

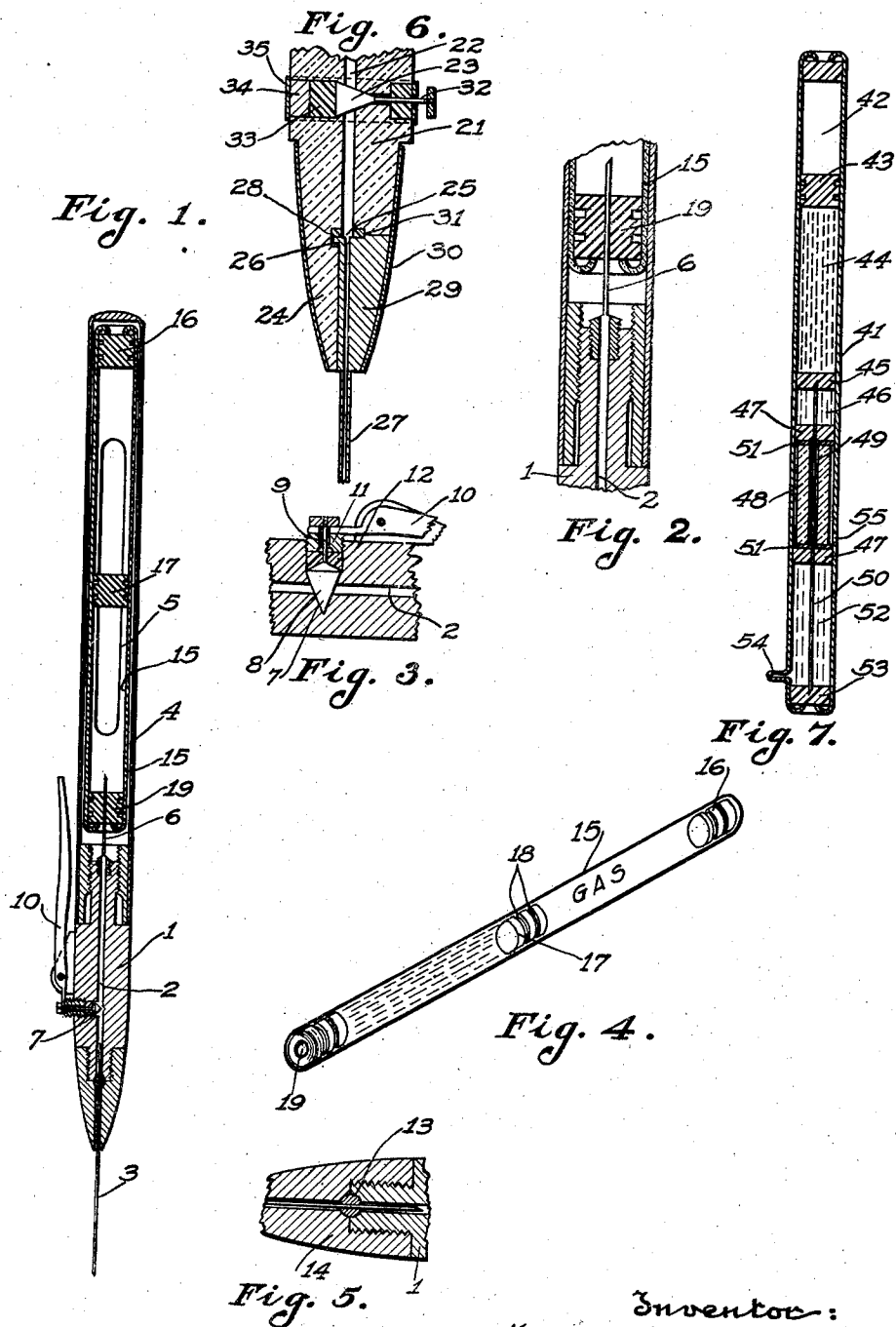
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INJECTION DEVICE

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INJECTION DEVICE

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This invention relates generally to surgical devices and particularly to an injection device or syringe as is usually employed in intravenous and intramuscular injections.

5 The object of the present invention, generally stated, is to provide a device of the kind described, wherein injection of the medicament may be accomplished with a minimum of effort by the surgeon.

10 A further object of this invention is to provide a medicament container to be used in such injection devices and from which the medicament is automatically discharged upon release.

