March 30, 1948. L. BEEH 2,438,839

PLUNGER

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FIG. 1.

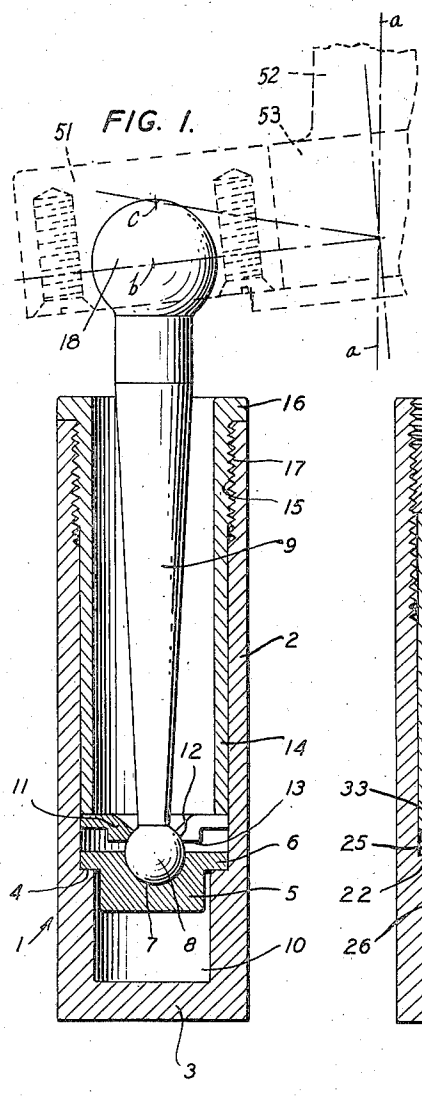


FIG. 2.

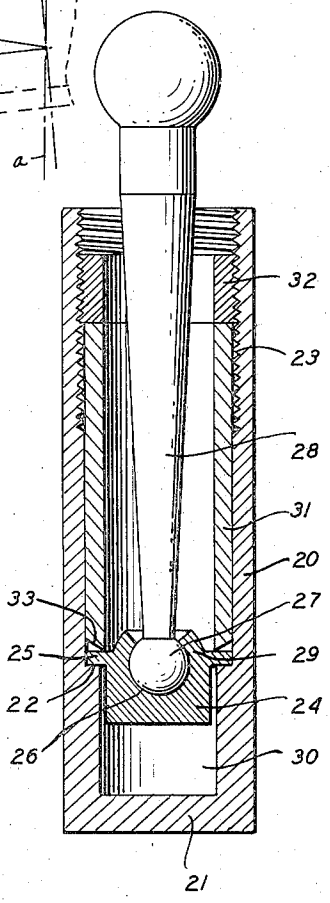
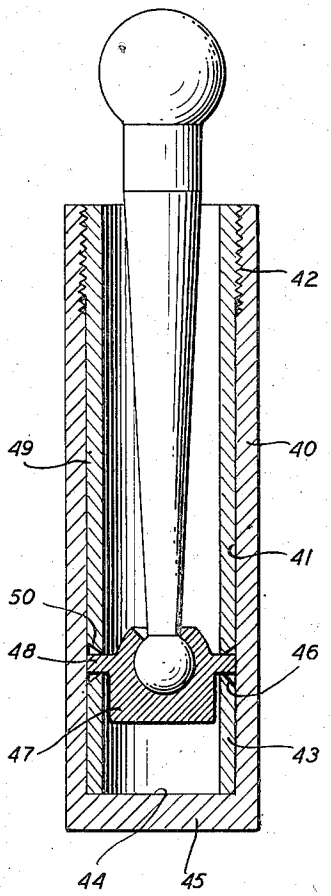


FIG. 3.



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PLUNGER

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2 Claims. (Cl. 309—20)

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The invention relates to a plunger and rod connection. In certain types of pumps such as for instance fuel pumps where the pumped fluid can be characterized as a grease or oil remover, the danger exists of the plunger freezing in the pump cylinder during the operation and that, in consequence, a break of the one or other of the driving elements occurs. If such break takes place in a multiple pump the entire machine usually is put out of operation although the original damage may affect only one of a larger number of pump units actuated by a common drive.

The invention aims to minimize the injury caused for instance by a freezing plunger, and it essentially consists in the provision of means whereby any break due to an excessive strain of the connection of the plunger and its connecting rod will occur in a predetermined element or part of the connection, so selected that an inexpensive and easy replacement is possible. Another object of the invention is the provision of a space in the plunger for a free movement of the connecting rod if the connection of the parts is broken.

