C. STORZ.

SYRINGE.

APPLICATION FILED MAR. 6, 1915.

1,222,814. Patented Apr. 17, 1917.

Fig. 1.

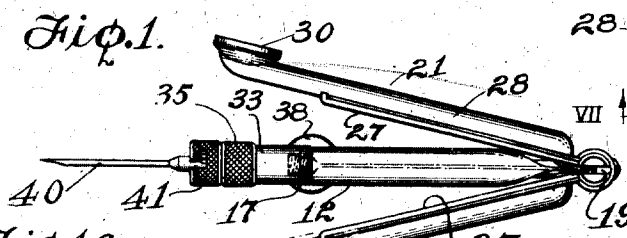


Fig. 1a

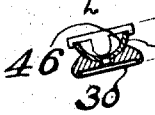


Fig. 6.

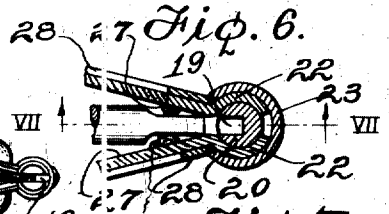


Fig. 7.

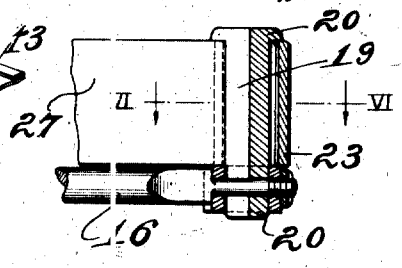


Fig. 9.

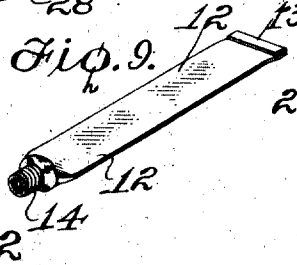


Fig. 2.

Fig. 8.

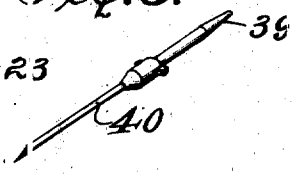


Fig. 10.

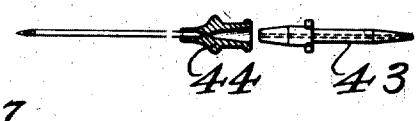


Fig. 3

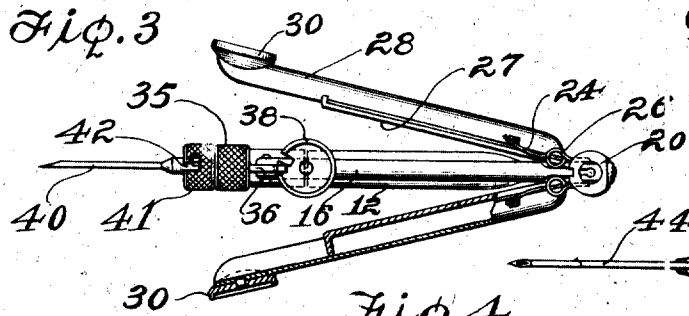


Fig. 11.



Fig. 4.

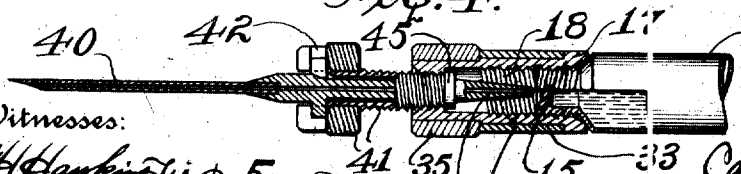
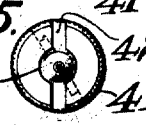


Fig. 5.



Witnesses:

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CARL STORZ, OF TUTTLINGEN, GERMANY.

SYRINGE.

1,222,814. Specification of Letters Patent. Patented Apr. 17, 1917.

Application filed March 6, 1915. Serial No. 12,505.

To all whom it may concern:

Be it known that I, CARL STORZ, a citizen of the United States, residing at Tuttlingen, Bavaria, Germany, have invented certain new and useful Improvements in Syringes, of which the following is a full, true, and complete specification.

