

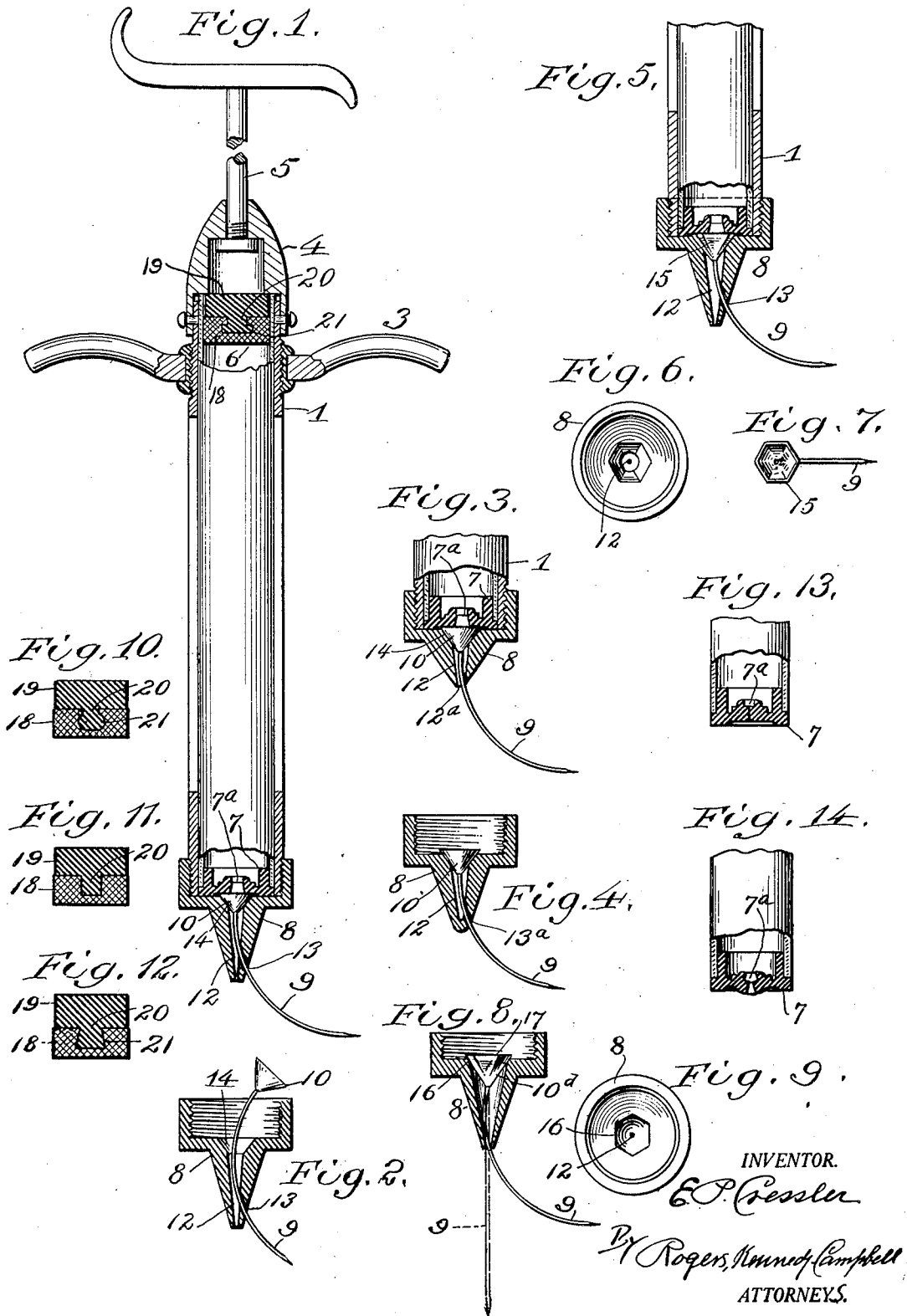
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SYRINGE

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UNITED STATES PATENT OFFICE

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SYRINGE

Application filed April 19, 1924. Serial No. 707,598.

This invention relates to hypodermic or other syringes for the injection of serums, vaccines, drugs or other solutions, and the invention is particularly concerned with the type of syringe in which the solution to be injected is contained in an ampule or container and is discharged therefrom by the actuation of a plunger through a piercing needle supported by a needle holder sustained at the discharge end of the ampule.

