March 7, 1967 H. J. KACHERGIS 3,307,548

MULTIPLE CAPACITY SYRINGE

Filed Jan. 10, 1964

Fig. 1.

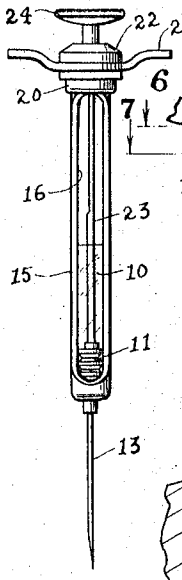


Fig. 3.

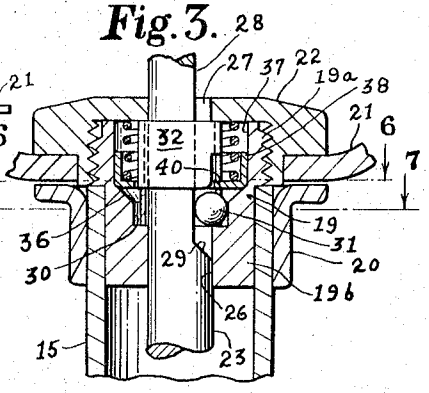


Fig. 4.

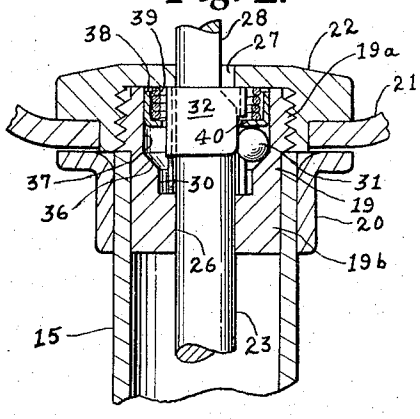


Fig. 6.

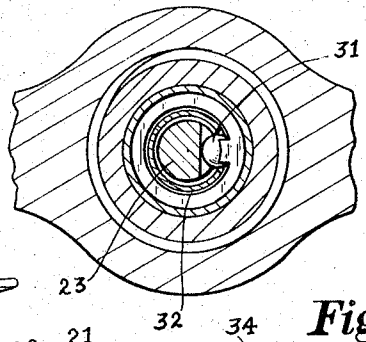


Fig. 5.

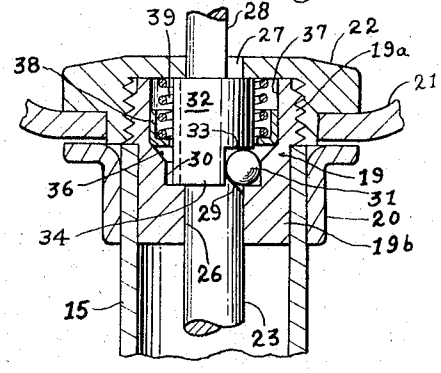


Fig. 2.

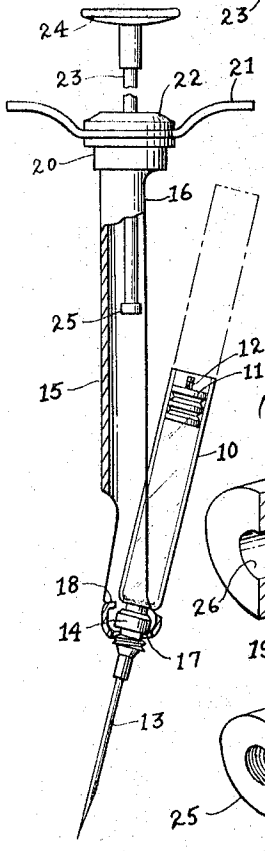


Fig. 7.

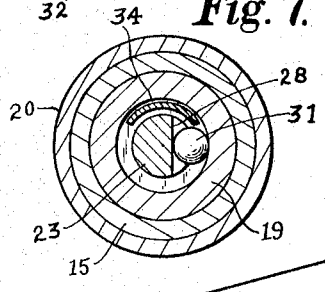


Fig. 8.

