

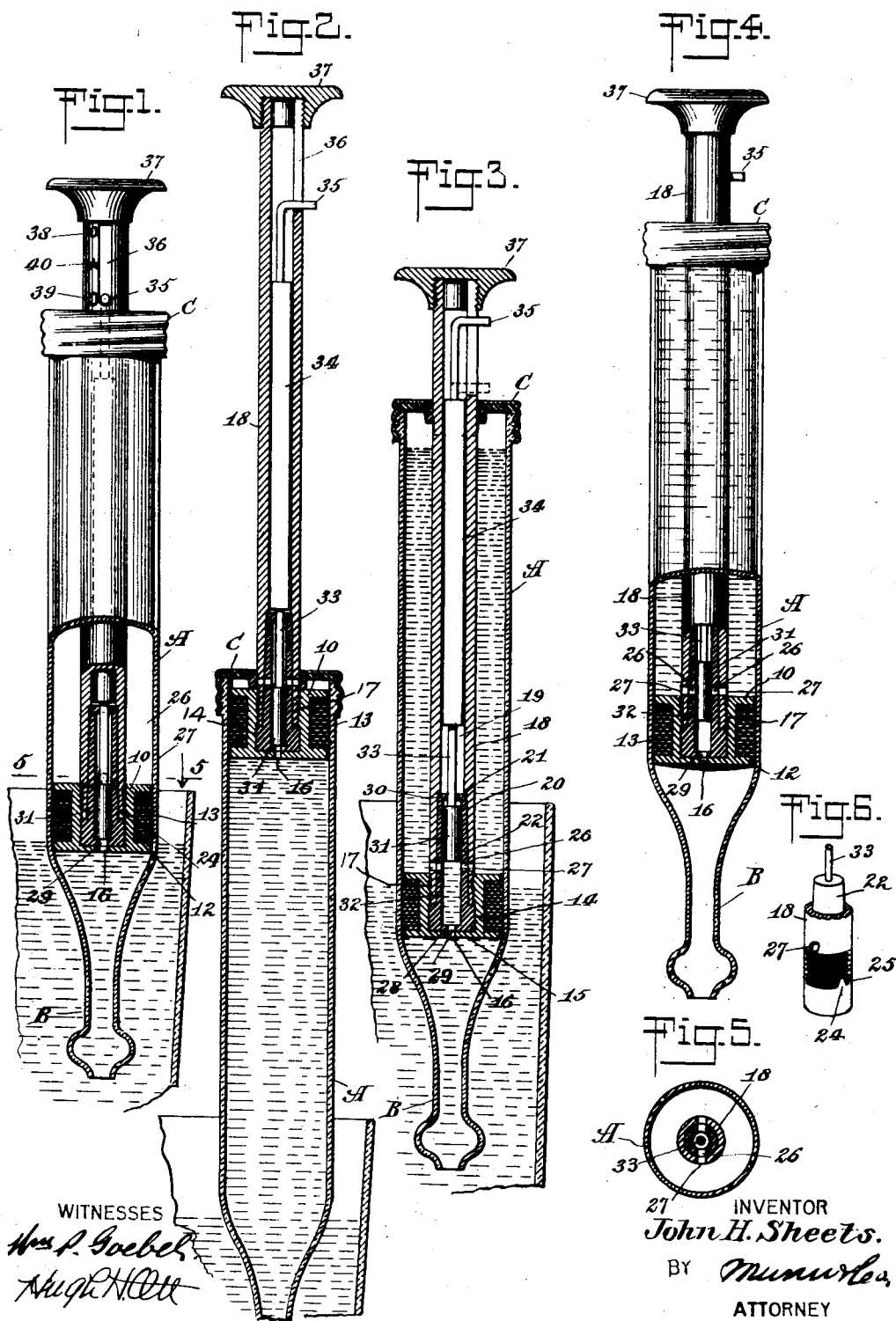
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SYRINGE

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UNITED STATES PATENT OFFICE.

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SYRINGE.

Application filed July 22, 1927. Serial No. 207,742.

This invention relates to syringes of the piston or plunger type, and has particular reference to a vial syringe comprehending an improvement over prior United States Letters Patent No. 984,037, granted February 14, 1911.

As set forth in the previous patent, the piston is provided with a hollow piston rod embodying a valve operable in the piston rod for establishing or cutting off communication between the syringe barrel or vial compartments defined on opposite sides of the plunger. In the manufacture of the syringe it was found impracticable to provide the valve plunger with a suitable packing which would prevent leakage, and the present invention, therefore, comprehends an improved valve structure for the piston which eliminates the necessity of packing the valve plunger while affording a valve structure which is leak-proof and practical.

Other objects reside in the comparative simplicity of construction of the valved piston, the economy with which the same may be produced, and the general efficiency derived therefrom.

