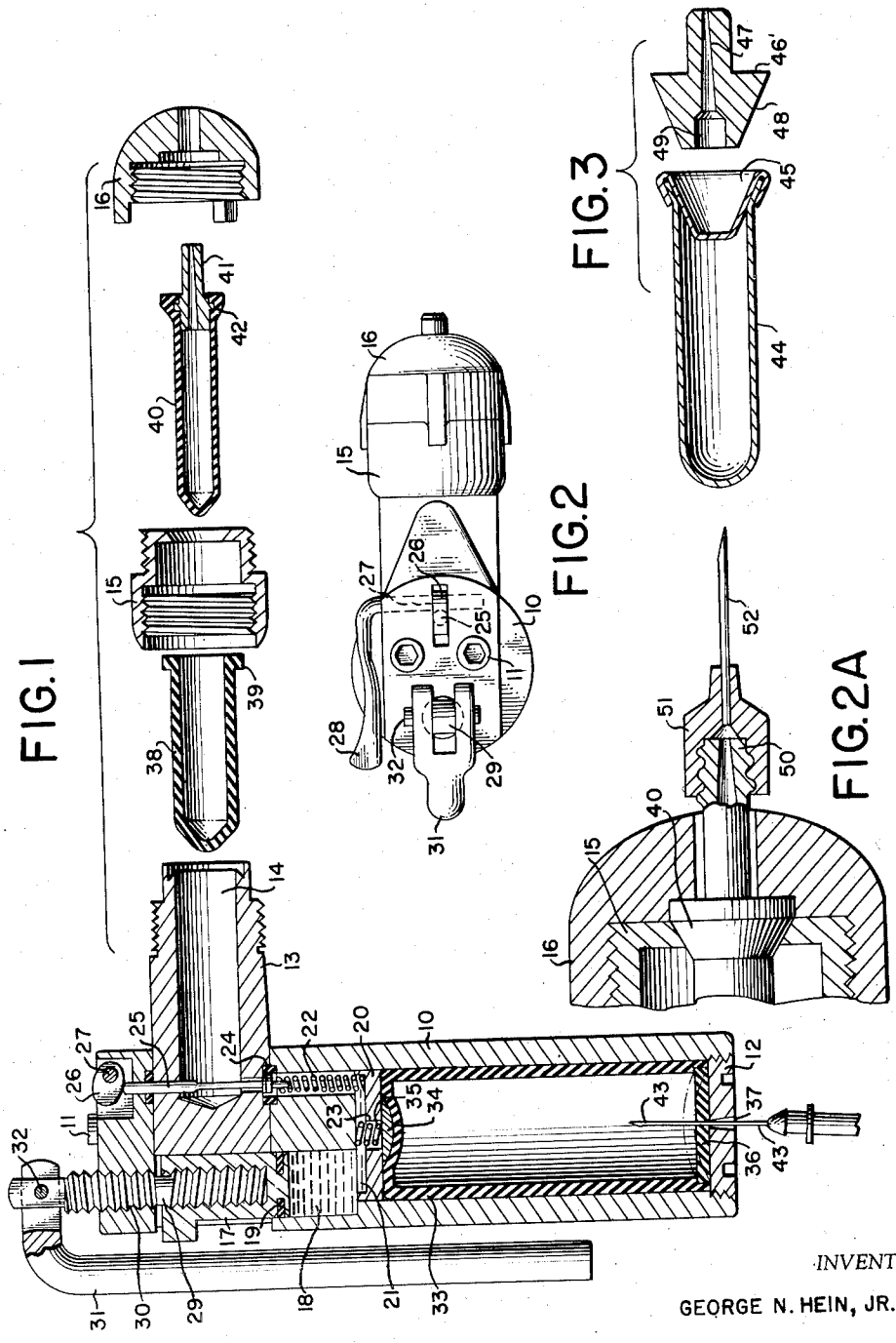
July 9, 1957 G. N. HEIN, JR 2,798,486

INJECTION ASSEMBLY

Original Filed May 29, 1948 2 Sheets-Sheet 1



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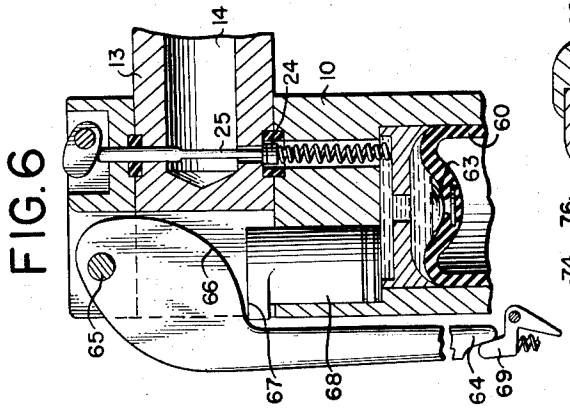