The object of my invention is to provide an instrument for use as a medical syringe, adapted to discharge the liquid medicament from collapsible, sealed containers or tubes representing individual charges or doses in unit package form. The device accordingly comprises a holder for the tube and means for collapsing the latter to eject its contents, mechanism being preferably also provided for puncturing the tube just before use, and for properly assembling the parts for use with hypodermic needles. In the preferred construction the device comprises a pair of squeezing members with means for holding the collapsible tube and nozzle or needle disposed between them; but many other different embodiments are practicable, for example such as that shown in my German Patent No. 280,192 of March 28, 1914, wherein the tube is collapsed by a rolling action, and it is to be understood that in certain instances all of the instrumentalities mentioned need not be employed in conjunction, or that others may be added or substituted, depending upon the particular purpose in view, and that I do not limit myself to the particular application of the principles and mechanism of the invention indicated above. Various features and advantages will become apparent as the specification proceeds and are more especially pointed out in the claims appended hereto.

In the accompanying drawings forming a part hereof:

Figure 1 is a top plan view of the preferred embodiment;

Fig. 1ª is a sectional end view of one of the squeezing members;

Fig. 2 is a side view, partially sectioned and broken away, with the tube and tube-receiving socket shown in the position of insertion or removal, and the operative portion of the tube and needle being indicated by broken lines;

Fig. 3 is a bottom plan view, with a portion in section;

Fig. 4 is an enlarged longitudinal sectional view, illustrating the means for assembling the tube, needle and puncturing means;

Fig. 5 is an end view of Fig. 4.

Fig. 6 is an enlarged horizontal section through the rear hinge portion of the device, being taken on the line 6—6 of Fig. 7;

Fig. 7 is a vertical section on the line 7—7 of Fig. 6;

Fig. 8 is a perspective view of a needle with a puncturing extension;

Fig. 9 is a perspective view of a tube after the discharge of its contents;

Fig. 10 is a side view, partly in section, of a puncturing element or "adapter" and a standard form of needle adapted to be jointed therewith; and

Fig. 11 is a similar view showing another form of adapter and needle.

The fluid to be discharged or injected is to be supplied in closed unit containers 12, of collapsible material such as tin or lead or a suitable alloy which after using are thrown away, being thus properly designated as single service containers. A filled tube is shown in Figs. 1 to 4, and the collapsed condition produced by the lateral squeezing means which I prefer to employ is illustrated in Fig. 9. The tubes have a folded or crimped rear seam 13 and a threaded nozzle portion 14 at the opposite end, the latter being closed by a slightly concaved wall 15, constituting an integral or self-contained seal.

The holder for the tube consists in this instance of a central bar 16, having suitable means for receiving the tube and holding it in proper relation to the squeezing members. The said means comprise a socket 17 on the forward end of the bar having an internal screw-thread 18 for the insertion of the threaded nozzle, and a recess or slot 19 at the rearward portion of the bar to receive the flattened seam end of the tube. The socket 17 is pivotally mounted on the forward end of the bar as presently described and the said slot 19 is formed in the main hinge support or pintle 20 of the squeezing members, which pintle projects upward at right angles from the rear end of the holder bar, being secured thereto in the manner clearly shown in Fig. 7.

The squeezing means comprise two angularly-closing lateral members 21, which op-

erate in a plane offset from, and parallel to, the intermediate holder member 16. At their rear ends these members are hinged on the pintle 20 as shown in Figs. 6 and 7, by the confinement of their curved extremities 22 within the annular space provided between the pintle 20 and an exterior sleeve or casing 23, which latter is loosely confined in place between the head of the pintle and the bar 16. Springs 24, seen in Fig. 3, urge the squeezing members apart serving at the same time to centralize the tube-holding bar with relation thereto. For this purpose the springs may be anchored each at one end to the pintle, with their opposite ends bearing outwardly against lugs 25 on the squeezing members and their intermediate coiled portions 26, pressing inwardly against opposite sides of the holder bar. The degree of separation of the squeezing members is limited by stop engagement of their outer sides with the edges of the sleeve 23. The said members may of course be formed in various ways. In the present case they are built up of several united pieces, one piece 27 being flat so as to afford a plane face for pressing against the tube container and the hinge portion 22 being formed at the rear end of this part. The other or outer piece 28 is formed with a pressed rib 29 for strength and carries a finger button 30 at its forward end, as shown in Fig. 1ª, being also curved to form inwardly facing cavities 46 forward of the squeezing faces and as shown in Figs. 1ª and 2. These cavities accommodate the socket 17 above referred to and certain other parts when the squeezing members are closed together upon the collapsed tube.

