March 12, 1929. R. C. REHM 1,704,924

SYRINGE CARTRIDGE

Filed Sept. 5, 1925

Fig. 1.

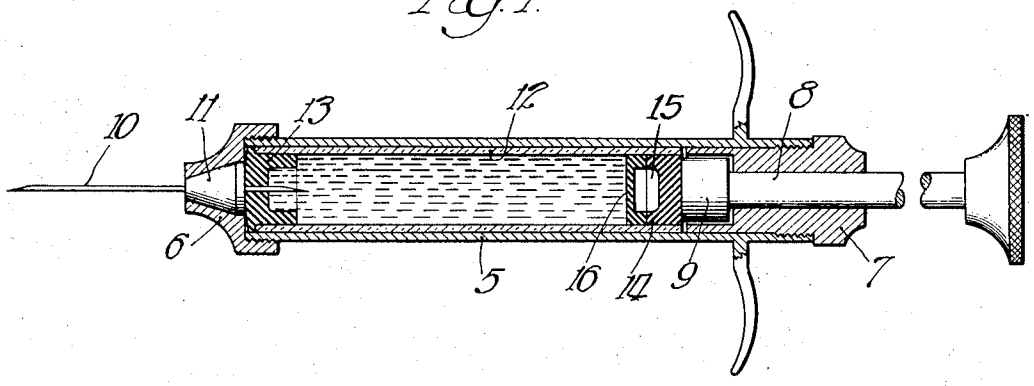


Fig. 2.

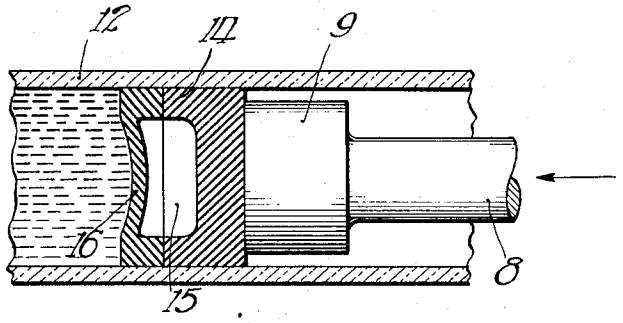
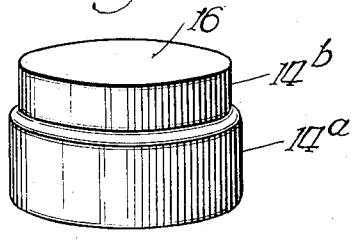


Fig. 3.



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Patented Mar. 12, 1929. 1,704,924

UNITED STATES PATENT OFFICE.

ROLAND C. REHM, OF EVANSTON, ILLINOIS, ASSIGNOR TO COOK LABORATORIES, INC., A CORPORATION OF DELAWARE.

SYRINGE CARTRIDGE.

Application filed September 5, 1925. Serial No. 54,644.

This invention relates to cartridges or medicament-dispensing packages for use as operative components of hypodermic syringes. The object is to provide a cartridge with an improved piston plug adapted upon release of the applied operating pressure to exert an action counter to that which would tend to produce back-suction.

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 containing said cartridge as an operative component thereof;

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

Fig. 3 is a detailed perspective view of the piston plug on an enlarged scale.

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.

The rubber plug 14, which in this instance is a slidable piston plug as well as a sealing closure, is designed or constructed so that any distortion which the plug undergoes by plunger thrust during the fluid-ejecting operation will not cause a back-suction by reflexing of the plug when the pressure on the syringe plunger is relaxed. In fact, upon release of the applied pressure the plug will react in a manner to counteract or prevent sucking-back tendency. As shown, the said plug 14 has an interior closed cavity 15 and a relatively thin front wall 16 exposed to the liquid in the cartridge. The back wall of the hollow plug and its annular wall around the cavity are relatively thick to provide a sufficiently firm plug to be compressed in the cartridge tube and which may be pushed forward by the plunger applied against the back end of the plug. By reason of the cavity 15, it will be apparent that the thrust of the plunger against the tight fitted rubber plug cannot cause relative forward protrusion of the major central portion of the front of the plug. Hence the opportunity for distortion by plunger thrust in a manner which would cause back-suction by reflexing, is minimized. Moreover, in the fluid-ejecting operation, the fluid pressure in the cartridge acting against the resilient or flexible fore wall 16 will cause said wall to flex backward or bulge into the cavity, as indicated in Fig. 2; and when the applied pressure is released the reflexing of the wall in resuming its normal undistended position will be in a direction tending to continue the ejection and thus have an effect contrary to a sucking-back tendency. The wall 16 may be sufficiently thin to be quite flexible and to provide a pressure sensitive diaphragm which will be distended as soon as any pressure is applied on the liquid and will relax immediately after the pressure ceases.