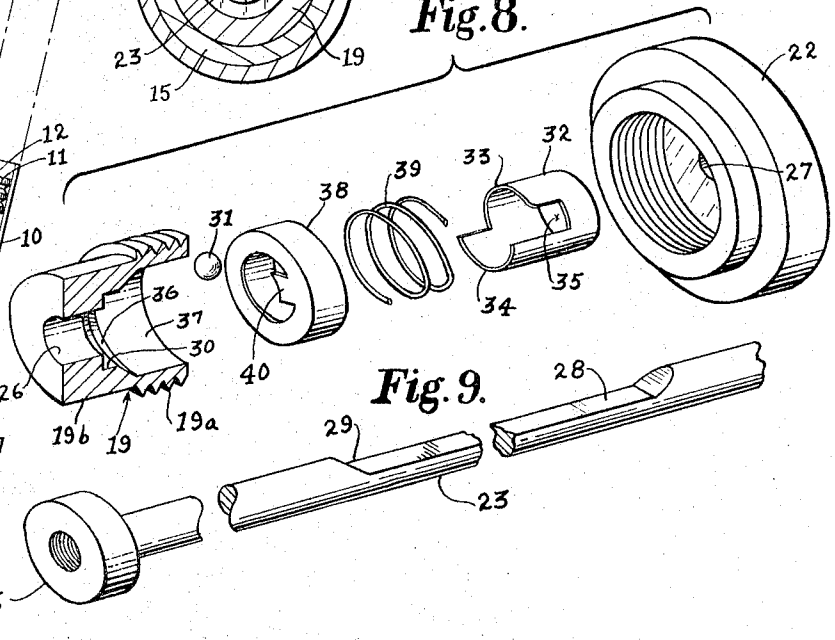


Fig. 9.

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MULTIPLE CAPACITY SYRINGE

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5 Claims. (Cl. 128—218)

This invention relates to injection syringes adapted for use with ampules of different capacities and particularly with ampules of different lengths. The ampules are usually provided as separate units and preferably, as a cartridge needle unit consisting of a drug-filled ampule with an attached needle.

The invention presents improvements over the prior art, in many respects. One of the purposes of such improvements is to provide for a greater safety and convenience in use. Another very important objective is economy of manufacture. Another object is to avoid so far as possible, holes or crevices which might become contaminated in use.

In pursuing the objective of greater safety and convenience, my improved syringe is automatically operable upon threading of the plunger rod to the piston to a shorter ampule to activate a device for limiting the outward movement of the plunger rod beyond a predetermined position to insure against pulling of the piston away from such shorter ampule. This limiting device is operative until deliberate motion is applied to the plunger rod, as by twisting it in the opposite direction.

In order to appreciate the probems which are solved by this invention, it should be understood that in use, the ampule is secured in the syringe, the plunger rod applied to the ampule piston, the piston moved to eject air from the needle, and the needle inserted. Then the user will pull back on the piston to a degree to permit a small amount of blood to enter the ampule to determine whether or not the needle has been properly inserted. This operation is referred to as aspiration.

When a syringe barrel of sufficient length to accommodate a longer ampule is employed with a shorter ampule, some means must be employed to stop or limit the outward movement of the piston so as to prevent its being withdrawn from the ampule.

The invention is adaptable for use with syringe barrels of the side-entry type which are preferable to the swinging head type shown in the prior art because they can be manipulated much more quickly and have a better appearance.

