

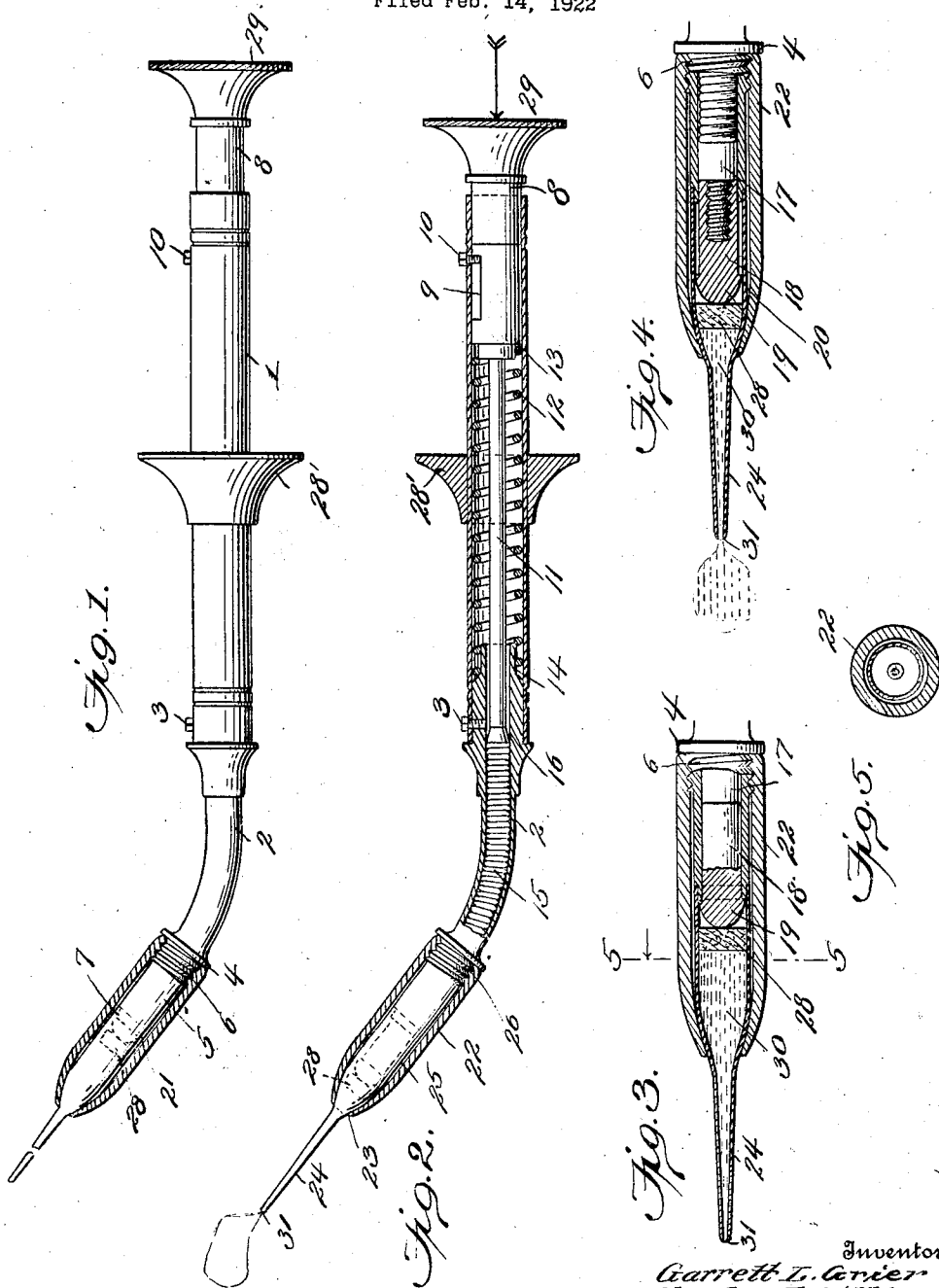
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SYRINGE

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SYRINGE.

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This invention relates to syringes and proposes the construction of a syringe of that class in which the medicament or other substance to be injected is loaded into the syringe in the form of a filled capsule, and discharged by compression of a plunger against a movable wall of said capsule.

In the present instance the capsules used in connection with the syringe are of the type which is cylindrical at one end and prolonged at the outer end into a reduced injection tube, and they are made of a flexible, insoluble, non-metallic substance, of which celluloid is an example.

The capsules are partially filled with a medicament, which is usually liquid in nature, and closed by a cork, or stopper, thrust into the cylindrical end thereof, each capsule holding but a single charge of medicament and being discarded after use.

On account of the flexibility of the material of which the capsules are formed, it is common for the cylindrical ends to become mis-shapen, due to irregularities in the shape of the corks, lateral compression in packaging, or careless handling prior to use, so that it is essential for them to be restored to a uniform cylindrical shape to insure a positive actuation of the capsules by the syringe.