Further objects and details of the invention will be apparent from the description given hereinafter and the accompanying drawing illustrating several embodiments thereof by way of example. In the drawing, Figs. 1, 2 and 3 are cross-sections of three different plungers and rod connections according to the invention. Referring to the drawing the plunger 1 of Fig. 1 is a hollow cylindrical body 2 with a bottom 3 at one of its ends. Body 2 has an inner shoulder 4 and on that shoulder an element 5 is seated with a relatively thin flange-like projection 6 which is an integral portion of said element. The latter is provided with a semi-spherical cavity 7 in which the ball head 8 of the connection rod 9 engages. Shoulder 4 is at such a distance from the plunger bottom 3 and element 5 is so shaped that between the two there is a free space 10 of an axial length not less than the length of the stroke intended to be performed by the plunger. The stroke may be derived from any suitable drive. A wobble plate drive for this purpose is indicated in dash lines. The wobble plate 51 encompasses the upper ball head 18 of the connecting rod 9 and is non-rotatably held by means not shown. A drive shaft 52 turning about its axis *a* has a cylindrical end portion 53 inclined with respect to the axis *a* and journaled in the wobble plate 51. Thus, if shaft 52 rotates the wobble plate will be reciprocated with the center of the ball head 18 moving between the end positions *b* and *c*. The distance

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b—*c* is equal to the aforementioned intended stroke of the plunger. A slotted washer 11 is positioned in the rear of the ball head 8 and may have, for this purpose, a spherical surface 12 in a middle portion 13 which may be thicker than the peripheral zone of the washer. A tubular part 14 having an outer threading 15 and an outwardly projecting flange 16 is inserted into the plunger from its open end and screwed into an interior threading 17 of the latter. Flange 16 bears on the top rim of the body 2 and simultaneously on the washer 11 so that the head 8 of the connecting rod is held between the parts 5 and 11. The thicknesses of both the flange 6 and the washer 11 are so selected with respect to the strength of the other parts of the rod connection and the drive (not shown) that a break of either the flange or the washer or both will occur if the load, i. e. pressure transmitted by the connecting rod, exceeds a predetermined value. With plungers of the illustrated form, movement in the direction of the bottom will take place during the compression stroke, and movement in the opposite direction during the suction stroke. Thus, if an overload occurs, for instance due to freezing of the plunger, at the beginning of the compression, flange 6 will break and the rod 9 will push the remainder of the element towards the bottom 3. As the space 10 is of a length, as stated hereinbefore, not less than that of the stroke, no other part or portion will be damaged. Should the freezing of the plunger occur during compression between the dead centers, first the flange 6 will break and then washer 11 whereas the sequence of breaks will be reversed when the plunger freezes during the suction stroke. In no event, however, any additional damage will occur, and if the plunger is one of a number of similar ones operated by a common drive, only the one unit will become inoperative while the others continue to work.

The plunger according to Fig. 2 has a body 20 with bottom 21, shoulder 22 and interior threading 23 in an arrangement similar to that of the corresponding parts of Fig. 1. An element 24 bearing with a thin flange 25 on shoulder 22 forms the seat 26 for the ball head 27 of the connecting rod 28. The head is held on its seat by an integral rim 29 of the element 24, the rim being turned down on the ball head 27 after its insertion in the seat-forming cavity 26. Again, the space 30 between the plunger bottom 21 and the element 24 is at least according to the length of the plunger stroke, and flange 25 is so thin that it will break under an excessive load. The

flange is held against its seat by the tubular member 31 which is pressed down by an externally threaded piece 32 screwed into the inner thread 23 of the body. In order to facilitate a break at the predetermined location, the tubular member which for that purpose may be of steel or similar hard material, is provided with a circular cutting edge 33. This edge will be capable of shearing off the flange 25 so that the element 24 can freely move in space 30 when an overload with resulting break occurs. Of course, it is also possible so to select the strength of the rim 29 that the latter may open and permit the head 27 to slip through. However, this is less desirable as in such an event, upon the return stroke of the connecting rod, a hammering or impact action must be expected which may cause injury to the connecting rod proper or other parts of the drive.

Whereas in Fig. 2 only one cutting edge has been provided which can be effective only during plunger movement in one direction, there are two such edges in the embodiment of Fig. 3 in order to obtain, if necessary, a shearing action during either stroke. In Fig. 3, the plunger body 40 has an inner cylindrical surface 41 of constant diameter except for the inner threading 42 of the top end. A first tubular member 43 is fitted into the cylinder 40 and bears upon the top surface 44 of the plunger bottom 45. Tube 43 has an upper cutting edge 46 and is of such length that there is the required distance between the surface 44 and an element 47 which sits with its flange 48 on that edge and is similar to the element 24 of Fig. 2. A second tubular member 49 with a lower cutting edge 50 is screwed into the threading 42 so that flange 48 is placed between the edges 46 and 50. In consequence, a shearing effect can take place for either direction of plunger movement.

Although I have shown only three embodiments of my invention it will be apparent to those skilled in the art that many alterations and modifications are possible without departure from the essence and spirit of the invention which, for this reason, shall not be limited but by the scope of the appended claims.

I claim:

1. A plunger and connecting rod assembly for a multiple injection pump or the like comprising a hollow cylindrical plunger body closed on one of its ends and having an inner shoulder, a ball headed connecting rod, a hollow, spherical bearing member fitting said connecting rod, and including an outer flange, a tubular member fitting the inner wall of said body and extending between the other end of said body and said flange and constituting a means to hold said flange bearing against said shoulder, said flange being so dimensioned as to break when said connecting rod causes on said member a load substantially exceeding the maximum pressure in normal operation, and said plunger forming between said closed end and said shoulder a chamber of a length at least equal to the intended plunger stroke and of sufficient width to permit the connecting rod when a break of said flange occurs, to reciprocate said member in said chamber.

2. A plunger as claimed in claim 1 said tubular member having a shearing edge bearing on said flange.

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