Other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawing, I have shown for purpose of illustration, one embodiment which the invention may assume in practice. In the drawing:

FIG. 1 is a small scale side view of an injection syringe for which my invention is intended;

FIG. 2 is a similar view showing how one of the shorter ampules may be inserted into the barrel of the syringe and also indicating a longer ampule in dot-and-dash outline;

FIG. 3 is a central vertical section through the head portion of the syringe, indicating the position of the parts where the plunger rod may be moved outwardly to its fullest extent;

FIG. 4 is a similar view showing a later stage of such movement;

FIG. 5 is also a similar sectional view showing the parts in position to limit outward movement of the plunger rod when one of the shorter ampules is used;

FIG. 6 is a cross-section on line 6—6 of FIG. 3;

FIG. 7 is a cross-section on line 7—7 of FIG. 3;

FIG. 8 is an exploded view showing the head and associated parts; and

FIG. 9 is a perspective view of the plunger rod.

The type of ampule which my improved syringe is intended to accommodate has a vial **10**, usually of glass and containing the desired medicine. It is closed at its outer end by a piston **11** having a threaded stem **12**. At the outer end, the ampule carries a needle **13** having a collar **14**.

The barrel of the syringe, generally indicated by the numeral **15**, has a wide side opening **16**, and to insert the ampule, the needle is placed through an opening **17** at the inner end of the barrel, so that the collar **14** bears against the inturned end portion of the barrel. The lower portion of this barrel **15** carries a hook **18** and when the ampule is swung into the barrel from the position shown in FIG. 2, the hook engages over the collar **14** to lock the ampule against outward movement relative to the barrel.

A head **19** is provided, consisting of a top threaded section **19*a*** and a bottom plug portion **19*b***. The head **19** is mounted on the barrel **15** by means of its bottom plug portion **19*b*** fitting tightly in the outer end of said barrel which is confined against outward expansion by a flanged ring **20** which fits tightly around the barrel. The handle element **21** rests upon this flanged ring **20** and is held by a screw cap **22** threaded on to the threaded section **19*a*** of the head **19**.

The plunger rod **23** has the usual thumb piece **24** at its outer end and a circular boss **25** at its lower end which is internally threaded to fit over the stem **12** of the ampule piston. The plunger rod **23** is guided in a bore **26** of the head **19** and also in a hole **27** in the cap **22**. The plunger rod **23** has a lengthwise extending groove from near its outer end for approximately half the length of the rod. This groove may be of any desired shape, but is herein shown as formed by a flattened surface **28** so that the groove terminates in a beveled shoulder **29**.

The head **19** has a counterbore to provide an annular recess **30** around the plunger rod, and in this recsss is mounted a locking member, preferably in the form of a ball **31** which is fitted rather snugly in the plunger rod groove or against the flat surface **28**. Thus, the ball **31** is freely movable in said recess **30** in a circular path upon twisting movement of the plunger rod in either direction. It will be evident that as long as the ball **31** is confined against axial movement out of the recess **30**, it will limit the outward movement of the plunger rod beyond a predetermined point, depending upon the inward extent of the groove or the location of the shoulder **29**.

Surrounding the plunger rod is a sleeve **32** whose configuration is best seen in FIG. 8, and shown in full in FIGS. 3, 4 and 5. It has a shorter portion **33** which is normally located just over the ball **31** to prevent it from coming out of the recess, and a longer portion **34** extends into the recess **30** in the circular path of the ball **31**. While this longer portion **34** is indicated as a single axially extending lug, it obviously can be made to take the form of two or more lugs. The sleeve **32** is confined within the head **19** against axial movement at its outer end by the cap **22** and at the inner end, by the bottom of the recess **30**.

Adjacent one edge of the longer portion **34** is an axially extending slot **35**, and when the ball **31** is in registry with this slot, it may move axially in said slot and over the beveled interior surface **36** of the head **19** so that the plunger rod is free to move without interference from the locking member or ball **31**. The slot **35** is at that side of the shorter sleeve portion **33** to which the ball moves when the plunger rod is twisted in a counterclockwise direction.

