

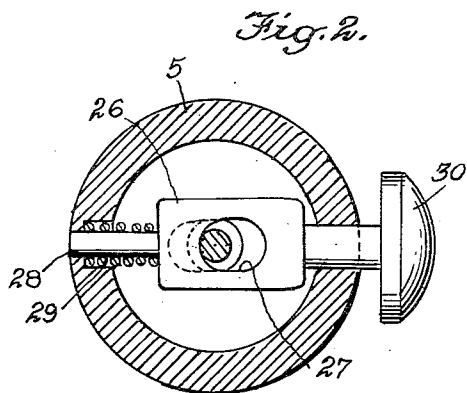
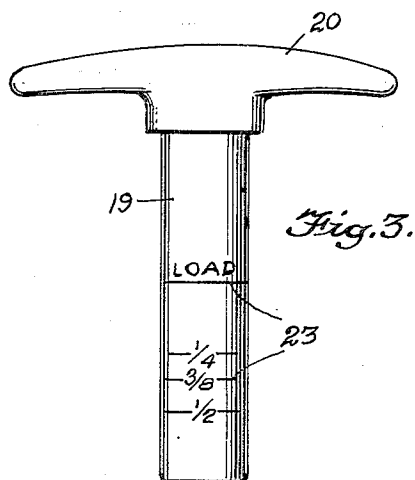
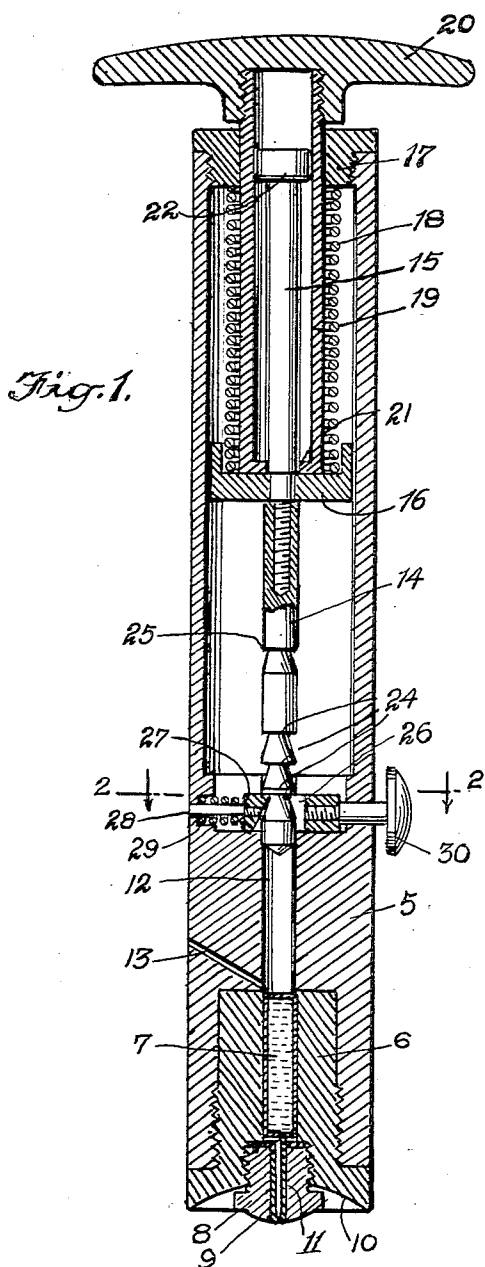
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INJECTION APPARATUS

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## INJECTION APPARATUS

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3 Claims. (Cl. 128—173)

This invention relates to a structurally and functionally improved injection apparatus; the present application being a division of my prior application for patent on Injection Apparatus now issued under No. 2,669,230 on February 16, 1954.

By means of the present teachings, a compact assembly is furnished which may be readily employed by relatively unskilled persons to effect an injection of medicament without the necessity of employing a relatively long needle which penetrates those tissues to the requisite depth.

Moreover, the present apparatus permits of the ready injection of different volumes of medicament at the will of the operator; the mechanism being capable of ready use in connection with the so-called velocity injection technique.

Still another object is that of furnishing a mechanism which will include relatively few parts, each individually simple and rugged in construction, such parts being capable of ready manufacture and assembly to furnish a unitary apparatus capable of use over long periods of time with freedom from all difficulties.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating one practical embodiment of the invention and in which:

Fig. 1 is a sectional side view of the apparatus;

Fig. 2 is a transverse sectional plan view taken along the line 2—2 in the direction of the arrows as indicated in Fig. 1; and

Fig. 3 is a side elevation of one of the elements embodied in the assembly.

