustrating one of the annular thrust members and its associated spacer rods.

Fig. 7 is a cross sectional view taken along the line 7—7 of Fig. 3.

That form of the invention shown in the drawings includes generally a conventional piston rod 11 adapted to be reciprocated within a conventional pump liner or barrel 12. Positioned upon the rod 11 there is a member 13, which I have termed a "piston carrier". Surrounding the carrier 13, there is a piston body 14 of resilient material, which is adapted to be compressed in a certain manner by fluid pressure as will be presently explained. Annular thrust members 15 and 16 are positioned at the opposite ends of body 14, and serve to transmit fluid pressure to the body.

The preferred construction for the carrier 13 is shown in Fig. 5. It includes a sleeve portion 17 having a tapered bore 18, adapted to fit upon the tapered portion 19 of piston rod 11. Lock nuts 21 threaded upon piston rod 11, serve to securely fix the sleeve portion 17 upon the rod. Formed upon the outer periphery of sleeve portion 17, and preferably integral with the same, there is an annular portion 22 of substantially less diameter than the inner diameter of pump barrel 12. The faces 23 of this annular portion 22 are preferably "wickered". In other words they are provided with a plurality of annular teeth 24 faced inwardly. The ends of sleeve portions 17 are preferably of reduced diameter to provide annular shoulders 25.

The piston body 14 is shown in detail in Fig. 4, and is preferably formed of a single integral member of suitable resilient material, such as a resilient vulcanized rubber. It is formed with an inner annular recess 26, to accommodate the annular portion 22 of carrier 13. Both ends of this piston body are preferably beveled in such a manner as to properly cooperate with the thrust members 15 and 16. Thus referring to Fig. 4, each end has a beveled surface 29, the slope of the bevel being inwardly from the periphery of the

body 14 toward the center of the same. Surface 29 merges with another beveled surface 31, which is beveled oppositely and is adjacent the inner periphery of body 14.

The thrust members 15 and 16 are preferably substantially identical. The inner face of each member is preferably provided with beveled surfaces 32 and 33, which are complementary to and which fit upon the beveled surfaces 29 and 31 of body member 14. The central apertures in thrust members 16 are of sufficient diameter to slidably receive the reduced ends of sleeve 17.

For retaining the carrier 13, body 14, and thrust members 15 and 16 in assembled relationship, I prefer to employ a plurality of spacer rods 36. When the piston is being assembled, these spacer rods are preferably secured in spaced relationship to one of the thrust members, say thrust member 16, as shown in Fig. 6. Rods 36 can then be inserted thru apertures 37 provided in body 14, and registering apertures 38 in carrier 13. Thrust member 15 is then properly positioned so that the end portions 41 of spacer rods 36 project thru the same. End portions 41 are of reduced diameter to provide shoulders 42. Nuts 43 are then screwed down upon thrust member 15 to partially compress the resilient body 14, until member 15 abuts the shoulders 42. Fig. 3 shows the position of thrust member 15 before the nuts 43 have been tightened, while Fig. 2 shows the thrust members 15 and 16 in normal position with respect to carrier 13. In this normal position it will be noted that members 15 and 16 are spaced from shoulders 26.

Assuming that the parts of my piston have been assembled, and that the piston is operatively positioned within the pump barrel 12, the peripheral surface of the piston body is in substantially fluid tight contact with the inner walls of the pump barrel. Due to the normal compressional stresses in resilient body 14, the material of this body is forced into engagement with the annular teeth 24. Referring now to Fig. 1, it is assumed that the piston is moving upwardly against fluid pressure, so that the fluid pressure upon the upper face of the piston is substantially greater than the fluid pressure upon the lower face. Fluid pressure upon thrust member 15 therefore forces this thrust member toward the annular portion 22, to compress the rubber in the intervening zone 46. The compression of rubber within zone 46 tends to cause this portion of the body 14 to expand outwardly in a radial direction, so that the peripheral portion of body 14 adjacent zone 46 is forced more tightly into contact with the inner walls of the pump barrel. The extent of movement of thrust member 15 depends of course upon the degree of fluid pressure. It is limited by engagement of this thrust member with the adjacent annu-

lar shoulder 26. It will be noted that when thrust member 15 is moved relative to carrier 13 to compress the rubber within zone 46, thrust member 16 moves together with thrust member 15, so that the rubber within zone 47 upon the other side of annular portion 22 is permitted to expand. Thus pressure between the rubber adjacent zone 47 and the inner walls of pump barrel 12, is relieved, so that the piston is free to move with a minimum of frictional resistance. When fluid pressure is applied to the opposite sides of the piston, that is upon thrust member 16, this thrust member in turn is moved towards annular portion 22, to compress the rubber within zone 47, while the compression of the rubber within zone 46 is correspondingly relieved. Therefore the peripheral surface of the body 14 adjacent zone 47, now presses tightly against the inner walls of the pump barrel, while the peripheral pressure adjacent zone 46 is relieved.