The socket 17 is swiveled in a sleeve 33, wherein it is rotatably confined by a knurled head 35 on one end of the sleeve and a flange at its other end, so that it may be grasped by the said knurled head and rotated on its own axis. The said sleeve is provided with a lug or arm 36 by which it is pivoted, at 32, to the end of the bar 16 so that it can be turned, on such transverse axis to the position indicated in Fig. 2. In this position the collapsible tube 12 can either be screwed into it, or it can be screwed onto the tube, and then by swinging the sleeve on its pivot 32 the seamed end of the tube can be readily introduced into the slot 19 above referred to. A notch 37 in the pivot lug 36 is adapted to be engaged by the wall of a notched turn button 38 pivoted on the bottom of the holder bar, so that the tube will be securely confined in position between the squeezer members. This position of the tube is indicated in Figs. 1 and 3 and also by the dotted lines of Fig. 2.

The puncturing of the forward end of the container is preferably done by a rearward extension 39 of a nozzle or needle 40, means being provided for assembling the nozzle and puncturing element in operative relation to the tube. This is preferably accomplished by means of a separate tubular puncturing screw 41, threaded in the forward end of the socket 17 and through which the needle or puncturing element extends, as represented in Fig. 4. The said element is insertible through the forward end of the screw and is separably united therewith by a bayonet joint 42, or its obvious equivalent a screw joint. Inasmuch as the needle or puncturing device is introduced from the front, it is unnecessary to remove the puncturing screw, which may be accordingly provided with an enlargement 45, which guards against possible loss by preventing disengagement from the socket 17. By screwing home the puncturing screw after the tube has been secured to the socket 17, the puncturing point is driven into and through the concaved end wall 15 of the said tube and the interior of the latter is thereby placed in communication with the needle. Manifestly the needle might be provided with a screw-thread to engage directly with the screw-thread in the forward part of the socket, but the use of a separate means is preferred for obvious reasons. The head of the puncturing screw is also knurled as indicated to provide a secure grip thereon and it is to be noted, that the screw is threaded in the reverse direction to the threads which connect the tube, to the socket 17 so that the operation of the said screw does not tend to loosen the joint or connection previously made. The direction of the bayonet slot 42 is also the reverse of the thread of the puncturing screw, so that the operation of the latter does not tend to disengage the needle therefrom or turn it to its position for removal. In the case illustrated the tubes are screwed into the socket with a left hand thread, the puncturing screw is right hand and the bayonet slot is left hand, this relationship being important for the reasons noted.

In order to enable the device to be used with ordinary standard needles one or more "adapters" may be included as part of the equipment. These adapters are hollow puncturing elements adapted to be contained in the screw 41 and to be secured thereto in the same manner as the needle 40, and are so formed at their forward ends as to be capable of being jointed with ordinary needles. Fig. 10 shows an adapter 43 designed to receive a taper or coned needle 44, while in Fig. 11 there is illustrated an adapter 43ª for a screw-on needle 44ª. It will be noted that the tapered rear end of the needle 40 or of either adapter, forms a tight driving fit with the soft metal wall 15 of the tube when the latter is punctured, so that the liquid is not allowed to escape into

the interior of the socket or to touch any portion of the instrument before entering the adapter or the needle, as the case may be.

When the needle 40, or the needle and adapter as the case may be, has been secured to the puncturing screw and the latter has been screwed home to puncture the unit dose-containing tube, the nozzle may then be introduced into the place where the injection is to be deposited, and the squeezer members 27—28 are then pressed together, which discharges the entire contents of the tube through the nozzle, leaving the tube collapsed and completely evacuated as indicated in Fig. 9.

From the foregoing description, the operation and advantages of the device will be apparent. The system of unit sealed packaging of the drug or medicament contributes to accuracy of dosage and insures sterility. The mechanical holding and collapsing devices enable the unit to be manipulated conveniently and expel the contents completely. The angularly-closing lateral squeezers have the special advantage of completely flattening the tube from the rear to the front end. For certain purposes, however, collapsing means, such as disclosed in my German patent above referred to, may be employed, enabling any desired and accurately determinable portion of the contents to be discharged. Manifestly the leading feature of the invention is the provision of a mechanical injection device having a single-service reservoir, whereby the uncertainties and dangers of ordinary syringes and the necessity for sterilizing the reservoirs after and before use are avoided. In the present invention only the needle or the adapter and needle require sterilizing, if subject to repeated use.