Referring primarily to Fig. 1, the numeral 5 indicates the body of the unit which as shown may include a single, main component of tubular configuration and provided adjacent one end with a recess within which a plug 6 is mounted by, for example, screw threads. This plug defines a bore constituting a medicament-receiving chamber and within which an ampule 7 of any desired and proper type may be disposed. It is definitely preferred to employ such an ampule rather than have the medicament disposed in direct contact with the surfaces defining the chamber. The outer end of the chamber is closed by a nozzle unit 8 which may be mounted by screw threads formed therein and in a recess defined in plug 6. Preferably the outer face of nozzle 8 is bulged or convex as indicated at 9 and the adjacent face of plug 6 may be concave or recessed as at 10 to define in conjunction with surface 9, an assembly suitable for contact with the skin surface. Nozzle 8 is formed with a bore leading through to its outer face. A cannula 11 is disposed within this bore and has its inner end of a nature such that it may perforate or otherwise extend into the body of the ampule 7. If velocity injection is to be resorted to, then at least the outer end of the cannula should be reduced to define an orifice ranging for example from .003" to .012".

Body 5 is formed with a bore aligned with the chamber of plug 6. Adjacent its lower end, this bore may be formed with a laterally extending venting passage 13. A plunger 14 is projectible through this bore and into the

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chamber of plug 6. With an ampule 7 within the chamber the plunger will serve to cooperate with the latter to assure a discharge of medicament from that space and out through the passage of nozzle 8 or any equivalent structure employed at that point. Piston 12 is power projected in a manner hereinafter brought out and is continued in the form of a rod 15 connected to it in any suitable manner as, for example, by screw threads.

Conveniently disposed at the point of juncture of the piston and rod is a washer 16. The diameter of the latter, as shown, is sufficiently small so that it may be freely movable axially of the assembly and within the bore or enlarged recessed portion formed in the upper end of body 5. A cap 17 closes the outer end of this bore. A powering mechanism such as a spring 18 is interposed between cap 17 and washer 16. Therefore, with cap 17 secured against movement with respect to body 5, it follows that spring 18 will exert an outward or downward pressure on the washer 16 and piston 14. In this manner, the piston will be power projected.

Cap 17 is formed with an opening through which a sleeve 19 slidably projects. The upper end of the latter conveniently terminates in a handle portion 20 lying beyond cap 17. The inner end of sleeve 19 may be intumed as at 21. The upper or inner end of rod 15 terminates in an enlarged head 22, the diameter of which is such that it will engage with the surfaces of end portion 21. Conveniently as in Fig. 3, the outer face of sleeve 19 provides indicia at 23. This indicia may be exposed above the upper face of cap 16 and include any desirable number of graduations indicative of volumetric capacity. As illustrated, these graduations embrace the marks  $\frac{1}{4}$ ,  $\frac{3}{8}$  and  $\frac{1}{2}$  and in each instance indicate fractions of a cubic centimeter.

As shown, the rear end of piston 14 may be formed with a corresponding number of detent or shoulder portions 24. Additionally, it may be formed with a somewhat spaced shoulder or detent portion 25. To cooperate with these portions, a movable trigger or latch mechanism is furnished. Conveniently, and as shown in detail in Fig. 2, this element includes a transversely disposed and shiftable plate 26. This plate is formed with a central opening 27 of an area such that plunger 14 may pass there-through. The plate is mounted upon a rod 28 which may be spring-pressed as at 29 and provided with an actuator or trigger portion 30 projecting beyond the side face of housing or body 5. Normally, and under the influence of spring 29, plate 26 will occupy a position such that it underlies one of the shoulders 24 or 25. However, when actuator 30 is pressed inwardly against the action of this spring, opening 27 will assume a position such as has been indicated in dash lines in Fig. 2. Under these circumstances, the edge zone of the plate opening will completely clear the latch portions or detents and plunger 14, together with rod 15, will be free to project under the influence of spring 18.

In operation, it will be understood that a user will grasp actuator or handle 20 and retract the same. With such retraction, the intumed end portion of sleeve 19 will engage head 22. This will cause rod 15 and piston 14 to be retracted to a point where at least detent or stop portion 25 rides past the upper surface of plate 26. Under these circumstances, piston 14 will be clear of the medicament chamber defined within plug 6. Therefore, if nozzle 8 is dismounted, an ampule 7 may be disposed within this chamber or the latter may otherwise be suitably filled with medicament. The fact that piston 14 has been retracted to a point rendering the entire interior of the chamber accessible will be indicated by, for example, the "load" term of indicia 23 being visible above cap 17. According to the amount of medicament which

is to be injected, a more or less forceful projection of piston 14 should occur. Therefore, the operator will observe the area of sleeve 19 above cap 17 and according to the elected dosage, will interrupt further retraction of the actuator 20 and sleeve 19 in line with the indication 23 which corresponds to the volume of liquid to be discharged under effective conditions.