FIG. 6

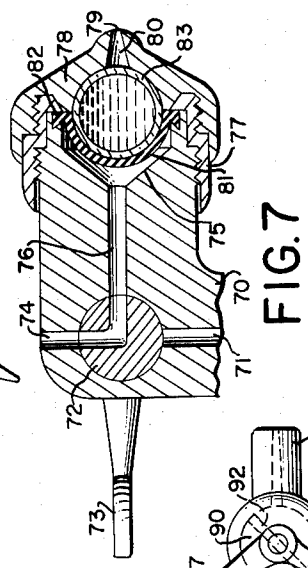

FIG. 7

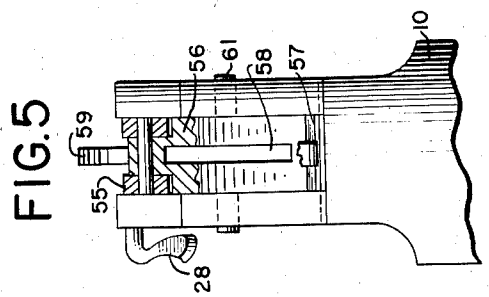

FIG. 5

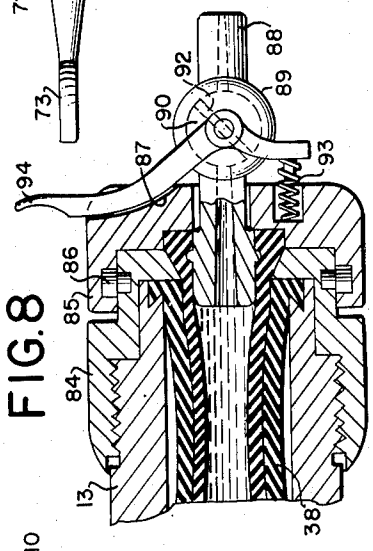

FIG. 8

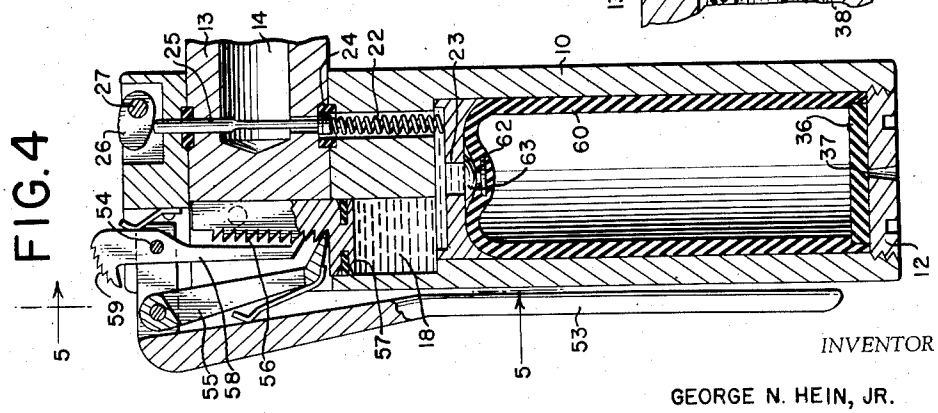

FIG. 4

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United States Patent Office 2,798,486 Patented July 9, 1957

2,798,486

INJECTION ASSEMBLY

George N. Hein, Jr., San Carlos, Calif.

Continuation of application Serial No. 30,047, May 29, 1948. This application December 21, 1953, Serial No. 399,511

9 Claims. (Cl. 128—173)

This invention relates to a structurally and functionally improved hypodermic assembly; the present application being a continuation of my prior application for United States Letters Patent on Injection Assembly, filed in the United States Patent Office on May 29, 1948 and identified under Serial No. 30,047, and now abandoned.

It is a primary object to provide an assembly which will function without the aid of a tissue-piercing needle. However, such a needle may be employed and when so utilized will provide—in conjunction with the assembly—an apparatus in which conventional injection techniques may be followed.

It is a further object of the invention to furnish an apparatus which will be readily portable and operable by a person who is not mechanically skilled and by means of which the injection of medicament may be precisely controlled, not alone with respect to amount, but also in the case of a velocity injection apparatus, with regards to depth and area of penetration and dispersion of the liquid.