I claim:

1. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed and screw-threaded outlet nozzle, an elongated holder having means connected therewith for collapsing the tube, a puncturing point, a needle, and means for detachably securing the tube at its sealed nozzle end and connecting the same with the puncturing point and needle.

2. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed outlet nozzle end, an elongated holder having means connected therewith for collapsing the tube, a puncturing point, a needle, a detachable coupling between the nozzle and needle, said coupling being movable from position on the holder for the purpose of insertion and removal of the container, and means for locking the coupling upon the forward part of the holder.

3. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed screw nozzle, an elongated holder having means connected therewith for collapsing the tube, a needle, a puncturing point, and means for coupling the container with the needle and puncturing point comprising a screw socket for detachably receiving the sealed nozzle, and a screw for driving the puncturing point into the nozzle also engaging with the socket.

4. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed and screw-threaded outlet nozzle, an elongated holder having means connected therewith for collapsing the tube, a puncturing point, a needle, and a screw coupling whereby the tube is detachably secured at its sealed nozzle end and connected with the puncturing point and needle, the puncturing point having a taper formation whereby it is tight seating in the puncture which it forms in the nozzle.

5. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed outlet nozzle end, an elongated holder, lateral squeezing members connected with the holder, a puncturing point, a needle, and a coupling for detachably securing the tube at its nozzle end and connecting the same with the puncturing point and needle.

6. Means for giving a hypodermic injection comprising the combination of a replaceable sealed unit single-service dose container consisting of a tube having pliable walls and an integrally sealed outlet nozzle end, an elongated holder, lateral squeezing members connected with the holder, a puncturing point, a needle, a coupling for detachably securing the tube at its nozzle end and connecting the same with the puncturing point and needle, said coupling being movable from position on the holder, means for securing the coupling upon the forward part of the holder, and means at the rear part of the holder for retaining the rear end of the tube.

7. A hypodermic injection instrument comprising a pair of laterally-disposed relatively-swinging squeezing members, said members being normally free to be swung inward one toward the other by squeezing the same in the hand, a socket mounted adjacent the forward ends of said members

adapted to detachably sustain a collapsible sealed dose container in a definite position between said members in combination with said container consisting of a tube with pliable walls and an integrally-sealed screw-threaded nozzle, a tubular needle and a puncturing point adapted for connection therewith, and means for forcing said point into the sealed end of said container.

8. A device for discharging the contents of collapsible single-service tubes, comprising laterally swinging squeezing members connected toward their rear ends, a socket toward the forward part of the device having means for receiving the forward end of the tube and for holding the same immovable, a needle, and means for connecting the needle to the socket.

9. A device for discharging the contents of collapsible single-service tubes, comprising angularly closing lateral squeezing members, a socket between the forward portions thereof for detachably receiving the nozzle of the tube, said socket being movable from position on the holder to facilitate insertion and removal of the tube, means for locking the socket in position, and additional positioning means adjacent the connected ends of the squeezing members for engagement with the rear end of the tube.

10. Means for giving a hypodermic injection comprising the combination of an elongated holder, angularly closing lateral squeezing members connected with said holder and operating at one side of the plane thereof, a collapsible single-service dose container having an integrally sealed outlet end, a needle and puncturing point, and means for detachably securing the outlet end of the container upon the forward part of the holder and for connecting the same with the puncturing point and needle.

11. In a device of the character described, the combination of angularly closing lateral squeezing members, an intermediate member having means for holding a collapsible single-service container between the squeezing members, and means for centralizing said intermediately member.

12. In a device of the character described, the combination of angularly closing lateral squeezing members, an intermediate member having means for holding a collapsible single-service container between the squeezing members, and resilient means for centralizing said intermediate member and urging said squeezing members apart.

13. Means for discharging the contents of collapsible single-service containers comprising angularly closing lateral squeezing members, an intermediate holder member, and means connecting said holder and squeezing members comprising a hinge pintle and a sleeve surrounding and spaced from the pintle, the rear ends of the squeezing members being formed to operate in the annular space between sleeve and pintle.