With the trigger mechanism not engaged by the operator's finger, plate 26 will, under these circumstances, override one or more of the stops or detents 24 and come to rest below the one corresponding to the elected dosage. So arranged, it will latch against the elected surface to prevent a projection of piston 14 until such time as plate 26 is shifted by actuator or trigger 30.

The site of injection having been selected, nozzle 9 will be pressed against the adjacent skin surface. Lateral movement of the apparatus will be prevented incident to the surface configuration of this nozzle especially in conjunction with the relatively sharp edges defined by the edge surfaces of plug 6 due to the concavity or recess portion 10 of the latter. Therefore, no fear need be felt of injuring the patient during injection incident to an accidental movement of the assembly. This will be especially desirable in the case of velocity injection technique being resorted to.

When the triggering mechanism is operated by shifting actuator 30 and consequently plate 26, plungers 14 and 15, under the thrust exerted by spring 18 or any equivalent powering mechanism, will be forced downwardly at relatively great speed. Air may escape through vent 13. The outer end of piston 14 will engage with considerable violence the upper end of ampule 7 or equivalent, medicament-containing element. During the positioning of nozzle 8, communication will have been established between the interior of the ampule and the bore of passage 11. Therefore as the plunger assembly cooperates with the medicament chamber, the liquid within the latter will be expelled through the nozzle bore. If at least the outer end of that bore be constricted, then a stream of sufficiently reduced diameter will be projected such that the liquid will move at skin-penetrating velocities so that no tissue-piercing needle will have to be employed. According to the setting of the plunger as established by the retraction of the actuator and sleeve, the desired dosage will be injected.

After completion of the injection, the operator, by engaging actuator 20, may retract sleeve 19 and the plunger assembly to a point where the detent plate 26 engages stop 25. Under these conditions, nozzle 8 may be dismounted and the ampule which has been collapsed coincident with the injection, can readily be removed from the medicament chamber. Thereupon a new ampule is positioned within that chamber and the entire cycle of operation completed.

As a consequence of the different positions to which the piston assembly may be retracted, that assembly will enter the medicament chamber with greater or lesser force. As aforebrought out this will permit of larger or smaller volumes of liquid being expelled from the chamber at the necessary pressures. Additionally, it will permit of that liquid medicament being injected into the

tissues to a greater or lesser depth. To this end a shorter ampule may be used within the chamber. Also, the indicia 23 may be altered to indicate the force with which the piston will act against the ampule and/or the general depth of injection and pattern of dispersion which may be anticipated.

Thus, among others, the several objects of the invention as specifically aforementioned are accomplished. Obviously, numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

#### I claim:

1. An injection apparatus including in combination a body providing at one end a medicament-receiving chamber having a discharge opening, a power-driven piston reciprocal within said body to expel medicament from said chamber, a latch movably mounted by said body to maintain said piston in a retracted position, a sleeve slidably mounted by said body to extend rearwardly of the same, said sleeve engaging with said piston adjacent its inner end to retract said piston, said sleeve being thereupon projectible into said body to be housed therein and said piston, during such projection, remaining in retracted position as a consequence of the operation of said latch.

2. An injection apparatus including in combination a body providing at one end a medicament-receiving chamber having a discharge opening, a power-driven piston reciprocal within said body to expel medicament from said chamber, a latch movably mounted by said body to maintain said piston in a retracted position, a tube slidably mounted by said body to be projected beyond the rear end of the same, an intumed portion carried by said tube, a head at the inner end of said piston, said intumed portion slidably engaging said piston and abutting said head to thereupon retract said piston in unison with said sleeve and a handle secured to the outer end of said sleeve.

3. An injection apparatus including in combination a body providing at one end a medicament-receiving chamber having a discharge opening, a power-driven piston reciprocal within said body to expel medicament from said chamber, a latch movably mounted by said body to maintain said piston in a retracted position, a tube slidably mounted by said body adjacent its rear end and being extendible beyond that end, means for connecting said sleeve and piston for slidable movement with respect to each other and thereupon for movement in unison, indicia upon the surface of said sleeve and exposable beyond the body as said sleeve is retracted, said indicia indicating the degree of retraction of said piston by said sleeve and a series of latch portions on said piston and engageable by said latch, said latch portions being spaced in conformity with such indicia.

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