Feb. 21, 1956 R. L. HUBER 2,735,429

HYPODERMIC SYRINGES

Filed April 26, 1954

Fig. 1

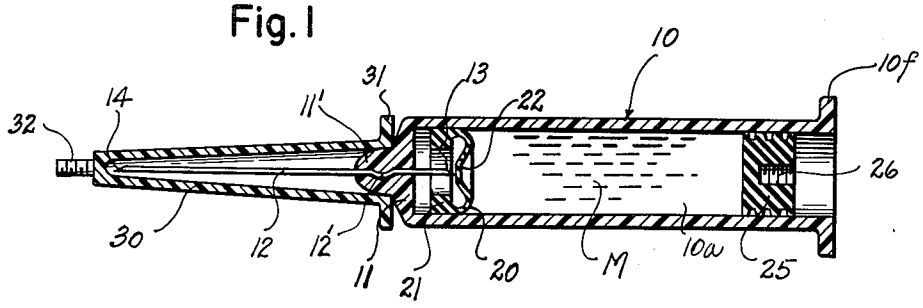


Fig. 2

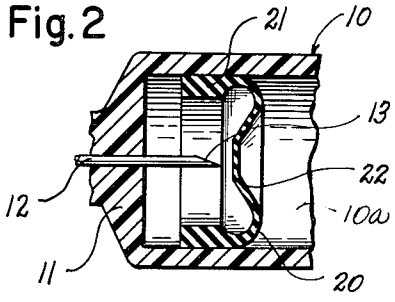


Fig. 3

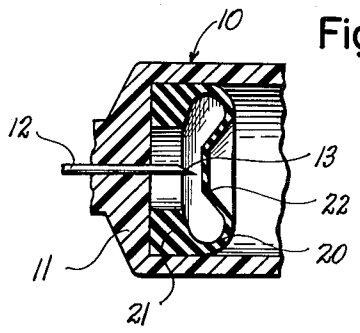


Fig. 4

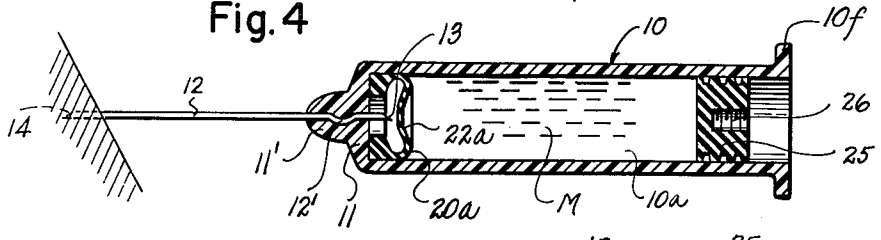


Fig. 5

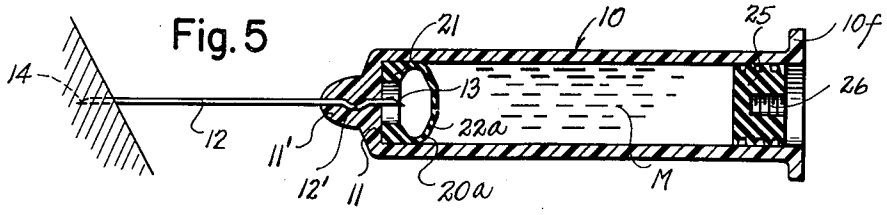


Fig. 6

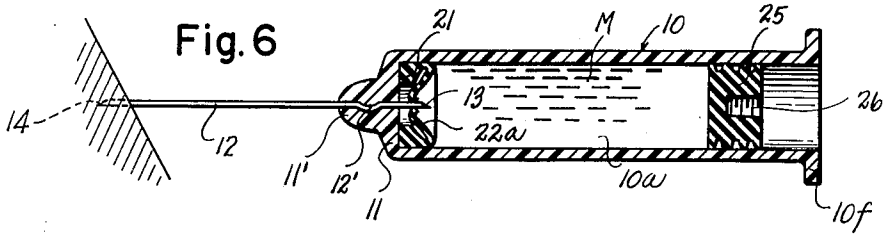
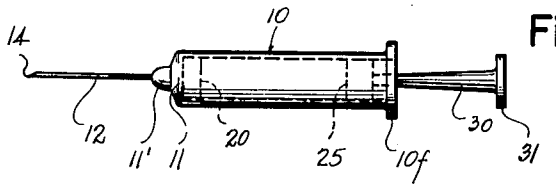


Fig. 7



INVENTOR.
Ralph L. Huber
deceased
Jennie L. Huber
administratrix

BY

Cook & Robinson ATTORNEY

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2,735,429

HYPODERMIC SYRINGES

Ralph L. Huber, deceased, late of Seattle, Wash., by Jennie L. Huber, administratrix, Seattle, Wash.