14. A device for discharging the contents of collapsible single-service tubes, comprising angularly-closing lateral squeezing members, an intermediate holder member, and a hinge mounting for the squeezer members on the intermediate member, said hinge mounting having means for engaging the rear end of the tube.

15. A device for discharging the contents of collapsible single-service tubes comprising angularly closing lateral squeezing members, an intermediate holder member, and a hinge pintle on the latter for the squeezing members, having a slot to receive the rear end of the tube.

16. A device for discharging the contents of collapsible single-service tubes comprising tube-collapsing means, a holder member, and a socket to receive the nozzle end of a tube, said socket being movable with respect to said holder member to permit the insertion of a tube.

17. A device for discharging the contents of collapsible single-service tubes comprising tube-collapsing means, a holder member, a socket to receive the nozzle end of a tube and a pivotal connection between said socket and the forward end of the holder member.

18. A device for discharging the contents of collapsible single-service tubes comprising a central bar, lateral squeezing members hinged thereon for movement in a plane parallel to the bar and means for the reception of a tube pivotally mounted on the forward end of the central bar so as to be capable of swinging in a central plane to an angular position.

19. A device for discharging the contents of collapsible single-service tubes comprising lateral squeezing members, an intermediate holding member connected therewith, a collar carried by said holder member, and a socket swiveled in said collar to receive the nozzle end of a tube.

20. A device for discharging the contents of collapsible single-service tubes comprising lateral squeezing members, an intermediate holding member having means for receiving the rear end of a tube, and an internally-threaded socket to receive the nozzle end of a tube swiveled on the forward part of the holding member and also movable at an angle thereto.

21. A device for discharging the contents of collapsible single-service tubes, comprising a holder portion having a pivotally mounted socket for the reception of the nozzle end of a tube, means for locking said socket against pivotal movement, and means for collapsing the tube.

22. A device for discharging the contents of collapsible single-service tubes, compris-

ing in combination with tube-collapsing means, tube-receiving means movable to facilitate insertion of a tube, and means for locking said tube-receiving means.

23. Means for giving a hypodermic injection comprising the combination of a single service container consisting of a tube having pliable walls and a screw-threaded integrally sealed outlet nozzle, a holder and means connected therewith for collapsing the tube, a taper puncturing point and needle, a puncturing screw, and a socket having reverse screw threads engaged by the screw nozzle and puncturing screw, respectively.

24. A device for discharging the contents of collapsible single-service tubes, comprising in combination with tube-collapsing means, a holder connected with said means and including a socket adapted to receive the nozzle portion of a sealed tube, a puncturing element adapted to enter the opposite end of the socket, and means engaging the socket to force said puncturing device into the tube.

25. A device for discharging the contents of collapsible single-service tubes, comprising in combination with tube-collapsing means, a screw-threaded socket adapted to receive the nozzle end of a sealed tube, and puncturing means operable through the opposite end of the socket and including a puncturing screw with its thread running in the reverse direction to the thread of the tube.

26. Means for giving a hypodermic injection comprising an elongated holder, tube-collapsing means connected therewith, a replaceable sealed-unit single service collapsible dose container tube having an integrally sealed screw-threaded outlet nozzle, an internally threaded socket upon the forward part of the holder adapted to receive the nozzle of the tube at one end, and a puncturing device and screw entering the opposite end of the socket.

27. In a device for discharging the contents of collapsible single-service tubes, the combination of a holder comprising a socket adapted to receive the nozzle end of a tube, a puncturing screw, and a hollow puncturing member adapted to extend through the screw and socket to said nozzle end.

28. In a device for discharging the contents of collapsible single-service tubes, the combination of a holder comprising a socket adapted to receive the nozzle end of a tube, a puncturing screw, and a hollow puncturing member insertible through said screw from the forward end and having means for connecting it with the screw.

29. Means for giving a hypodermic injection comprising the combination of a single-service container consisting of a tube having pliable walls and a screw-threaded integrally sealed outlet nozzle, a support and means connected therewith for collapsing the tube, a puncturing point and needle, a puncturing screw, and a coupling having reverse screw-threads for engaging the sealed tube nozzle and puncturing screw respectively.

In testimony whereof, I have signed this specification in the presence of two witnesses.

CARL STORZ.

Witnesses:
K. L. GRANT,
G. A. TAYLOR.