While the described piston plug may be made in various ways, I contemplate making it by uniting two separate recessed or cup-shaped sections as shown, their contacting ends being cemented or otherwise suitably joined. Preferably the front section is of originally smaller diameter than the other, so that the compression of the plug when inserted in the cartridge tube will not bow or improperly affect the wall 16, and also because it is deemed preferable to have the rear plunger-engageable section in tighter engagement with the glass tube than the fore section.

The described piston plug may be considered as one embodying an elastic closed hollow body adapted to be compressed in the fluid-ejecting operation, as manifested by contraction of the cavity, and which upon release of the pressure will expand toward the discharge end of the cartridge.

In view of a prior invention of Harvey S. Cook, described and claimed in his pending application Serial No. 71,319, filed November 25, 1925 as a division of an earlier application, which embraces a cartridge having a rubber piston plug formed or constructed so that when the pressure is released the plug or a portion thereof exposed to the internal fluid pressure will reflex in a direction to counteract or prevent a sucking-back tendency, I make no claim herein such as to cover said prior Cook invention.

Notice is also given that the particular syringe organization and cartridge therefor herein shown embody other prior inventions of said Harvey S. Cook, including a cartridge having the kind of pierceable fore plug or stopper herein shown, and an organization comprising such a cartridge with an instrument of substantially the construction herein shown; which prior Cook inventions are described and claimed by him in prior applications for patent now pending.

What I claim is:

1. A medicament dispensing package comprising, in combination, a tubular body; a plug sealing one end; and a second resilient plug initially disposed at the other end of the tubular body and slidable therethrough to eject the medicament through a canula which penetrates the first named plug; said second plug having spaced end walls the fore one of which is adapted to be deformed in the region of its axis by the hydrostatic pressure created within the package by said ejection.

2. A medicament dispensing package comprising, in combination, a tubular body; a plug sealing one end; and a second resilient plug initially disposed at the other end of the tubular body and slidable therethrough to eject the medicament through a canula which penetrates the first named plug; said second plug having a closed hollow interior and a relatively thin fore wall which flexes towards said interior under the hydrostatic pressure created within the package during the ejection.

3. A medicament dispensing package comprising, in combination, a tubular body; and a resilient hollow plug sealing an opening in the body and slidable therethrough to contract the interior volume of the package; said plug having end walls of different thicknesses, the thinner end wall being exposed to the medicament and so made as to be readily flexed by the hydrostatic pressure created during an injection, and automatically resuming its natural unflexed state when said pressure is relieved.

4. A medicament dispensing package comprising, in combination, a body; and a slidable plug for said body having a closed hollow interior and constructed and arranged to transmit mechanical pressure at and near the periphery thereof and having one end face sufficiently flexible to be distended within said hollow interior by hydrostatic pressure within the package.

5. A hypodermic syringe embodying a cartridge and needle in communication therewith, said cartridge having a piston plug with a closed hollow interior, the fore wall of which plug is adapted to be flexed by hydrostatic pressure in the fluid-ejecting operation, for the purpose described.

6. A syringe cartridge embodying a piston plug with a closed hollow interior, the fore wall of which plug is adapted to be flexed by hydrostatic pressure in the fluid-ejecting operation, for the purpose described.

7. A syringe cartridge embodying a closed hollow piston plug of resilient material having a relatively thick back wall and a relatively thin fore wall.

8. A syringe cartridge having a piston plug composed of two sections, including a recessed or substantially cup-shaped section the recess of which is closed by the other section, the fore wall of said plug adapted to be flexed by hydrostatic pressure in the fluid-ejecting operation, for the purpose described.

9. A syringe cartridge having a piston plug comprising a rear section to be engaged by a plunger and a substantially cup-shaped fore section of resilient material arranged with its recess facing the rear section.

10. A syringe cartridge embodying a composite plug composed of two recessed sections so positioned that the recesses thereof provide a closed hollow chamber, the inner one of said sections having an end wall adapted to be flexed by hydrostatic pressure in the fluid-ejecting operation.

11. A syringe cartridge embodying a resilient plug composed of two recessed sections united so that the recesses provide a closed hollow chamber within the plug, one of said sections being of larger external diameter than the other, the smaller section having a relatively thin end wall adjacent said hollow chamber.

12. A syringe cartridge having a piston plug embodying an elastic closed hollow body adapted to be compressed in the fluid-ejecting operation and to expand toward the discharge end of the cartridge when the pressure is released, for the purpose set forth.

13. A syringe cartridge embodying a pis-

ton plug comprising an elastic stopper having a closed hollow interior, said stopper constructed to receive and transmit plunger thrust applied against its back end and adapted to undergo compression in the fluid-ejecting operation in a manner such that when the pressure is released the stopper will exert an expansion action toward the discharge end of the cartridge, for the purpose set forth.

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

ROLAND C. REHM.