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1 Claim. (Cl. 128—218)

This invention relates to hypodermic syringes, and it has reference more particularly to syringes of those kinds commonly referred to as "one-shot disposable syringes," that are designed to be used once and then thrown away. More specifically, the particular novelty of this invention resides in a new, improved and inexpensive means which makes possible the function of aspiration prior to injection of medicament from the syringe into the patient.

It is the principal object of this invention to provide a hypodermic syringe having a barrel or cylinder with a hypodermic needle sealed therein, and so equipped with stopples that it serves as a container for the medicament, and eliminates conventional glass ampules commonly used as medicament containers in conjunction with reusable syringes, and means is provided for the necessary and desirable function of aspirating prior to injection of the medicament.

More specifically stated, the objects and advantages of the present invention reside in the provision of a syringe comprising a cylindrical barrel and equipped at one end with a closing wall through which a double-pointed, hypodermic needle is sealed, and fitted with a novel and improved form of partitioning stopple which protectively overlies the inner end of the needle, and a piston stopple that is fitted in the other end of the barrel and is movable to effect the function of aspiration and the piercing of the partitioning stopple by the inner end of the needle and the ultimate forcible ejection of the medicament, contained in the barrel between the stopples, through the needle.

It is a further object of this invention to provide a hypodermic syringe of the character above stated wherein the novel and improved form of partitioning stopple is adapted or constructed so as to be effected by slight variations in pressure resulting from the manipulation of the piston stopple so as to produce an area of decreased pressure surrounding the inner, pointed end of the needle. The construction and arrangement of parts further providing means whereby the end wall of the partitioning stopple will be pierced by the needle point to permit ejection of the medicament incident to the inward movement of the piston stopple.

It is also an object of this invention to provide a new, improved and inexpensive form of partitioning stopple which will protectively overlie the inner, pointed end of the needle and wherein the end wall of the partitioning stopple is of transparent, relatively thin, rubber or elastic type material which will respond to slight variations of pressure change.

In accomplishing the above mentioned and various other objects of this invention, he has provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal, cross-section view of a "one-shot disposable syringe" embodying the improvements of the present invention.

Fig. 2 is an enlarged cross-sectional view of a portion

of the forward end portion of the syringe illustrating the end wall of the partitioning stopple in normal position.

Fig. 3 is an enlarged cross-sectional view similar to Fig. 2 illustrating a partitioning stopple of alternative form.

Fig. 4 is a longitudinal sectional view of a "one-shot disposable syringe" embodying the alternative form of partitioning stopple of Fig. 3 with the stopple in normal position.

Fig. 5 is an enlarged cross sectional view illustrating the partitioning stopple of Fig. 3 with the end wall in outwardly cupped position resulting from reduction of pressure in medicament chamber incident to retraction of the piston stopple.

Fig. 6 illustrates the stopple of Fig. 3 with the needle piercing the end wall of the stopple to permit injection of medicament incident to the inward movement of the piston stopple.

Fig. 7 illustrates a syringe assembled for aspiration and injection.

Referring more in detail to the drawings:

In its present preferred form of construction, the syringe of this invention comprises a cylindrical barrel **10**, preferably of transparent plastic, or the like, open at one end and closed at the other end by an integral end wall **11** through which a conventional, double-pointed, hypodermic needle **12** is sealed to extend in the axial center line of the barrel; the needle being beveled to sharpened points at both its inner end **13** and its outer end **14**. It will be noted with reference to Fig. 1 that the inner end of the needle extends a substantial distance into the interior of the syringe barrel. As herein shown, the needle is formed with an arcuate bend as at **12'**, which is sealed in the end wall **11** to prevent any possible slippage or movement of the needle in the end wall.

Applied within the barrel, adjacent its end wall, is the barrel partitioning stopple **20** which is of transparent, rubber or elastic-like material and which is of such diameter as to fit in the barrel in relatively tight frictional relationship. The partitioning stopple comprises the cylindrical body **21**; a relatively thin diaphragmatic end wall **22** which in diameter is greater than the interior diameter of the cylindrical body portion of the stopple and thus providing a fullness of material that effects a reverse cupping of the wall. It is an important and necessary feature of the invention that the end wall **22** of the partitioning stopple **20** must be of such thickness or weight of material that relatively slight increases or decreases in pressure applied thereto will cause the end wall to change its position so as to increase the areas surrounding the inner end of the needle and thereby cause a partial vacuum or an area of reduced air pressure surrounding the end of the needle incident to the outward cupping of the end wall as illustrated in Fig. 5.

The liquid medicament M is contained in the barrel **10**, in a medicament chamber **10*a*** between the partitioning stopple **20** and the piston stopple **25**, fitted in the outer end portion of the barrel, as is seen in Figs. 1, 4, 5 and 6. This latter stopple **25** is of rubber, or the like and it is formed with a central, threaded socket **26** open to its outer end.

