

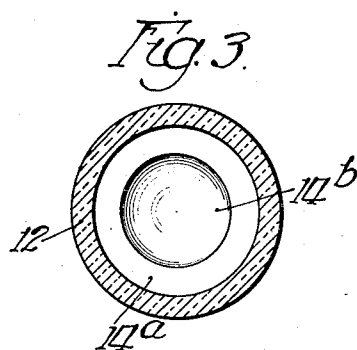
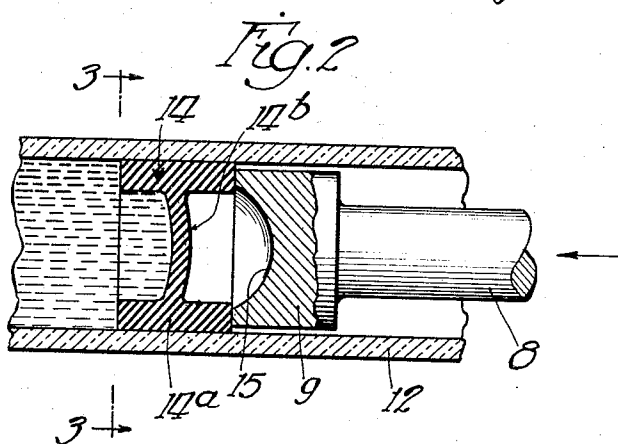
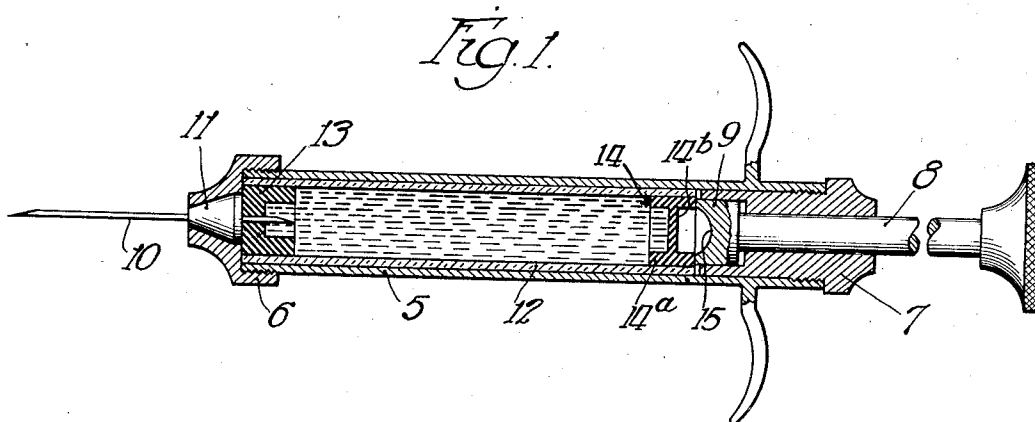
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H. S. COOK

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SYRINGE CARTRIDGE

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UNITED STATES PATENT OFFICE.

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SYRINGE CARTRIDGE.

Original application filed July 1, 1921, Serial No. 481,997. Divided and this application filed November 25, 1925. Serial No. 71,319.

This invention relates to hypodermic syringes of the cartridge type, and more particularly to cartridges or medicament-dispensing packages for incorporation in such syringes. The invention aims to improve such devices with a view to preventing or counteracting sucking-back tendency, and to provide a practicable and reliable cartridge which will not be liable to sucking-back action when the applied pressure for operating the cartridge is released.

A cartridge embodying the invention in one practicable form is shown for illustration in the annexed drawings, in which:

Fig. 1 is a longitudinal section of a syringe or injection-administering organization containing such a cartridge as an operative component thereof;

Fig. 2 is an enlarged longitudinal section of a fragment of the cartridge, showing its piston plug being pushed forward by the syringe plunger;

Fig. 3 is a cross-section on the line 3—3 of Fig. 2, looking in the direction of the arrows.

The illustrative cartridge, comprising a glass tube 12 sealed by rubber plugs or stoppers 13 and 14, is shown in Fig. 1 in an instrument which in conjunction with the cartridge provides an operative syringe or injection-administering organization. Said instrument comprises a cartridge-holder 5 having removable heads 6 and 7. In the breech head 7 is a slidable plunger rod 8 having an enlarged inner end 9 adapted to enter the glass cartridge tube and drive the stopper 14 forward for ejecting the liquid contents of the cartridge through the injecting needle 10 attached to the fore end of the instrument. Communication between the cartridge and needle is established in this instance by penetration of the inwardly projecting end of the needle through the readily pierceable recessed rubber stopper 13 in the fore end of the cartridge. By means of an intermediate needle enlargement 11, seated in the head 6, the needle is held in place. It will be understood that this particular organization is merely exemplary.