A still further object is that of furnishing an injection apparatus which may be readily loaded or charged and in which those portions requiring sterilization may be subjected to accepted technique. Additionally the apparatus may contain desired quantities of medicaments of definite brands; the present invention, moreover, contemplating novel medicament-containing elements such as ampules and cartridges which may either have a "one time" use or may be capable of being refilled any desired number of times.

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

Fig. 1 is a sectional side view of an assembly with certain of the parts separated from each other;

Fig. 2 is a top plan view of the assembled apparatus;

Fig. 2A shows the outer end of the assembly as illustrated in Fig. 1, but with a tissue-penetrating needle in association therewith;

Fig. 3 illustrates an alternative form of ampule or cartridge and nozzle from that shown in Fig. 1;

Fig. 4 is a sectional side view of another form of assembly;

Fig. 5 is a fragmentary sectional view taken along the lines 5—5 and in the direction of the arrows in Fig. 4;

Figs. 6 and 7 are fragmentary side elevations of actuating mechanisms different from that shown in Fig. 1; and

Fig. 8 is an enlarged fragmentary sectional view of an alternative form of structure.

With primary reference to Figs. 1 and 2, the numeral 10 indicates the body of the apparatus which is preferably formed of metal and includes an assembly the parts of which are retained against displacement by, for example, bolts 11. The lower end of the body may be provided with a compartment which is normally closed by plug 12 having screw threaded connections therewith. Conveniently, the body is provided with an extension 13 formed with a bore 14. Mounted by the outer end of

the extension is a retaining collar 15 and a cap 16, the latter being formed with a central aperture.

A piston 17 is reciprocable within a cylinder 18 forming a part of body 10. This piston mounts a seal 19 which will prevent the escape of liquid under pressure. A plate 20 may define the upper end of the body chamber, the lower end of which is closed by the cap or plug 12. This plate is formed with a passage 21 extending from cylinder 18 to a bore 22. The passage 21 is centrally interrupted by a passage 23. A spring pressed poppet valve 24 normally seals the outer end of bore 22, and may be faced with tin or other proper material. This valve may be unseated by operating a stem 25 which may be engaged by a cam 26. The stem is suitably guided to prevent rotation. The cam as especially shown in Fig. 2, is mounted for rotation with a shaft 27 capable of being rocked by a handle 28.

With a view to actuating the piston 17 an operating stem 29 may be employed. The ends of this stem are oppositely threaded as at 30 and engage respectively with threads formed in the upper part of the assembly and the piston 17. A handle or lever 31 is pivotally secured as at 32 to the stem 29. Therefore this lever may be swung outwardly to assume a position substantially perpendicular to the axis of the stem. In that position the stem may readily be rotated by the handle. With such rotation, the piston 17 will either be projected into cylinder 18 or retracted therefrom.

Disposed within the bore of body 10 is an accumulator of the gas type. According to the teachings of this invention that unit is preferably in the form of a rubber cup 33 disposed in inverted position within the bore. The cup has disposed adjacent its base and in line with the bore 22 a disk 34. A spring 35 may bear against this disk. Also, if desired, the disk may be directly attached against movement with respect to the base of cup 33. The lower end of the cup is sealed by a disk 36 which may also be formed of rubber and the inner face of which is preferably convex. The plug 12 is formed with an opening 37 preferably in line with the center of disk 36 for a purpose hereinafter brought out.

Within the bore 14 of extension 13 a collapsible member 38 preferably formed of rubber is disposed. This member or bag has a flange 39 adjacent its outer end which flange is conveniently interposed between the adjacent faces of extension 13 and ring 15. Accordingly, a liquid type seal is provided between these parts. A medicament-containing chamber is disposed within bag 38. As illustrated in Fig. 1 this chamber is also in the form of a collapsible bag 40 and has its outer end extending beyond the collar 15. The outer end of the receptacle 40 is closed by a tip 41 having an inner flange portion 42 around which the mouth of the receptacle 40 may extend. Therefore, the tip 41 and the receptacle 40 are maintained in association with each other. Additionally the receptacle 40 extends between the adjacent surfaces of collar 15 and cap 16 to provide a sealing structure between these parts. As shown, the tip 41 projects substantially beyond the face of cap 16. It will be understood that it may extend to a lesser or greater amount than has been illustrated in Fig. 2 or might, in fact, be substantially flush with the outer cap face.