It will be apparent that my piston embodies many desirable features. It not only has a minimum number of parts, but it is of relatively rugged construction and can be used over long periods without repair or replacement. It can be used in pumping materials containing a quantity of abrasive material, without undue wear of either the body 14 or the associated pump barrel. I attribute this result not only to the rugged construction of the piston, but also to the fact that the piston when in operation is properly pressed into engagement with the pump barrel, to prevent abrasive material from working in between the piston and the inner walls of the barrel. The resilient body 14 can either be directly molded upon the carrier 13, or it can be inserted upon the carrier after it is formed.

I claim:

1. A fluid pump piston adapted to operate within a pump valve, comprising a piston rod, a body of resilient material secured to said rod, the outer periphery of the body being adapted to contact with the inner walls of the pump barrel, and means for compressing one portion of said body responsive to fluid pressure on one side of the piston and for simultaneously relieving compression on another portion of said body by a proportional amount.

2. A fluid pump piston adapted to operate within a pump barrel, comprising a piston rod, a body of resilient material secured to said rod, the outer periphery of the body being adapted to contact with the inner walls of the pump barrel, and means responsive to fluid pressure on one side of the piston for compressing one annular portion of said body in the direction of movement of the piston, means responsive to fluid pressure on the other side of the piston for compressing another annular portion of said body in the

same general direction, and means for limiting the amount of compression of said annular portions.

3. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod, a piston body of resilient material having portions overlying both faces of said carrier, the peripheral portion of said body being adapted to contact with the inner walls of the barrel, means actuated by the pressure of fluid being pumped for compressing said overlying body portions, and means for limiting the amount of compression of said annular portions.

4. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod, a piston body of resilient material having portions overlying both faces of said carrier, the peripheral portion of said body being adapted to contact with the inner walls of the barrel, and annular thrust members overlying both faces of said body, said members being rigidly interconnected and slidable relative to said carrier.

5. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod, said carrier being of substantially smaller diameter than the inner diameter of the pump barrel, a piston body of resilient material extending about the periphery of the carrier and having portions overlying both faces of the carrier, and annular thrust members overlying both faces of said body, said members being connected to one another and slidable relative to said carrier whereby a portion of the body is compressed to expand the same radially responsive to fluid pressure on either side of the piston.

6. A fluid pump piston adapted to cooperate with a pump barrel comprising a piston rod, an annular carrier of rigid material secured to the rod, said carrier being substantially less in diameter than the inner diameter of the barrel, a body of resilient rubber surrounding said carrier and having portions of substantial thickness overlying the faces of the carrier, the ends of said body being beveled inwardly toward the carrier for a substantial distance inwardly from the periphery of the same, annular thrust members disposed upon the ends of said body, said members having beveled surfaces adapted to interfit the beveled end of said body, means rigidly interconnecting said thrust members, and means for slidably securing said thrust members relative to said carrier, said thrust members serving to compress said portions of the body responsive to fluid pressure on either side of the piston to expand peripheral portions of the piston against the barrel.

7. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod; a piston body of resilient material having portions overlying both faces of said carrier, the peripheral portion of said body being adapted to contact with the inner walls of the barrel, annular thrust members overlying both faces of said body, said members being slidable relative to said carrier and abutment means for limiting the extent of movement of said members.

8. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod, a piston body of resilient material having portions overlying both faces of said carrier, the peripheral portion of said body being adapted to contact with the inner walls of the barrel, annular thrust members overlying both faces of said body, said members being rigidly interconnected and slidable relative to said carrier and abutment means for limiting the extent of movement of said members.

9. A fluid pump piston adapted to operate within a pump barrel comprising a piston rod, an annular piston carrier of rigid material secured to said rod, a piston body of resilient material having portions overlying both faces of said carrier, the peripheral portion of said body being adapted to contact with the inner walls of the barrel, annular thrust members overlying both faces of said body, said members being rigidly interconnected and slidable relative to said carrier and means for limiting the extent of movement of said members, one of said thrust members serving to compress one portion of said body as the other thrust member relieves compression on another portion of said body.

In testimony whereof, I have hereunto set my hand.

LESTER C. BLACK.