The invention deals in part with a syringe of the aforesaid character embodying an improved needle holder permitting the use of a curved needle, and in part with an improved syringe wherein communication between the ampule and needle is established by imposing pressure on the fluid in the ampule, and further pertains to the ampule and needle therefor. The constructions, features and combinations comprised in the invention will be hereinafter explained by reference to the drawings, and are particularly pointed out in the claims.

In the accompanying drawings:

Fig. 1 is a longitudinal section of a syringe having my improved invention embodied therein in one form.

Fig. 2 is a sectional elevation of the needle holder and needle, removed, showing how a curved needle may be inserted and removed.

Fig. 3 is a sectional view of a needle holder embodying the invention in modified form.

Fig. 4 is a similar view showing still another modification of the invention.

Fig. 5 is a sectional elevation of a needle holder of the form shown in Fig. 1 and the needle supported thereby, the said parts being modified with respect to the form of the head on the needle, and the seat on the holder to support the head.

Fig. 6 is a plan view of the needle holder of Fig. 5 showing particularly the form of the seat for the needle head.

Fig. 7 is a plan view of the needle of Fig. 5 removed.

Fig. 8 is a view similar to Fig. 5 showing still another form of the needle head and the seat therefor on the needle holder.

Fig. 9 is a plan view of the needle holder of Fig. 8.

Figs. 10, 11 and 12 are sectional views of different modified forms of the plunger.

Fig. 13 is a longitudinal section through the discharge end of the ampule and the valved closure therefor, showing the valve in closed position.

Fig. 14 is a similar view showing the valve in open position.

Referring to the drawings:

Referring more particularly to Figs. 1 and 2, the syringe of the form there shown by way of example as suitable for the application of my invention, comprises a tubular frame 1 provided in its sides with longitudinal slots through which the ampule seated in said frame may be viewed. The frame has fixed to it adjacent its rear end a handle 3 in rear of which is a plunger rod guiding member 4 carrying a plunger rod 5, the said member 4 being detachably connected with the rear end of the frame by suitable means, such as the "bayonet joint" constituted by pins on the frame entering slots in the member 4. At its rear end the ampule has seated in it a plunger 6 of a form which will be hereinafter described in detail, and at its front or discharge end, the ampule is closed by a cap or plug 7 formed of rubber and having a valve 7^a, which, when the contents of the ampule are free from pressure, will close as shown in Fig. 13, but which, when the closure is flexed outwardly under the pressure of the contents in the actuation of the plunger, will open as shown in Fig. 14. The construction of this valve is fully set forth in an application Serial No. 689,518, filed by me on the 30th day of January, 1924, to which reference

may be had for a more detailed description than is here given. As explained in said application, the valve 7^a may be provided in the flexible end wall of the ampule plug or closure by a conical cavity extending 5 part way therethrough from the inner side and a slit in the outer side meeting said cavity; the relationship of the parts being such that normally the walls of the slit are pressed together as in Fig. 13, but, when 10 the end wall of the plug is flexed outwardly by internal fluid pressure in the ampule, the walls of the cavity will distend and the walls of the slit will separate so as to establish a passageway through the plug. Thus communication with the needle is established by 15 the opening of the valve by outward flexing of the end wall of the plug when pressure is applied to the fluid in the ampule, and such communication is shut off by the closing of 20 the valve when the pressure is released, preventing back suction of fluid from the needle into the ampule. In this connection, a feature of improvement embodied in the valved plug shown in the drawings is that the end 25 wall thereof has a portion of substantially reduced thickness surrounding the central portion in which the valve is formed, promoting ready flexibility of the valved portion of the plug in response to internal pressure in the ampule. 30

Screwed on the front end of the syringe frame is a needle holder 8 in which is supported a needle 9. The needle is of curved 35 form and it has attached to its inner receiving end a head 10 in the form of a conical funnel which is held by the holder close up against the underside of the valved ampule closure, in such position that the contents 40 of the ampule will enter the funnel when the valve is opened on the advance of the plunger. It will be observed that the rim of the funnel projects above the inner face of the syringe head provided by the needle holder and affords an annular abutment on 45 which the valved closure seats and about which its control valved portion flexes.