In using an apparatus of this nature, it will be understood that the receptacle defined by the cup 33 is filled with gas under pressure. Such gas is preferably nitrogen although other gases or, in fact, air might be employed. The medicament-containing receptacle 40 with its nozzle 41 is filled in any desired manner with the proper liquid. Prior to such filling it may be sterilized. With the cap 16 removed, this receptacle is disposed within the collapsible bag or chamber 38. Thereupon cap 16 is mounted in order to properly engage the outer portions

of the receptacle 40 and depress the same into sealing contact with the surfaces of collar 15. If the capacity of the largest size ampule or cartridge 40 capable of being accommodated within the chamber 38, is for example, 2 cc. the effective capacity of the cylinder 18 should be slightly in excess of this amount. That cylinder will be filled with liquid when the piston is fully retracted which liquid will also fill the passages 21 and 23 and the bore 22 as well as the bore 14 of extension 13.

It will be assumed that the apparatus is being employed in connection with velocity injection of medicament, i. e. an injection employing no tissue piercing needle. Under these circumstances, the pressure within the chamber defined by cup 33 and plug 36 may be of substantial value, for example, 2,500 pounds per square inch or even higher. Assuming that all of the medicament within the ampule 40 is to be injected, then the operator will turn the stem 29 by means of the handle 31 in order to fully project piston 17 within cylinder 18. This will cause the liquid to be displaced from the cylinder through passage 21. Valve 24 being closed, it follows that the liquid will flow through passage 23 and act against the face of plate 34; the parts normally being urged in an inward direction by the spring 35. Due to the provision of plate 34 and the fact that the base of cup 33 is relatively thin, the entrance of liquid into the upper end of the bore containing this cup will cause the base portion of the same to collapse upon itself or move towards the plug 12. With a partial collapse of the cup 33, the pressure within the latter will be increased. Such increase with the full projection of piston 17 may amount to 100 pounds. Thus, if an initial pressure of 2,500 pounds existed within the cup, the pressure existing under these circumstances may now be 2,600 pounds. It is to be remembered that these pressures are merely illustrative and that pressures of materially lower or higher values might be employed. Higher pressures will be especially desirable where the medicament is relatively viscous. Substantially lower pressures will be employed where free flowing or thin liquids are employed and where either readily penetratable tissues are being injected or where the injection is not to be relatively deep.

In any event, the tip 41 which in the case of velocity injection will function in lieu of a needle, is disposed by the physician either in contact with or adjacent the surface tissue to be penetrated. Thereupon cam 26 or its equivalent is shifted by, for example, rocking handle 28 to oscillate shaft 27. With the parts functioning in this manner, pressure is exerted against the stem 25. This will cause valve 24 to be unseated against the action of its spring. With such unseating, the liquid under high pressure will flow into bore 14. This will cause the chamber or bag 38 to be collapsed. With such a function occurring, the receptacle 40 contained within the collapsible chamber will likewise be collapsed. This will cause the contained medicament to be expelled under a high velocity and pressure from the nozzle 41 to thus cause the desired injection. As will be understood from the foregoing, 2 cc. of liquid will flow into the bore 14 thus causing a complete expulsion of the 2 cc. of medicament within the ampule or cartridge 40. The excess amount of liquid provided by the full projection of piston 18 merely assures that this result completely obtains.

If the receptacle 40 contains 2 cc. of medicament and only 1 cc. of the same is to be injected, then, of course, the piston 17 will not be fully projected. Rather it will be projected through one-half of its fully extended position. Therefore, only slightly in excess of 1 cc. of the liquid within the cylinder 18 will be displaced to cause a corresponding collapse on the part of the cup or receptacle 33 due to the displaced liquid bearing against its upper end. Accordingly the latter will only expand—upon release of valve 24—to a point where it firmly engages the adjacent faces of the walls within which it is confined. Such extension will result merely in 1 cc. of liquid being delivered within the bore 14 when valve 24 is released to cause the corresponding collapse on the part of chamber 38 and the contained medicament receptacle.

Should it be necessary to relieve the pressure within the cup 33 or its equivalent, this may be accomplished by inserting a cannula in the form of a hypodermic needle 43 through the opening 37 and piercing the plug 36. This will allow the escape of the compressed gas or air to the desired extent. If this operation is continued, all pressure will be exhausted. Conversely, if the interior defined by cup 33 is to be charged with gas or air under pressure a needle 43 may again be inserted as described. Under these circumstances, plug 36 will assume the position indicated in dotted lines in that such plug preferably has a diameter slightly in excess of the lip diameter of cup 33. Thereupon, with nitrogen or other material under proper pressure flowing through the needle 43, the receptacle or cup will receive a suitable pressure charge. Under these circumstances plug 36 will gradually assume the position shown in full lines. With adequate pressure existing, the needle may be withdrawn. It is obvious that a relatively fine cannula is employed. Therefore plug 36 will automatically seal the aperture established by the needle upon the withdrawal of the latter.