15 Another object of this invention is to provide an energized medicament container which is cheap to manufacture and simple of construction.

A further object of this invention is to provide a prepared package containing an energized and charged injection device which is convenient to handle and of simple construction.

20 A more specific object of this invention is to provide an injection device of the character described and a medicament container therefor in which a charge of medicament is confined in a cylinder with a charge of compressed gas, the two charges being separated by a sealing plug adapted to move lengthwise within the cylinder so as to discharge the medicament under the pressure of the compressed gas.

30 Further objects will become apparent to those skilled in the art when the following description is read in connection with the accompanying drawing, in which

35 Figure 1 is a longitudinal sectional view of an injection device constructed in accordance with the present invention and showing the energized medicament container in position therein;

40 Figure 2 is a sectional view, showing in detail the connection between the body of the device and the energized container;

Figure 3 is a sectional view, showing in detail a control valve for the device of the present invention;

45 Figure 4 is a perspective view, showing the energized medicament container of the present invention;

Figure 5 is a detail sectional view, showing particularly the manner of connecting an injection needle with the body of the device;

50 Figure 6 is a detail view in longitudinal section showing particularly the arrangement of the valve and the interconnection between the injection needle and the body of the device constructed in accordance with another embodiment of the present invention;

Figure 7 is a longitudinal sectional view, illustrating another embodiment of the energized medicament container of the present invention.

Generally stated, in accordance with the present invention, an ampoule may be provided, in one portion of which a charge of compressed gas is confined and in another portion of which the charge of medicament is disposed. Separating the charges of compressed gas and medicament may be a suitable plug or diaphragm, preferably in the form of a piston, arranged to slide lengthwise of the ampoule upon expansion of the compressed gas but to maintain itself in sealing relation with the interior walls of the ampoule. In accordance with one embodiment of the present invention, such an ampoule may be employed in an injection device provided with suitable valve control means whereby the surgeon, after injecting the needle, may accomplish either an intravenous or an intramuscular injection by simply opening the valve and permitting the medicament to flow out through the needle under the force exerted by the energy which may be stored in the device, as by expansion of the charge of compressed gas.

25 In accordance with another embodiment of the invention, the injecting needle may itself be contained in the energized ampoule and may be so arranged therein as to be maintained sterile until the occasion arises for its use. Then, upon actuating suitable releasing means, the needle may become exposed for use, and the medicament may be discharged therethrough under the pressure exerted by the expansion of the compressed gas contained in the ampoule.

35 Referring now particularly to the drawing, there is illustrated in Figure 1 a device of the type particularly suitable for intramuscular injections, although it will be understood that this embodiment may also be used for intravenous injections when desired. In the embodiment illustrated in Figure 1, the injection device may comprise a body 1, having a passage 2 there-through. At one end of the body 1 an injection needle 3 may be suitably connected. At the other end of the body 1 a hollow shield 4 may be provided and within the shield 4 an energized ampoule 5 may be removably disposed. It will be understood that the shield 4 provides a compartment which may be readily opened to permit insertion, removal or replacement of the energized ampoule of the present invention. The shield 4 may be connected in any suitable manner, as for instance by a slip joint to the body 1.

A conducting needle 6 may be provided to ex-

tend into the compartment formed by shield 4 and may have its end sharpened so as to puncture the energized ampoule 5 in a manner to be more fully described hereinafter. The needle 6 may have a passage extending axially therethrough in order to conduct medicament from the ampoule 5 to passage 2 and eventually to needle 3.

Provided in the body 1, so as to control the flow of fluid through passage 2, is a valve 7, shown more in detail in Figure 3. The valve 7 may be of any suitable construction and operated by any suitable means; but in the embodiment illustrated comprises a cone 8 arranged to seat in a correspondingly shaped recess within the body 1. Extending from member 8 may be a stem 9 connected at its upper end to a suitably arranged operating lever 10. The valve 7 may be arranged in a hole extending radially into body 1 and may be closed by a cap 11 secured to the body as by threads. Between cap 11 and cone element 8 may be arranged a yieldable member 12, such as a block of rubber, which, if made of rubber, may also fill the office of a gasket.