With the above recited and other objects in view, reference is had to the following description and accompanying drawings in which there is exhibited one example or embodiment of the invention, while the appended claims define the actual scope of the invention.

In the drawings—

Figure 1 is a side view of the syringe with parts shown in section and illustrating the position of the piston valve for drawing a fluid into the syringe;

Fig. 2 is a longitudinal sectional view illustrating the syringe barrel completely filled;

Fig. 3 is a similar view illustrating the piston valve shifted and with the fluid filling the barrel behind the plunger;

Fig. 4 is a side view with parts in section, illustrating the valve plunger of the piston shifted to an intermediate closed position for carrying the syringe filled with a fluid or medicine;

Fig. 5 is a transverse sectional view taken approximately on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary perspective view of the piston rod removed from the piston and with the valve casing associated therewith.

Referring to the drawings by characters of reference, A designates the body or barrel of a vial syringe having the usual constructed

nozzle B at one end and a cap C at the opposite end. The improved piston includes a substantially cylindrical head 10 which is provided with an external or peripheral annular groove 12 in which packing 13 is arranged. The bore 14 of the piston head is closed at one end by a centrally apertured wall 15, the aperture of which constitutes a port 16. The opposite end of the bore is internally threaded at 17 and threadedly receives the exteriorly threaded end of a tubular piston rod 18. The axially extending bore 19 of the tubular piston rod at the threaded end is formed with an inwardly tapering portion 20, which at the junction with the main portion of the bore 19, defines a shoulder 21. A correspondingly tapered yieldable valve casing 22 is mounted in the tapered portion 20 of the bore with the portion extending beyond the tapered bore 20 provided with an enlarged head 23 of a diameter to snugly fit within the bore 14 of the piston head between the wall 15 and the end of the piston rod 18. The enlarged head 23 is provided with one or more inwardly projecting lugs 24, while the end of the piston rod 18 is provided with one or more corresponding notches 25. The lugs 24 and notches 25 serve to hold the valve casing and plunger against relative rotation and to register the port or ports 26 and 27 in the valve casing and plunger at a point in rear of the piston head. The lower or outermost end of the valve casing is closed by a central apertured wall 28 the aperture of which defines a port 29 which registers with the port 16 in the end wall 15 of the piston head. The opposite inner or upper end of the valve casing is closed by a central apertured end wall 30. A valve plunger 31 of a length less than the distance between the radial ports 26 and the opposite ends of the valve casing, is mounted for axial movement in the valve casing. The valve plunger 31 is of a diameter slightly exceeding the diameter of the bore 32 of the valve casing so that the casing is normally compressed to prevent leakage around the periphery of the plunger. The valve plunger is provided with a stem 33 which extends loosely through the apertured upper or inner end wall 30 of the valve casing. Intermediate its ends the valve stem is provided with an enlarged portion 34 which is of slightly less diameter than the bore 19 of the piston rod 18. The upper end of the valve stem 33 is provided with a laterally or radially projecting terminal

35 which operates in a slot 36 in the upper end of the piston rod and which projects beyond the outer periphery of the piston rod where the piston rod extends beyond the cap C, so that the terminal 35 serves as a manipulating means for moving the valve plunger in the valve casing. The uppermost projecting end of the piston rod 18 has threadedly engaged thereon, an operating handle for moving the piston in the barrel or body A of the syringe. Any suitable packing means is carried by the cap for preventing leakage around the piston rod at the point where it extends through the cap. Alongside of the slot, the piston rod may be inscribed with suitable indicia 38, 39 and 40, for indicating the three shifted positions of the valve plunger in the valve casing.

In use and operation, when the manipulating terminal 35 of the valve stem is shifted to the point in the slot 36 where it is disposed adjacent the indicia 39, as illustrated in Figs. 1 and 2, the valve plunger 31 is disposed in the lower or outer end of the valve casing and cuts off communication between the ports 16 and 29 and 26 and 27, so that movement of the piston causes the syringe to function as an ordinary syringe. By immersing the nozzle B in a liquid with the piston adjacent the nozzle end, an upward or inward stroke of the piston draws the liquid into the barrel or body A in front of the plunger as illustrated in Fig. 2.

In order to permit movement of the plunger outwardly or downwardly so that the fluid within the barrel or body A is not expelled, the terminal 35 is shifted in the slot 36 to a point adjacent the indicia 38, or the position illustrated in Fig. 3. The piston is then moved downwardly or outwardly, and due to the fact that the valve plunger 31 is at the upper or inner end of the valve casing the downward or outward movement of the piston allows the same to move through the column of fluid to the position illustrated in Fig. 3.

In order to trap and seal the fluid within the barrel in rear of the piston, the valve plunger 31 is shifted downwardly to the intermediate safety carrying position illustrated in Fig. 4, in which instance the terminal 35 is disposed at a point intermediate the slot or opposite the indicia 40. It will be observed that in moving the plunger upwardly from the position illustrated in Fig. 1 to the position illustrated in Fig. 2, the ports 26 and 27 allow the air in the barrel to be expelled through the upper end of the valve casing around the stem 33 and through the slot 36.