One of the objects of the invention, therefore, is the provision, in a syringe, of means for shaping the inner end of the capsule to conform to the shape of a seat provided in the syringe for the reception of said capsule.

Another object of the invention is the provision in a syringe, of a casing including a neck portion, and a terminal nipple, said parts being provided with a bore which serves as a housing and guideway for a plunger rod, the terminal nipple being rabbeted at its end to form an annular seat for a flexible capsule, and the plunger rod being provided with a convex head having a diameter equal to that of said seat, said plunger head being adapted to restore to a cylindrical shape a flexible capsule which, by mischance, has become flattened, so that it will conform to said seat when the capsule is forced over said plunger head.

Another object of the invention is the

construction of a capsule holder having an apertured lower end for the extrusion there-through of the injection tube of a flexible capsule, and being screw-threaded at its upper end for engagement with screw-threads on the terminal nipple, the flexible capsule being forced over the convex plunger head and seated upon the annular seat on said nipple by the advancement of said capsule holder relative to said nipple, where it is held by said holder during operation of the plunger rod.

With the above and other objects in view, our invention consists in the improved syringe illustrated in the accompanying drawings, described in the following specification, and particularly claimed, and in such variations and modifications thereof as will be obvious to those skilled in the art to which our invention relates.

In the drawings accompanying and forming a part of this specification, and wherein the preferred embodiment of our invention is illustrated:

Figure 1 is a side elevation of the syringe embodying the present invention, showing the capsule holder in cross section.

Figure 2 is a cross sectional view of the syringe with the plunger rod depressed.

Figures 3 and 4 are detail views on a slightly larger scale than that of the previous figures, showing the plunger head in operative relation to the flexible capsule, respectively, in charged and discharged positions.

Figure 5 is a cross sectional view taken along the lines 5—5 of Figure 3.

Referring in detail to the several figures, the numeral 1 designates the casing of a syringe, to which is rigidly secured the curved neck portion 2 by means of the set screw 3. The lower end of the neck portion is outwardly flanged at 4 and extended beyond said flange to form a terminal nipple 5, the latter being provided with screw-threads at its base as shown at 6 and provided at its outer end with the rabbeted shoulder 7 which forms an annular seat having a diameter slightly reduced from the diameter of said terminal nipple. The casing, neck portion and terminal nipple are provided with a continuous bore in

which the plunger rod reciprocates. The latter comprises an outer portion 8, of large diameter, fitting within said casing and being provided with a recess 9 the ends of which cooperate with the set screw 10 to determine the limits of the reciprocatory stroke of said plunger rod. To the inner end of the part 8 of the plunger rod is fixed a stem 11 preferably of small diameter, the space between said stem and the inner wall of the casing 1 being occupied by a spiral spring 12 one end of which is seated on a rabbeted shoulder 13 of the part 8, the other end being seated within a recess formed between the inner wall of the casing 1 and the reduced inner end 14 of the neck portion 2. The spring 12 is normally under compression and maintains the plunger rod in extended position as shown in Figure 1. To the lower end of the stem 11 a flexible shaft 15 is secured which snugly fits within a bore 16 formed in the neck portion 2, said flexible shaft being provided at its lower end with a rigid threaded nipple 17 on which is threadedly secured the plunger 18.

The plunger rod, the stem 11, the flexible shaft 15 and the nipple 17 are preferably metallic but the plunger 18 is made of material such as hard rubber, which is non-corrodible, and may be readily removed from the nipple 17, for the purpose of sterilizing.

The plunger 18 is provided with an enlarged lower end or head 19, which is convex on its outer surface and provided with a shoulder 20 which is adapted to abut against the end 21 of the terminal nipple 5 when the plunger rod is in extended position. The plunger head is of the same diameter as the annular seat 7 on the terminal nipple.

A capsule holder 22 is provided, which is preferably made of hard rubber or other non-corrodible material and is apertured at its lower end as at 23 for the protrusion therefrom of the injection tube 24 of the flexible capsule 25. The holder 22 is provided with an internal bore within which the flexible capsule makes an approximate fit and the upper end of said holder is internally screw-threaded as at 26 for engagement with the screw threads 6 on the outside of the terminal nipple 5. The holder 22 and the flexible capsule 25 are of such relative lengths that when the holder is screwed upon the terminal nipple to the limit imposed by the flange 4 the capsule will then be telescoped upon the annular seat 7.

When it is in this position, the plunger head 19 is within the outer end of said capsule and in engagement with the cork 28 which forms the closure for the upper end of said capsule. The casing 1 is provided with a finger rest 28 and the plunger rod with a cooperating thumb piece 29. When the thumb piece 29 is depressed the plunger

head 19 is advanced against the cork 28 forcing it into the flexible capsule and displacing the medicament 30 which finds an outlet through the apertured end 31 of the injection tube, as shown in Figure 4.