Referring now particularly to Figure 5, it will be observed that the needle 3 is provided with an enlargement 13, which in the embodiment shown is of spherical form, but it will be understood that other suitable shapes may be employed. The end of member 1, adjacent the mouth of passage 2, is shaped to correspond with enlargement 13 and likewise a cap 14 is provided to engage the opposite side of enlargement 13. Cap 14 may be screwed down upon the body 1 or connected in any suitable manner. By this construction, it will be observed that a tight joint is made between needle 3 and passage 2, so that the escape of fluid therearound is effectively prevented.

The energized ampoule of the present invention may comprise a cylinder or tube 15, which may be made of glass or other suitable material. In the embodiment shown, a closing plug 16 is provided for one end of the cylinder 15, but it will be understood that if the device is made of glass, this end may be fused. Intermediate the ends of cylinder 15 is a plug 17 arranged to slide lengthwise therein but to maintain itself in sealing relation against the interior walls of cylinder 15. The space between plug 17 and plug 16 is, in accordance with the present invention, occupied by a charge of compressed gas, the pressure being sufficient that the volume at or above atmospheric pressure will be sufficient to entirely fill the cylinder 15. The plug 17 may be made of any suitable material which will effect an hermetic seal with the interior of the cylinder 15. For instance, the plug can be made of soft rubber, and, in order to assure a seal, circumferential grooves, such as 18, may be formed in the plug. Such grooves as 18 permit easy deformation of the plug and thereby force it into more intimate contact with the walls of cylinder 15.

On the opposite side of plug 17 from the charge of compressed gas, the charge of medicament may be disposed. This charge of medicament may be confined in the cylinder by a suitable closure 19, and the end of the cylinder, if made of glass, may be fused over or otherwise deformed so as to maintain closure 19 in position. Closure 19 may be of any suitable material for preventing the escape of the medicament, but is preferably made of a puncturable material, which, upon puncturing, will effect a seal about the puncturing element. Soft rubber is a suitable material for this purpose.

When the ampoule 5 is inserted into the injection device shown in Figure 1, closure 19 is forced

down upon needle 6 so that the closure is punctured and the end of needle 6 extends into the medicament chamber within cylinder 15. With the parts in this relation, it is apparent that the medicament may flow out from ampoule 5 through needle 6 and into passage 2 where, if valve 7 is open, it will continue to flow outwardly through needle 3—all under the pressure of the compressed gas confined beyond plug 17. As the medicament is discharged from the ampoule, plug 17 moves downwardly, permitting expansion under the force of the expanding gas therebeyond until finally all of the medicament is discharged from the ampoule.

For intravenous injections, it is often desirable to form some portion of the injecting device of a transparent material so that the surgeon will be able to observe the inflow of blood into the device when a vein is punctured. In the carrying out of the invention in this form, as illustrated in Figure 6, body 21, which corresponds to body 1 of Figure 1, may be formed of glass or other suitable transparent material, such as synthetic resin. Passage 22 may be controlled by a suitable valve 23, the details of which will be later described. Body 21 may be provided with an extension 24, extending beyond mouth 25 of passage 22, and a lateral recess 26 may be formed into the extension 24 in order to accommodate an interlocking part of the needle to be attached. An injection needle 27 may be provided with a lip 28 arranged to extend into recess 26 and thus prevent longitudinal displacement of the parts so long as lip 28 remains interlocked with the recess 26. In order to maintain the parts in interlocking relation, a part 29 may be provided which, as in the embodiment illustrated, may, if desired, be integral with needle 27. As shown, part 29 is shaped so as to complete the conical surface formed in part by extension 24, and over this part a ferrule 30 may be provided. Suitable arrangement may be made for securing ferrule 30 to body 21, as for instance by providing a ground surface on the parts to be engaged. A gasket 31 may be interposed between mouth 25 of passage 22 and the inner end of needle 27.

In the embodiment shown in Figure 6, a valve 23, which is particularly suitable for use in a glass device, is shown. As in the previous embodiment, a cone shaped valve element is provided, having a stem 32 extending outwardly. Beneath the cone shaped valve element may be provided a block of yieldable material, such as soft rubber 33, which also serves as a gasket, and the remaining space in the hole provided therefor may be filled by a suitable filler 34. In order to maintain these parts in position, a band 35, extending about the exterior of body 21 and provided with a slot to accommodate stem 32, may be placed thereover.