When it is desired to expel a quantity of the liquid from the syringe, the terminal 35 of the valve stem is moved to the position alongside of the indicia 38 or at the upper end of the slot, as illustrated in Fig. 3, and the piston is then drawn upwardly or in-

wardly until the desired quantity is disposed below or in front of the piston. The valve plunger is then moved to the position illustrated in Figs. 1 and 2, and outward movement of the plunger will discharge or dispense the quantity of fluid in front of the piston.

From the foregoing it will be seen that by constructing the valve casing of a suitable yieldable elastic material, such as rubber, the necessity of providing packing rings on the small valve plunger is eliminated, while the frictional compression of the casing by the plunger precludes possible leakage therearound.

What is claimed is:

1. In a syringe, including a barrel, a piston movable therein and having a hollow piston rod provided with a port opening into the barrel at the rear of the piston, and a manually controlled plunger valve movable in said piston rod and controlling said port, with a valve stem extending through said piston rod to the exterior thereof; a valve casing mounted within the piston and piston rod having a port registering with the piston rod port, said valve casing constructed of a yieldable material.
2. In a syringe, including a barrel, a piston movable therein and having a hollow piston rod provided with a port opening into the barrel at the rear of the piston, and a manually controlled plunger valve movable in said piston rod and controlling said port, with a valve stem extending through said piston rod to the exterior thereof; a valve casing mounted within the piston and piston rod having a port registering with the piston rod port, said valve casing constructed of a yieldable material and having a bore of slightly less diameter than the valve plunger.
3. In a syringe, including a barrel, a piston movable therein and having a hollow piston rod provided with a port opening into the barrel at the rear of the piston, and a manually controlled plunger valve movable in said piston rod and controlling said port, with a valve stem extending through said piston rod to the exterior thereof; a valve casing mounted within the piston and piston rod having a port registering with the piston rod port, said valve casing constructed of a yieldable material and having a bore of slightly less diameter than the valve plunger, the said piston rod and piston head clampingly engaging and holding the valve casing in associated relation therewith.
4. In a syringe, including a barrel, a piston movable therein and having a hollow piston rod provided with a port opening into the barrel at the rear of the piston, and a manually controlled plunger valve movable in said piston rod and controlling said port, with a valve stem extending through said

piston rod to the exterior thereof; a valve casing mounted within the piston and piston rod having a port registering with the piston rod port, said valve casing constructed
5 of a yieldable material and having a bore of slightly less diameter than the valve plunger, the said piston rod and piston head clamping-
10 ingly engaging and holding the valve casing in associated relation therewith, and the said valve casing and piston rod having means for preventing rotation thereof and for registering the valve casing port with the piston rod port.

5. In a vial syringe, a piston comprising
15 a tubular piston head internally threaded at one end and having a centrally ported wall at the opposite end, a tubular piston rod threadedly engaged in said head and having its bore tapered inwardly at said end, a cor-
20 respondingly tapered yieldable valve casing mounted in said tapered bore, said valve casing having an axial bore closed at its opposite ends by centrally apertured walls, the aperture of one of which walls constitutes
25 a port which conforms in size to and registers with the port of the piston head end wall, said valve casing and piston rod having alined radial ports opening into the syringe barrel in rear of the piston, and a plunger
30 valve of lesser length than the distance between the axial ports and the ends of the valve casing, said plunger valve mounted for axial movement within said valve casing, and a valve stem extending loosely through the
35 remaining apertured wall of the valve cas-

ing and through the piston rod to the exterior thereof, for manipulating the plunger valve.

6. In a vial syringe, a piston comprising
40 a tubular piston head internally threaded at one end and having a centrally ported wall at the opposite end, a tubular piston rod threadedly engaged in said head and having its bore tapered inwardly at said end, a correspondingly tapered yieldable valve
45 casing mounted in said tapered bore having an enlarged head at its larger end clamping-
50 ingly engaging between the end of the piston rod and the apertured wall of the piston head, said valve casing having an axial bore closed at its opposite ends by centrally aper-
55 tured walls, the aperture of one of which walls constitutes a port which conforms in size to and registers with the port of the piston head end wall, said valve casing and piston rod having alined radial ports opening
60 into the syringe barrel in rear of the piston, and a plunger valve of lesser length than the distance between the axial ports and the ends of the valve casing, said plunger valve
65 mounted for axial movement within said valve casing, and a valve stem extending loosely through the remaining apertured wall of the valve casing and through the piston rod to the exterior thereof for manip-
ulating the plunger valve.

Signed at New York, in the county of New York and State of New York, this 20th day of July, A. D. 1927.

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