As above indicated, the stopper 14 serves

as a slidable piston plug. When the plug is pushed forward by the syringe plunger, a considerable pressure is imposed on the liquid in the cartridge, causing rapid discharge through the needle, since the area of the piston plug is large as compared with the fine bore of the needle. It is desirable to have the piston plug of sufficient length and tightly fitted or under sufficient compression in the glass tube for effectual sealing and to maintain the seal during the fluid-ejecting operation. On the other hand, if the thrust of the operating plunger on a tight fitting rubber plug or stopper should cause forward protrusion of the central body portion of the plug, due to lagging of the peripheral portion of the plug in frictional engagement with the glass tube, then when the applied pressure on the plunger is released the reflexing of the plug in resuming its undistorted state would create or tend to create a back-suction through the injecting needle. It is desirable to avoid such an effect, in order to guard against possibility of contamination by drawing back blood or matter from the patient's tissue, lest a practitioner after having administered an injection of only part of the cartridge contents should make a further injection of the remaining contents in another person, contrary to good practice.

Accordingly, the rubber plug 14 is designed with a view to minimizing such distortion by plunger thrust as would cause sucking-back action by reflexing of the plug when the applied operating pressure is released. Moreover, said plug embodies provision to exert an action counter or in opposition to sucking-back tendency. In the specific form shown, said plug comprises an annular body 14^a having a transverse web 14^b integral therewith, the web being shown intermediate the ends of the plug. The annular portion 14^a is relatively thick to provide a sufficiently stout or firm plug body to be compressed in the cartridge tube and which may be pushed forward by the plunger bearing against the rear end of the annular plug. The transverse web 14^b is relatively thin for flexing, and is preferably thin enough to be quite

flexible. In view of the design or form of the plug, the plunger thrust is applied on the annular body, so that there can be no forward protrusion of the central portion of the plug by the thrust of the plunger, even though the plug should initially stick to the glass tube. Moreover, during the fluid-ejecting operation, the fluid pressure in the cartridge causes the relatively thin web 14^b to bulge or flex backward as shown in Fig. 2, or perhaps even to a greater extent than shown. When the operating pressure is relieved, the resilient web in reflexing or resuming its normal undistended position will cause or tend to cause the liquid to continue its flow through the needle, for an instant after the pressure on the plunger is relieved. Thus the reflexing action is such as to tend to continue the ejection rather than to cause or tend to cause a sucking-back effect.

The web or diaphragm 14^b typifies a liquid abutment yieldable to the internal fluid pressure and the reaction or rebound of which will tend to continue the ejection and thereby prevent or counteract back-suction tendency. Again, the plug 14 typifies a stopper having a cavity with a front resilient wall exposed to the liquid, for the purpose stated, such cavity in this instance being the rear cavity behind the web.

While the plug may assume various forms, I prefer the specific form herein shown, wherein the web 14^b is located about halfway between the ends of the plug, or at any rate substantially beyond the rear end of the plug, on which the plunger thrust is imposed. With this form of plug, the plunger head whether of the ordinary flat-faced form or of a recessed form as shown will bear only on the rear annular end of the plug and avoid a forward thrust of that considerable area of the plug which is within the annular portion.

If the plunger head 9 has a recess or cavity 15 as shown, the flexible web 14^b of the rubber piston plug 14 could be located at or so near the rear end of the plug that the web when distended by fluid pressure would bulge back into the said recess of the plunger head. Of course the recessed plunger head has the advantage that with any form of plug it would concentrate the thrust of the plunger on the rubber plug at or near its periphery, where frictional resistance is set up. However, a flat-faced or unrecessed plunger head is ordinarily or preferably employed in a syringe instrument of the kind shown, and in that event the rubber piston-plug embodying the rear cavity with the flexible front wall 14^b exposed to the liquid unites the advantages of avoiding plunger thrust on the center of the plug and of reflexing in a manner to prevent or counteract sucking-back tendency.

The described piston-plug provides a

sealing closure which is more easily compressed and inserted into the glass cartridge tube than a solid plug of the same dimensions and material; and while it adequately seals the cartridge, it does not stick to the glass so firmly after a long lapse of time, or if stuck can be more easily released and pushed forward.

A cartridge embodying a piston-plug of substantially the form shown was originally disclosed in my application filed July 1, 1921, Ser. No. 481,997, now pending, of which this application, in so far as it is based upon said original disclosure, is a division.

Notice is given that a cartridge embodying a pierceable fore stopper such as the stopper 13 herein shown, characterized by an inwardly facing axial recess which reduces the thickness of the wall to be pierced by the needle and on the annular wall of which the hydrostatic pressure will act radially outward during the fluid-ejecting operation, so as to tighten the hold of the stopper in the tube, is the subject-matter of an invention claimed by me in my said prior application Serial No. 481,997; and that a syringe embodying such cartridge and associated means including a cartridge-piercing needle or canula, to provide an injection-administering organization, is subject-matter disclosed in said prior application and in my pending application Serial No. 11,707, filed February 26, 1925, as a continuation of an application filed by me April 8, 1921, Ser. No. 451,680½, which syringe or subject-matter is now being claimed in said application Ser. No. 11,707. Notice is also given that a syringe organization embodying such a cartridge with an instrument of substantially the construction herein shown, the essential parts of which instrument were originally disclosed in my pending application Serial No. 540,628, filed March 2, 1922, is subject-matter claimed by me in my pending application filed August 5, 1922, Serial No. 579,924.