In the event that it is desired to employ a different type of ampule, then the structure illustrated in Fig. 3 may be utilized. In that structure a hollow cup-shaped body 44 of thin metal or metal foil may be used. Preferably the metal employed will be tin. The mouth of the receptacle will be closed by a cap or diaphragm 45 of similar material. The body 44 will contain the desired medicament and will have a capacity corresponding to the total injection to be given. Conveniently the diaphragm 45 is sealed against the lip of body 44 by clamping the edges of the diaphragm around the lip. If desired, a suitable sealing material may be employed at this point. The nozzle will include a body 46 formed with an orifice 47 and having an inner or rear portion 48 conforming generally to the contour of the face of diaphragm 45. Adjacent its inner end the passage 47 is enlarged as indicated at 49. At this time it is to be understood that for the purposes of illustration, both the passage of nozzle 46 as well as the passage of nozzle 41 have been shown as relatively large. In actual practice they might be minute (below, for example, .006") or relatively large. Also, only the outer ends of the passages need define these dimensions so that surface friction will be reduced to a minimum.

Returning to a consideration of the structure shown in Fig. 3, it will be understood that if the ampule or medicament-containing body 44 is disposed in a collapsible chamber or bag as shown in Fig. 1, and the parts are otherwise properly assembled, a release of liquid under pressure into the bore 14 will cause the diaphragm 45 to rupture adjacent the enlarged portion 49 of bore 47. Thus, medicament will be free to flow at high velocities and under high pressures from the nozzle. Again, the same technique as aforedescribed may be utilized in securing only a partial collapse of the body 44 and a corresponding partial discharge of the contained medicament.

In the event that the apparatus is to be employed in connection with a tissue piercing needle, then, as shown in Fig. 2A, the tip 50 may have its exterior surfaces so formed as to provide a mounting portion for the hub 51 of a needle 52. Under these circumstances, the pressures existing within the chamber defined by cup 33 or its equivalent will be relatively very low. For example, a 100 or less pounds to the square inch charge may exist within the diameter. The diaphragm 45 may be pierced should the pressure be inadequate to rupture or fracture the same. In any event, with the parts properly adjusted, and the needle extending through the epidermis into a vein or into sub-cutaneous tissues, an operation of valve 24 will

result in an injection of the medicament through the passage of the tip 50 and so through the bore of the needle 52. If desired, and before penetration of the epidermis the valve may be momentarily opened to a partial extent to assure the expulsion of all air within the hub and bore of the needle assembly and the aperture of the tip.

Actuating mechanisms different from that shown in Fig. 1 may obviously be employed. In certain respects, these alternative forms of mechanisms may be simpler to operate. Two layouts of such mechanisms have been shown in Figs. 4 to 6 inclusive. Referring to the first two of these figures, it will be seen that a lever 53 has been shown as pivotally connected at 54 to body 10. This lever mounts a spring pressed pawl 55 which engages with the teeth 56 of a ratchet forming a part of piston 57. A holding pawl 58 may also be mounted by pivot 54 and be provided with an actuator 59. Again, a spring may be employed to normally assure an engagement between this pawl and the teeth 56.

As will be observed, the lever 53 may be swung outwardly which will result in pawl 55 shifting upwardly to engage the next succeeding tooth of ratchet 56. Thereupon by swinging lever 53 downwardly piston 57 will be advanced within cylinder 18 a corresponding distance. With this movement of the parts, pawl 58 will override one of the teeth 56 and will shift into position above the same. Thereafter it will prevent a retraction of the piston 57. The liquid displaced from the cylinder 18 under this operation of the parts will cause the gas containing receptacle or cup 60 to be slightly collapsed due to that liquid acting against the surface thereof. Thereupon, as aforedescribed, the poppet valve 24 may be released to cause a partial collapse of the member or bag 38 with a corresponding ejection of medicament from the containers 40 or 44. Such operation will occur when only a minute amount of medicament is to be injected. If a larger amount is to be injected then the aforedescribed projection of the piston may be continued through two or more teeth of the ratchet 56 or, in fact, throughout all of those teeth. Under such conditions, a greater collapse or constriction of bag 60 will occur due to the increased amount of liquid which is displaced.