The needle holder is formed with a bore 12 which extends axially centrally through 50 the holder, which bore is formed with a lateral branch portion 13 extending through the side of the holder, the size and form of the bore being such that a curved needle may be readily inserted therein and passed 55 out through the side opening as shown in Fig. 2 thereby enabling the needle to be readily inserted in or removed from the holder at will. The bore is formed at its inner end with a conical seat 14 on which 60 the funnel head of the needle is supported, and when so supported, the needle will be held rigidly in place and will be prevented from turning around in the use of the syringe in puncturing the tissue and in effecting the injection. In this form of the 65

needle holder, either a straight or a curved needle may be employed, the straight axial portion of the bore permitting a straight needle to be inserted and held by the bore, and the side branch of the bore being adapted as described to receive a curved needle, 70 it being understood that, as above explained, the portion of the bore beyond the lateral branch is enlarged sufficiently to permit the needle to be inserted and removed notwithstanding the curved form of the same. 75

In Fig. 3 the construction is the same as in Figs. 1 and 2, except that in the case of Fig. 3, the lateral branch of the bore is omitted and the latter extends centrally 80 straight through the holder as at 12^a, the size and shape of the bore being such that the curved needle may be inserted or removed.

In Fig. 4 the construction is designed for 85 use only in connection with a curved needle. In this case it will be seen that the bore opens through the side only of the holder as at 13^a, and is closed at its lower end, and is of a form and size above the side 90 opening which will permit the needle to be inserted and removed as before described.

In some of the forms of the invention shown, the funnel head on the needle is conical and circular in cross section, and 95 the bore in the holder in each case is provided as shown with a correspondingly formed seat to support said head. In Fig. 5 however the conical head on the needle is formed with flat sides 15 angularly related 100 to each other, and the bore is correspondingly formed at its inner end so as to constitute a seat for the head. This arrangement will insure that the needle be maintained in position without liability of shifting 105 around on its seat. In this figure the side faces of the seat have some considerable radial extension, but this is not necessary since as shown in Fig. 8 the inner edge of the seat may be formed with angularly related supporting surfaces 16 having 110 no radial extent, and adapted to cooperate with a funnel head 10^a formed with sides 17 angularly related to each other similar to the construction of Figs. 5 and 7. 115

It will be understood that all of the forms of the needle holder shown, with the exception of that shown in Fig. 4, are adapted to support either a straight needle or a curved needle as desired, a single common 120 bore being provided for this purpose as shown in Figs. 3 and 8, while in the other figures with the exception of Fig. 4, the bore is branched off from its axial line to accommodate a curved needle. 125

The plunger 6 in the several forms of the same shown in Figs. 1, 10, 11 and 12 consists of two bodies, a front relatively soft one 18 which fits snugly in the interior of 130 the ampule, and a rear relatively hard one

19 which fits the ampule less snugly, these two bodies being independent of each other but connected together, preferably by interlocking them with each other so as to constitute in effect a single unitary body. 5 The front body 18 is preferably of soft rubber, and the rear body may be of different materials harder than soft rubber such as celluloid, glass, shell, bone, wood, metal, 10 pressed paper, and the like. As shown in Fig. 1 the two bodies are interlocked with each other by the provision on the rear body 19 of a head 20 provided with an overhanging portion 21 which head seats in a correspondingly formed cavity in the front 15 body. The constructions shown in Figs. 10, 11 and 12 are the same except as to the contour of the interlocking head therein shown.

In the action of the plunger, the forward 20 soft body will, as the plunger is advanced by the engagement of the plunger rod with the hard body, be forced against the contents of the ampule and will be caused to spread out and contact snugly and fluid-tight 25 against the interior surface of the ampule, so that the contents of the ampule will be discharged without liability of the escape of the same around the sides of the plunger.

In the foregoing description and accompanying drawings I have set forth my invention in different detailed forms in which the same may be embodied. It will be understood however that these details may 35 be variously changed and modified without departing from the spirit of the invention, and it will be further understood that the invention is not limited to any particular form or construction of the parts except in so far as such limitations are specified in 40 the claims.

Having thus described my invention, what I claim is:

1. A needle holder for a syringe having a 45 needle receiving bore of sufficient size and so placed as to permit the pointwise insertion of a curved needle, and having a branch bore leading off from the primary bore and providing means whereby a curved needle 50 is held against turning about the axis of the needle holder.

2. In a syringe, the combination of a curved needle having a head on its receiving end, and a needle holder having a bore 55 of a form and size to admit of the longitudinal insertion or removal at will of the needle, said holder embodying a tubular body surrounding the needle on all sides.

3. In a syringe, the combination of a 60 curved needle having a funnel shaped head, and a needle holder having a bore of a form and size to admit of the insertion or removal at will of the needle, said bore being provided with a seat to support said funnel 65 shaped head.

4. A needle holder for a syringe, said holder provided with a needle receiving bore opening through the side of the holder and of a form and size to admit of the longitudinal insertion or removal at will of 70 a curved needle, the lateral opening of the bore permitting only endwise insertion of the needle therethrough.