In charging the syringe a flexible capsule, filled with medicament to the point shown in Figure 3, and having the cork inserted therein, is placed within the upper end of the holder 22, the latter having been previously removed from the syringe. The holder is then screwed upon the terminal nipple 5. As the walls of the capsule 25 are flexible, it may happen that the upper end of said capsule is deformed from its normal cylindrical shape, and ordinarily, would not therefore seat upon the annular seat 7. In order to insure a perfect seating of said capsule, the convex plunger head acts as a shaping means for said capsule entering into the upper end of the latter as the holder advances along the screw-threads, and reforming the capsule to the exact shape and diameter of the seat 7. The capsule is likewise guided by said convex head to a position of registry with the seat 7 and forced upon said seat by the advancement of the holder 22 to the final position in which it is in abutment with the flange 4. Should the cork be out of round, as may frequently happen due to compression of the flexible capsule during shipment or from other causes, it will ordinarily seat imperfectly against the wall of the capsule in the course of its depression, resulting in leakage of fluid past the cork, thereby fouling the interior of the syringe. But the plunger head 19 in reforming the capsule, fits the same perfectly, forming a fluid-tight seal behind the cork, the capsule functioning as the plunger chamber.

The joint formed between the capsule and the seat 7 is practically leak-proof so that, should there be any tendency of the liquid within said capsule to leak past the cork as the latter is compressed, it will still be retained in the upper part of the capsule and will not escape therefrom, wetting the metallic parts of the syringe. The injection tube 24 of the flexible capsule 25 possesses a high degree of flexibility, which renders it particularly advantageous in treating pockets or lesions on both the labial and buccal sides of the gums, at the base of the teeth, said nozzle being readily deflectable, without undue pressure, against the hard surfaces with which it may come into contact.

Having described our invention what we claim as new and desire to secure by Letters Patent, is:—

1. In a syringe, a flexible combined capsule and injection tube having a movable end wall, said capsule acting as a plunger chamber, a plunger having a head fitting into said capsule outside of said end wall

in fluid-tight manner, and co-acting with said end wall to expel the contents of said capsule, and a casing operably supporting said capsule and injection tube.

2. In a syringe, a combined deformable capsule and injection chamber, a plunger having a head with a circular periphery fitting into the outer end of said capsule in fluid-tight manner, to reform the same when it is deformed and to expel its contents, and a supporting casing surrounding said capsule and injection tube.

3. In a syringe, a casing, said casing being provided with a capsule seat, a plunger rod passing through said casing, having an end projecting beyond said casing and formed with a shaping and guiding surface, a holder for a flexible capsule engageable with said casing for forcing a flexible capsule over said shaping and guiding surface onto said seat.

4. In a syringe, a casing, having the end thereof threaded and provided with a capsule seat, a plunger rod passing through said casing, having an end projecting beyond said casing, and formed with a shaping and guiding surface, a holder for a flexible capsule, having threads engageable with the threaded end of said casing and advanceable by screwing, to force the flexible capsule over said shaping and guiding surface onto said seat.

5. In a syringe, a casing, having the end thereof threaded and provided with a seat, a plunger-cylinder holder, a plunger rod passing through said casing having an end projecting beyond said seat and into said plunger-cylinder holder, said end being formed with a shaping and guiding surface, a flexible plunger cylinder within said holder provided with a movable plunger cooperating with said plunger rod, said holder having threads engageable with the threaded end of said casing and advanceable by screwing, to force the flexible capsule over said shaping and guiding surface onto said seat.

6. In a syringe, a casing provided at one end with a capsule engaging seat, a reciprocatory plunger rod extending through said casing, a plunger head detachably se-

cured to the lower end of said plunger rod and having an enlarged end, the outer surface of which is substantially continuous with the surface of said seat when the plunger rod is in extended position.

7. In a syringe, a casing having a bent neck portion and provided at one end with a capsule engaging seat, a reciprocatory plunger rod housed in said casing, including a flexible part within said neck portion, a plunger head detachably secured to said flexible part and having an enlarged end the outer surface of which is substantially continuous with the surface of said seat when the plunger rod is in an extended position.

8. In a syringe, a casing having a cylindrical portion provided with a rabbeted seat at its outer end, a replaceable flexible plunger cylinder, a hollow holder surrounding said plunger cylinder and supporting the walls thereof slidably arranged with respect to said cylindrical portion and forming with said rabbeted seat an annular channel surrounding the end of said casing, said plunger cylinder being advanceable within said channel by the sliding movement of the holder upon the cylindrical portion of said casing.

9. In a hypodermic syringe, a casing having a cylindrical portion provided with a rabbeted seat at its outer end, a replaceable flexible plunger cylinder, a hollow holder surrounding said plunger cylinder supporting the walls thereof slidably arranged with respect to said cylindrical portion and forming with said rabbeted seat an annular channel surrounding the end of said casing, said holder being provided with an aperture at its lower end, said plunger cylinder being formed with a reduced nozzle extending through said apertured end, and being advanceable within said channel by the sliding movement of the holder upon the cylindrical portion of said casing, and a plunger and plunger rod operatively associated with said plunger cylinder.

In testimony whereof we have hereunto set our hands.

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