As is illustrated in Fig. 1, the outer end portion of the needle is normally encased in a hollow guard or sheath **30**, the inner end portion of which is removably fitted over a central boss or projection **11'** on the end wall **11** of the barrel. About this end of the sheath is an annularly projecting flange **31** and at the opposite end of the sheath is a short, threaded stem **32**. When the sheath has been removed from the needle, the stem **32** can be threaded into the socket **26** of the stopple **25** to attach the part **30** to the stopple as an operating stem. The flange **31** serves as a finger grip in the manipulation of the op-

erating stem. The open end of the barrel **10**, likewise, is formed with an annular flange **10***f* and serves as a finger hold.

In Figs. 4, 5 and 6, there is illustrated a partitioning stopple **20***a* of slightly modified construction wherein the sealed area immediately surrounding the inner end **13** of the needle **12** is substantially reduced and wherein the stopple is at all times disposed in engagement with the end wall **11** of the barrel. The stopple of this construction will permit substantially freer diaphragmatic action of the end wall **22***a* of the stopple incident to reduced pressures in the medicament chamber **10***a*. Also, there will be substantially less compression of air in the sealed area incident to the injection of the medicament.

With the various parts constructed as shown in Fig. 1 and with the barrel properly charged with the liquid medicament, and all free air removed from the medicament chamber, the normal use of the syringe would be as follows:

First, the needle sheath, or guard **30**, is removed from about the outer end of the needle and its attaching stem **32** is threaded into the socket **26** of the piston stopple **25**. The parts then assume the relationship as shown in Fig. 7. The needle is then inserted into the proper site or location in the muscle of the patient and a slight inward movement is applied to the piston stopple **25** to cause it to move to a position where the end wall **22** of the partitioning stopple **20** barely touches the inner end **13** of the needle. Aspiration is then effected by outward retraction of the stopple **25** by means of the attached member **30**. If a drop of blood appears at the inner end of the needle, which blood will be visible through the transparent end wall **22**, this is an indication that the needle is in a blood vein and that injection of medicament at this point would be dangerous and injurious to the patient. It is, therefore, required that the needle be slightly withdrawn and its direction slightly changed and again inserted to a proper depth where aspiration can be repeated. This partial withdrawal spares the patient unnecessary pain resulting from repeated penetration of the sensory nerve in the region of the skin surface.

When the needle is properly set, the medication is injected by applying inward or injection pressure to the piston actuating stem **30**. When the pressure is applied, the piston stopple moves inwardly causing the stopple **20** to move inwardly and the end wall **22** is pierced by the inner, pointed end **13** of the needle. The continued pressure on the piston stopple discharges the liquid medicament through the needle into the patient. When injection has been completed the needle is withdrawn from the patient and the syringe in its entirety may be discarded.

The reduced pressure in the area about the inner end of the needle and the resulting aspiration is affected by the withdrawal of the piston stopple thereby causing a reduced pressure or partial vacuum in the medicament chamber. This reduced pressure or vacuum will cause the diaphragmatic end wall of the stopple to be cupped outwardly as shown in Fig. 5 and thereby a reduced pressure area or vacuum is caused in the sealed area or chamber surrounding the inner end of the needle.

The structure illustrated in Figs. 4, 5 and 6 is used in substantially the same manner as the structure of Figs. 1 and 2, except that the partitioning stopple is disposed against the end wall **11** and therefore it is only necessary to retract or move outwardly the piston stopple to cause the reduced pressure in the medicament chamber and the resulting reduced pressure in the area surrounding the inner end of the needle. The stopple is not moved and a tighter seal is possible between the stopple and barrel wall.

Instead of the needle herein shown, one may, if desired, alternatively employ a detachable, bi-pointed needle with screw on hub for its securement to the barrel. In such instances, the needle could, if desired, be reusable. Preferably the barrel is treated with silicon before loading with the medicament so as to protect the medicament.

The syringe structure as herein described is practical, easy to use and by reason of the elimination of the requirement for a glass ampule for containing the medicament, it is substantially less complicated in construction and is substantially more economical.

This application is a continuation-in-part of allowed application, Serial No. 307,066, filed August 29, 1952 and now abandoned.

Having thus described the invention, what is claimed as new therein and desired to secure by Letters Patent is:

A hypodermic syringe of the character described comprising a barrel formed with a closing wall at one end and a hypodermic needle sealed through said wall with the inner end of the needle extending into the barrel, a partitioning stopple disposed in the barrel adjacent the said closing wall and a piston stopple normally disposed in the opposite end of the barrel; said partitioning stopple comprising side walls and a diaphragmatic end wall, said end wall being of relatively thin, elastic, transparent material and of substantially greater diameter than the inside diameter of the syringe barrel whereby sufficient fullness is provided to effect cupping of the end wall when the stopple is contained within the barrel.

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