5. A needle holder for a syringe, said holder provided with a needle receiving bore opening both through the end and side of 75 the same, and of a form and size to admit of the insertion or removal at will of a curved needle, the end and side openings of the bore permitting only endwise insertion of the needle therethrough. 80

6. A syringe of the character described comprising, in combination, a body; a needle having a head with polygonal sides; said body formed with a seat for the needle 85 head so as to hold the needle against rotary movement about the longitudinal axis; and a medicament cartridge received within the body and bearing against the polygonal head of the needle to hold it from displacement off said seat. 90

7. A syringe of the character described comprising, in combination, a body; a needle having a head with polygonal sides, said body formed with a seat for the needle 95 head so as to hold the needle against axial movement; the polygonal needle head being hollow and funnel-like and leading to the bore of the needle.

8. A syringe cartridge comprising a tube 100 having a fore sealing closure adapted to permit establishment of communication between the contained fluid and a needle, and having a rear sealing closure comprising an inwardly displaceable piston-plug, said plug composed of a relatively soft inner part 105 tightly fitted in the tube and a relatively hard back part loosely fitted in the tube, one of said parts having a protruding head and the other having a socket engaged by said head, whereby the parts are mechanically 110 interlocked.

9. A syringe of the character described comprising, in combination, a body; a needle holder detachably secured to one end 115 of the body, said needle holder provided with a longitudinal bore to receive the needle, and having a seat at the end of the bore; a needle constructed and arranged to be longitudinally inserted in or removed from 120 the bore and provided with a funnel shaped head at one end thereof, which head is supported on the seat; and a medicament cartridge sealed at one end by a resilient plug which is deformable by the pressure 125 created during an injection; said plug flexing outwardly against the edge of the funnel shaped needle head, thus forming a tight joint for the medicament.

10. A needle holder for a syringe, said 130

holder being provided with a needle receiving bore opening both through the end and through the side of the holder, and being of a form and size to admit of the insertion at will of a straight needle through the end opening or a curved needle through the side opening.

11. A package for liquid medicaments comprising, in combination, a body constructed and arranged to have its interior volume reduced to expel its contents; and a resilient plug closing one end of the body and having a passageway therein provided by an axial cut, said passageway normally closed but opened by flexing of the plug responsive to increase in pressure of the medicament as during an injection; said plug being of reduced thickness between the perimeter thereof and the passageway therein so as to flex readily.

12. A package for liquid medicaments comprising, in combination, a body constructed and arranged to have its interior volume reduced to expel its contents; and a resilient plug closing one end of the body; said plug being of increased thickness centrally and projecting into the body and having a normally closed passageway formed therein at a central point, and being of greatly reduced thickness near its perimeter so as to provide a pressure-responsive diaphragm which flexes under the pressure of ejection to open said passageway.

13. A package for liquid medicaments comprising, in combination, a body constructed and arranged to have its interior volume reduced to expel its contents; and said body having an end closure embodying a resilient wall formed to provide a pressure-responsive, normally fluid tight check valve; said wall, when subjected to the pressure of an injection, flexing outwardly from a thin zone which surrounds the check valve.

14. A syringe for hypodermic and other injections comprising, in combination, a body constructed and arranged to hold a package for liquid medicaments; a plunger at one end of the syringe body; a needle having a funnel-like head and held on the opposite end of the body; and a liquid medicament package constructed and arranged to have its interior volume reduced by pressure from the plunger, said package having an end closure embodying a resilient wall formed to provide a pressure-responsive, normally fluid tight check valve; said wall, when subjected to the pressure of an injection, flexing outwardly from a thin zone which surrounds the check valve, said plug and needle head in close contact when the parts are in operative position, so that the medicament passes from the check valve directly into the needle and thence to the point of injection without contamination from contact with the body of the syringe.

15. A hypodermic syringe embodying a sealed medicament container and a curved injecting needle, with means holding said needle in proper relation to the container with sufficient firmness to prevent rotation of the needle about the longitudinal axis of the syringe; said container constructed to have its interior volume reduced and embodying sealing means openable by internal fluid pressure to establish communication between the fluid chamber of said container and the needle.

In testimony whereof, I have affixed my signature hereto.

EDWARD P. CRESSLER.

CERTIFICATE OF CORRECTION.

Patent No. 1,728,259.

Granted September 17, 1929, to

EDWARD P. CRESSLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, line 60, claim 14, for the word "plug" read "wall"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of October, A. D. 1929.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.