In any event, the piston will eventually be projected to its maximum extent. Under these circumstances a new or refilled medicament-containing member will have to be associated with the apparatus. It will be remembered that the cylinder 18 will preferably have a capacity slightly in excess of the medicament-containing member. Therefore, a residual pressure will exist, in that the reservoir or container 60 will still be slightly compressed. To relieve this pressure the operator may, for example, swing the lever 53 outwardly to its fullest extent, and prior to such swinging engage the actuator 59 to release pawl 58 from the ratchet 56. As will be obvious with such movement of the parts, the pressures will be relieved. Now the piston 57 may be retracted by, for example, gripping the extensions 61 of the same and shifting the assembly upwardly while maintaining valve 24 in open position. Under these circumstances, the hydraulic liquid, embodying suitable and necessary characteristics will be returned to cylinder 18. Thereupon the exhausted medicament-containing element may be removed and a fresh one substituted.

As previously indicated, the plate 34 can be associated with the cup or its equivalent in numerous different manners. One arrangement has been shown in Figs. 4 and 6 where the upper face or closed end portion of the receptacle 60 has been illustrated as formed with a recess. Into this recess a part 62 forming a portion of plate 63 may extend. Therefore, this plate will remain in association with the upper receptacle face and it will not be necessary to employ a spring 35 or the equivalent thereof. In any event, however, the plate 63 should be of such area compared to passage 23 that there will be no danger of any part of the body 60 entering that passage.

The form of actuating mechanism shown in Fig. 6 may conveniently include a lever 64 pivoted as at 65 and presenting a cam surface 66. The upper surface 67 of piston 68 is, under these circumstances, formed so as to cooperate with the cam 66. A latch diagrammatically indicated at 69 may be employed to retain lever or handle 64 against movement when that handle is in the position shown in Fig. 6.

With an apparatus of this type, it will be understood that as handle 64 is swung downwardly, it will force piston 68 to fully projected position. Under these circumstances, the gas containing receptacle 60 will be compressed by the hydraulic liquid. The cam 66 is conveniently developed in a manner such that the force with which piston 68 tends to retract will not cause the cam to be shifted. Rather it will act as a holding structure for the piston. In this, as a precautionary measure, it is preferred that a latch structure as suggested at 69 be employed. While it would be feasible to depress the piston 68 so that only a partial discharge of medicament would occur, it is also preferred that an apparatus such as this be operated so that all medicament will be discharged in a single operation. If fractional discharges are to be resorted to, then structures such as aforedescribed in connection with Figs. 1 and 4 should preferably be employed.

A further form of structure has been shown in Fig. 7 in which the numeral 70 indicates a suitable extension formed with a passage 71. A flow of fluid through this passage may be controlled by a valve 72 to which an actuator 73 is connected. The body 70 may be formed with a venting passage 74. At the outer end of part 70 a chamber 75 is provided; a passage 76 affording communication between this chamber, the valve 72 and passage 71.

A collar 77 may be mounted by suitable threads at the end of extension 70 and may, in turn, mount a cap 78. The latter is formed with a discharge orifice 79 which may define the outer end of an inwardly flared passage 80. Interposed between body 70 and collar 77 is a collapsible member 81 which may be formed with a sealing and retaining flange 82. This flange is clamped between the collar and body. Thus, the collapsible member seals the outer face of chamber 75. A medicament containing element 83 is arranged between cap 78 and the collapsible member 81. This medicament-containing member may be in the form of a gelatin capsule or comprise a body of foil or any other desired and proper material.

An apparatus such as this may be provided as part of a unit shown in any of the preceding figures. Under these circumstances, the hydraulic liquid will serve to displace the body 81 and collapse the medicament-containing capsule disposed adjacent thereto. If such a structure is adopted, then the venting opening 74 should be dispensed with. However, it will be apparent that apparatus as shown in Fig. 7 might conveniently be connected to any source of fluid pressure such as a compressed gas or air container. With the parts arranged as shown in this view and regardless of the pressure source, the orifice 79 is disposed adjacent or in contact with the skin of the patient at a point overlying the area to be injected. Thereupon by shifting valve 72 fluid under pressure will be free to flow from passage 71 into passage 76 and so into chamber 75. Under these circumstances, the flexible disphragm member 81 will be shifted. Such shifting will cause the body of the medicament-containing element 83 disposed adjacent the mouth of passage 80 to be ruptured. Obviously, the medicament will therefore be discharged under high velocity and pressure from orifice 79.