In the embodiment illustrated in Figure 7, a prepared package is provided in which the injection needle is contained within the energized ampoule. In this embodiment, a tube 41, which may be made of glass, may have a charge of compressed gas confined in one end thereof, as at 42. A plug 43, corresponding in function to plug 17 of the previous embodiment, may then be provided for confining the charge of compressed gas, and on the other side of plug 43 may be a charge of medicament 44. The charge of medicament is confined by a plug 45, which, as in the case of a plug 19 in the previous embodiment, may be formed of suitable puncturable material, but one

which effects a good seal with the interior of tube 41. Ahead of plug 45 may be a non-compressible filler, such as a small charge of distilled water 46. Between two sealing plugs 47 may be a spacing element 48 having a central opening 49 through which extends an injection needle 50, pointed at both ends and provided intermediate its ends with one or more laterally extending flanges 51. In the lower end of tube 41 may be another charge 52 of liquid (alcohol being convenient in this instance) and the end of tube 41 is finally sealed by a suitable puncturable closure 53. Adjacent the end of tube 41 and at the space occupied by liquid 52 may be a suitable releasing means, such as a teat 54, which may be broken off to permit the liquid 52 to escape.

When liquid 52 is permitted to escape, as by release through teat 54, the compressed gas 42 expands and forces the various plugs 43, 45, and 47 downwardly, carrying with them the needle 50 and puncturing closure 53 so that the needle extends outwardly thereof. The expansion of gas 42 will move the parts into such position that the charge of distilled water 46 will be opposite a hole 55 in tube 41, and the surgeon at this time should have his finger closing hole 55. In this condition, the needle may be inserted into the flesh. When hole 55 is opened by raising the finger therefrom, the distilled water 46 flows outwardly therethrough and permits a further downward movement of plug 45, which is then punctured by the upper end of needle 50, so that the needle is placed in communication with the charge of medicament and the injection is effected.

From the foregoing description, it is apparent that the present invention accomplishes its objects and that an energized ampoule and device for employing the same are provided whereby medicament may be administered by injection with a minimum of effort and with a maximum of convenience to the surgeon. It is apparent, of course, that many modifications of the device shown in the accompanying drawing and specifically described herein will present themselves to those skilled in the art, without departing from the spirit or principles of the present invention, and it is to be distinctly understood, therefore, that such modifications and the use of such individual features and sub-combinations of features as do not depart from the spirit of this invention are, although not specifically described herein, contemplated by and within the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. A device of the kind described comprising, a cylinder having a charge of compressed gas in

one end thereof, a movable plug in sealing relation with the interior of the cylinder confining the gas on one side thereof, a medicament on the other side of said plug, puncturable means confining the medicament, a needle arranged to puncture said means and inject the medicament, and releasable means for preventing said needle from puncturing said puncturable means.

2. A device of the kind described comprising, a cylinder having a charge of compressed gas in one end thereof, a movable plug in sealing relation with the interior of the cylinder confining the gas on one side thereof, a medicament on the other side of said plug, a puncturable closure for said cylinder, a needle arranged to puncture said closure, and releasable means for preventing the needle from puncturing said closure.

3. A device of the kind described comprising, a cylinder having a charge of compressed gas in one end thereof, a movable plug in sealing relation with the interior of the cylinder confining the gas on one side thereof, a medicament on the other side of said plug, a puncturable diaphragm confining said medicament, a puncturable closure for said cylinder, a needle between said diaphragm and closure arranged to be moved lengthwise in the cylinder upon expansion of the gas, releasable means for preventing movement of said needle, and second releasable means for preventing said needle from puncturing said diaphragm after release of said first means.

4. An ampoule comprising, a cylinder having impervious walls, each end of said cylinder having a resilient puncturable closure, a charge of compressed gas and a charge of medicament confined in the respective ends of said cylinder, a piston between said charges arranged to slide longitudinally of said cylinder in sealing relation with the interior thereof, said compressed gas charge being sufficient without extrinsic energy to completely eject the medicament charge from the cylinder when the confining pressure on the latter is released.

5. An ampoule comprising, a cylinder having impervious walls, one end of said cylinder having a resilient puncturable closure, a charge of compressed gas and a charge of medicament confined in the respective ends of said cylinder, a soft rubber plug between said charges arranged to slide longitudinally of said cylinder in sealing relation with the interior thereof, said compressed gas charge being sufficient without extrinsic energy to completely eject the medicament charge from the cylinder when the confining pressure on the latter is released.

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