This application is accordingly for the particular subject-matter described and set forth in the appended claims.

What I claim is:—

1. A dispensing package for liquid medicaments comprising, in combination, a rigid tube; a recessed plug sealing one end of the tube; and a second plug initially at the other end of the tube and slidable there-through; said second plug having an annular portion of sufficient length and thickness to prevent escape of the medicament during sliding thereof, and a thin, pressure-sensitive web coaxial thereof and integral with the annular portion and located centrally of the ends; said web being distended by the hydrostatic pressure of the medicament during ejection.

2. A dispensing package for liquid medicaments comprising, in combination, a container body having one end readily pierceable by a fine canula, and the other end sealed by a slidable plug which dispenses the contents thereof; said plug having a relatively thick annular portion of relative stiffness for secure sealing, and a relatively thin web integral with the annular portion and flexed when the hydrostatic pressure within the package is increased as during an injection.

3. A dispensing package for liquid medicaments comprising, in combination, a container body of tubular form having a rubber plug located at one end thereof; said plug having a diaphragm which is sensitive to and distended by the medicament when under the pressure created by dispensing.

4. A dispensing package for liquid medicaments comprising, in combination, a container body of tubular form having a slidable rubber plug initially located at one end thereof and slidable therethrough to dispense the medicament; said plug having a centrally located portion which is sensitive to and distended by the medicament when under the pressure created by dispensing.

5. A dispensing package for liquid medicaments comprising, in combination, a container body constructed and arranged to permit dispensing of the medicament through a fine canula; and a resilient plug slidable through said body to effect said dispensing; said plug having the portion adjacent its longitudinal axis provided with oppositely facing cavities or recesses so that the plug, if pushed by a syringe plunger, will not create a back suction through the canula when pressure on the plunger is relieved.

6. A hypodermic syringe comprising, in combination, a body having a slidable plunger whose inner end is coaxially recessed; and a medicament containing cartridge inserted in said body and having a slidable plug therein designed to be pushed by the plunger to dispense the contents of the cartridge; said plug having a pressure-sensitive web located coaxially thereof.

7. A hypodermic syringe comprising, in combination, a syringe body having a plunger; and a medicament dispensing cartridge held by the syringe body and having a slidable plug therein constructed and arranged to be distended by the hydrostatic pressure of ejection and to restore itself to its initial undistended state when said pressure is relieved.

8. A medicament-cartridge for hypodermic syringes comprising a sealed liquid container embodying a tube having at one end a closure to be pierced by a canula, and having in its opposite end a plug to be forced through the tube to expel the liquid, said

plug having a portion which during the ejecting operation will be distended by hydrostatic pressure and which when the pressure is released will flex in a direction tending to continue the ejection, thereby preventing sucking back tendency.

9. A medicament-cartridge for hypodermic syringes comprising a sealed liquid container embodying a tube having at one end a closure to be pierced by a canula, and having in its opposite end a plug to be forced through the tube to expel the liquid, said plug comprising a thick walled tubular body of resilient material and a web integral therewith located intermediately of the ends of the plug.

10. A medicament-cartridge for hypodermic medicaments comprising a sealed liquid container embodying a tube having at one end a sealing closure to be pierced by a canula, and having in its opposite end a sealing closure comprising a plug of resilient material tightly fitted in the tube and adapted to be forcibly pushed therethrough to expel the medicament, said plug embodying means whereby the plug if pushed inwardly by a syringe plunger will not create a back suction through the canula when pressure on the plunger is released.

11. A syringe cartridge comprising a sealed liquid container adapted for communication with an injecting needle and embodying a tube with an inwardly displaceable piston plug, said plug constructed to receive and transmit plunger thrust applied against its rear end and embodying in advance of its rear plunger-engageable portion resilient means exposed to the liquid in the cartridge and yieldable to the internal fluid pressure during the ejection and which upon release of the applied operating pressure will react on the liquid in a manner tending to continue the ejection and thereby prevent sucking-back action.

12. A syringe cartridge comprising a sealed liquid container adapted for communication with an injecting needle and embodying a tube with a rear sealing stopper of elastic or yieldable material adapted to be pushed inward by a plunger for ejecting the liquid through the needle, said stopper embodying in advance of its rear plunger-engageable portion a cavity with a flexible front wall exposed to the liquid in the cartridge, whereby as the stopper is pushed inward the said wall is flexed rearwardly by the fluid pressure in the cartridge and when the pressure applied by the plunger is released the said wall reflexes in a direction tending to continue the ejection.

13. A syringe cartridge comprising a sealed liquid container adapted for communication with an injecting needle and embodying a tube with a rear sealing stopper of elastic or yieldable material adapted to be

pushed inward by a plunger for ejecting the liquid through the needle, said stopper embodying an axial cavity closed at its front end such as to prevent forward protrusion
5 of the central portion of the stopper by the thrust of the operating plunger and thereby to minimize distortion of the stopper by the

plunger in a manner which would tend to create back-suction by reflexing when the pressure on the plunger is released.

In testimony whereof, I have signed my name to this specification.

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HARVEY S. COOK.