Accordingly, the desired injection will be achieved. Conveniently valve 72 will be potentialized by a spring

(not shown) to return to its normal position as shown in Fig. 7. If gas under pressure is employed as the motive force, then in that normal position the gas will be vented through opening 74. Accordingly, pressures will be relieved and cap 73 may be removed and the exhausted element 83 may be discarded. With the release of pressure, the collapsible member 81 will have assumed its normal position. Thereafter a fresh element may readily be inserted.

From the foregoing it will be understood that an injection assembly is provided by means of which medicament may be injected to desired depths and throughout selected areas of tissue. In the event that it is desired to employ a piercing needle, then such a needle may be suitably associated with the apparatus as suggested in Fig. 2A. In each instance, it is preferred that the collapsible chamber provided either by, for example, bag 38 or the diaphragm 81 be formed of rubber. It is apparent, however, that other material might be utilized. With an accumulator structure provided by the gas or air filled cup 33—60 or its equivalent, it is feasible to control the discharge of medicament with complete precision. It is preferred that the receptacle containing the pressure be formed of synthetic rubber such as Butyl rubber although any proper material which will be impervious to the compressed gas may be employed. Where an accumulator structure is not utilized, such as in Fig. 7, where any desired source of fluid pressure might be employed, a compressed gas such as CO_2 or air could be utilized and vented into the atmosphere without detriment. In each instance it is preferred that the inner face of the chamber defined by the collapsible member or flexible diaphragm and the adjacent parts be equal in volume to the body of the medicament-containing element and intimately contact the latter. Accordingly, there will be no dead air spaces or pockets which might interfere with the operation of the device. In many respects it is desired to utilize a medicament-containing element having the contour generally indicated in Figs. 1 and 3. However, any desired contour might be imparted to this unit. This is also true of the capsule element as shown in Fig. 7 which instead of the sphere there illustrated might be of egg shape or comprise a somewhat tubular structure as shown in the earlier views. As will also be understood, a separate medicament-receiving element might, in certain instances, be dispensed with. In that case, the liquid to be injected might be placed directly within the collapsible chamber—for example—the bag 38.

Under certain conditions it might be desired to place the medicament under pressure but to withhold a discharge of the liquid. In these circumstances, a structure such as is suggested in Fig. 8 might be employed. In that view the numeral 13 again indicates the extension which mounts a collar 84 by means of screw threads. A collapsible chamber 38 is disposed within the bore of the extension and encloses a medicament-containing element. Extending from the latter is a tip 88. This element is retained by, for example, bayonet slots within the cap 85 which cooperate with pins 86 mounted by the collar 84. The cap may be grooved as at 87 to accommodate the handle 94 extending beyond a valve casing 89 associated with the tip. Within this casing a rotary valve 90 is disposed having a passage 92. A spring 93 normally maintains the valve body 90 in a position such that a discharge of liquid from the tip 88 is prevented.

The casing 89 and tip portion extending beyond the same are connected in any desired manner to the tip portion extending from the medicament-receiving element. For example, screw threads (not shown) may be employed. In any event, it will be understood that with the medicament-receiving element in position within the collapsible chamber and with the collar 84 and cap 85 properly mounted, the valve housing 89 together with its tip extension may be mounted at a point beyond the cap.

Thereupon, as heretofore described in connection with the structures of Figs. 1 to 7, liquid under pressure may surround the collapsible chamber. The medicament will, under these circumstances, not be discharged because the valve 90 will be closed. Consequently, the tip 88 may be disposed adjacent the skin of the patient and valve 90 may be shifted by handle 94. With such shifting, passage 92 will afford communication between the body of medicament and the orifice of the nozzle. Under these circumstances, the liquid will be discharged at skin penetrating velocities. The valve structure shown in Fig. 8 is merely suggestive. It is obvious that one of any number of liquid-arresting structures may be utilized in substitution of the one shown. Likewise, these structures may be employed to control the flow of liquid from the tip in connection with any of the mechanisms shown in the preceding views.

Thus, among others, the several objects of the invention as aforenoted are achieved. 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. In an apparatus by means of which medicament may be injected into tissues without the aid of a penetrating needle, said apparatus comprising a body, a flexible container within said body and charged with fluid under pressure, said body being formed with a cylinder, a piston movable within said cylinder, said body being also formed with a receiving space and a passage in communication with said cylinder, such space and the area within which said flexible container is disposed, a valve for controlling the flow of liquid from said passage into said space and a flexible medicament discharging unit mounted within said space.

2. An injection assembly including in combination an accumulator under internal pressure, means forming a part of said accumulator to be displaced by fluid, means for causing a flow of fluid to thus displace said accumulator means, a medicament-receiving chamber including a portion responsive to fluid pressure to expel medicament under pressure therefrom and control means between said accumulator and said chamber to govern the fluid flow therebetween.

3. An assembly for injecting medicament without the aid of a skin-penetrating needle said assembly including in combination a body, means for operatively supporting an element defining a medicament chamber with respect to said body, a movable accumulator incorporating expandible fluid under an initial high pressure, said accumulator being disposed within said body, manually operated force-multiplying means movably mounted by said body and connected to said accumulator to increase the expansive force of the fluid within the latter, said accumulator being operatively connected to move and expel medicament from said element upon the expansive force of said fluid being released and manually controlled means carried by said body for so releasing said force.

4. An assembly for injecting medicament without the aid of a skin-penetrating needle said assembly including in combination a body, means for operatively supporting an element defining a medicament chamber with respect to said body, a movable accumulator incorporating expandible fluid under an initial high pressure, said accumulator being disposed within said body, manually operated force-multiplying means movably mounted by said body and connected to said accumulator to increase the expansive force of the fluid within the latter, means for retaining said accumulator against movement with the expansive force increased, said accumulator being operatively connected to move and expel medicament from said element upon the expansive force of said fluid being released and manually controlled means carried by said body for releasing such retaining means.

5. An assembly for injecting medicament without the aid of a skin-penetrating needle said assembly including

in combination a body, means for operatively supporting an element defining a medicament chamber with respect to said body, a movable accumulator incorporating expandible fluid under an initial high pressure, said accumulator being disposed within said body, a manually rotatable screw structure carried by said body, a piston projectable by said structure and connected to increase the pressure and expansive force of the fluid within said accumulator, the latter being operatively connected to move and expel medicament from said element upon the expansive force of said fluid being released and manually controlled means carried by said body for so releasing said force.

6. A medicament injecting assembly including in combination a hollow rigid body, means detachably mounted adjacent one end of said body to support a unit providing a medicament container in operative association with said body, a force accumulator, said accumulator containing gas under pressure, means acting on said accumulator for increasing the pressure of such gas, manually operable force-multiplying means movably carried by said body and extending exteriorly thereof, means for connecting said latter means with said pressure increasing means, the medicament containing unit being operatively connected with said pressure accumulator to cause an expulsion of medicament from said unit upon said accumulator expanding, means for retaining said accumulator in compressed condition and movable manually shiftable means extending beyond said body for rendering said retaining means inoperative.

7. A gun for applying fluid pressure to contract a cartridge and discharge the fluid contents therefrom, said gun having, in combination, a hollow casing defining a fluid filled chamber, means for detachably securing the cartridge to said casing for contraction by the pressure of the fluid in said chamber, an inflatable bladder mounted within said chamber, and mechanism manually operable from the exterior of said casing to compress said bladder and thereby correspondingly increase the pressure of the liquid in said chamber.

8. A hypodermic injection apparatus including in combination a hollow body providing adjacent one of its ends a space to receive a medicament-containing ampule from which liquid is to be discharged at high velocity, a loading cap movably mounted by said body to close said space, a compressible pressure accumulator disposed within said body and operatively connected to said space to act on an ampule contained therein, said apparatus being formed with a fluid passage extending to said accumulator, manually operated force-compounding means carried by said body to force fluid under pressure towards said accumulator for compressing the latter, means for retaining said accumulator in compressed condition and manually shiftable means accessible on the exterior of said body to release said retaining means.

9. A hypodermic injection apparatus including in combination a hollow body providing adjacent one of its ends a space to receive a medicament-containing ampule from which liquid is to be discharged at high velocity, a loading cap movably mounted by said body to close said space, a compressible pressure accumulator disposed within said body and operatively connected to said space to act on an ampule contained therein, said apparatus being formed with a fluid passage extending to said accumulator, said apparatus being also formed with a cylinder communicating with said passage, a piston movable in said cylinder to displace fluid therefrom through said passage and to act against said accumulator for compressing the latter, a manually rotatable plunger operatively connected to said piston and having screw threaded engagement with said body whereby upon said plunger being turned, said piston will be projected, means for retaining said accumulator in compressed condition and manually shiftable means to release said retaining means.

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