The position where the ball has escaped from its locking position in the recess **30** is shown in FIG. 4, where it has moved into a still larger counterbore **37**. Now, when one of the shorter ampules, such as shown in FIG. 2, is to be used, the plunger rod **31** must move down and be twisted clockwise to engage it with the threaded stem **12**. In this downward movement, the groove or flat surface **28** will again move opposite the ball **31**, and in order to insure that the ball will then move into the recess **30**, I have provided a ring, preferably cup-shaped, as indicated by the numeral **38**, together with a spring **39** acting between this ring and the inner surface of cap **22**. A lug **40** projects radially inwardly from the ring **38** to engage in the slot **35** of the sleeve **32**.

In the twisting action, clockwise of the plunger rod which is essential to engage it with the piston **11** of a shorter ampule, the ball will move in its circular path and engage that edge of the sleeve longer portion **34** opposite the slot **35** (this portion being that shown in FIG. 5); then, the plunger rod may be turned as much as necessary to tighten it on the stem **12** while the ball merely carries the sleeve **32** and the ring **38** around with it. It is thus automatically assured that when the syringe is prepared for use with the shorter ampule, the shorter sleeve portion **33** will always be positioned over the ball **31** to retain it in the recess **30**, and thereby obstruct movement of the piston rod beyond the point where the ball is locked between the shoulder **29** and the sleeve **32**.

After an injection has been made from the shorter ampule, the user will unscrew the plunger rod, whereupon the ball will move into registry with the lug **40** on ring **38** which can move upwardly in the slot **35** to allow him to pull the rod all the way to the point where the boss **25** engages the head.

In the specification and claims, the term "inward" is used to refer to that direction toward the needle or distal end of the syringe, and the term "outward" refers to the other direction toward the handle or proximate end of the syringe.

What I claim is:

1. A multiple capacity injection syringe adapted to be used with ampules of different lengths comprising

(a) a barrel of sufficient length to receive a long ampule and having means at its inner end to retain an ampule in the barrel;

(b) a head mounted at the outer end of the barrel;

(c) a plunger rod slidably mounted in the barrel head having means at its inner end for attachment to the ampule piston by a relative twisting movement in one direction; and

(d) means in said head automatically operable in response to such twisting movement when said plunger rod is being engaged with the piston of a shorter ampule to obstruct outward movement of said plunger rod beyond a predetermined position to insure against pulling of the piston away from such shorter ampule.

2. A multiple capacity injection syringe adapted to be used with ampules of different lengths, comprising

(a) a barrel of sufficient length to receive a long ampule and having means at its inner end to retain an ampule in the barrel;

(b) a head mounted at the outer end of the barrel and having an annular recess;

(c) a plunger rod slidably mounted in the barrel head having means at its inner end for attachment to the ampule piston by a relative twisting movement in one direction, the upper portion of said plunger rod having a groove extending lengthwise of the rod;

(d) a locking member normally confined in said recess and groove and movable in a circular path in said recess by any twisting movement of said plunger rod whereby outward movement of said rod is limited by the location of the inner end of said groove; and

(e) means operable by a deliberate movement of said piston rod different from that specified in clause (c) hereof to release said locking member from said annular recess to permit further outward movement of said plunger rod.

3. A multiple capacity injection syringe adapted to be used with ampules of different lengths comprising

(a) a barrel of sufficient length to receive a long ampule and having means at its inner end to retain an ampule in the barrel;

(b) a head mounted at the outer end of the barrel and having an annular recess;

(c) a plunger rod slidably mounted in the barrel head having means at its inner end for attachment to the ampule piston by a relative twisting movement in one direction, the upper portion of said plunger rod having a groove extending lengthwise of the rod;

(d) a ball fitted in said recess and normally engaged in said groove, said ball being movable in a circular path in said recess by any twisting movement of said plunger rod;

(e) a sleeve surrounding said plunger rod and confined against substantial axial movement in said head, said sleeve having a shorter portion whose bottom edge engages over the top of said ball to confine it against axial movement out of said recess and a longer portion projecting into said recess in the circular path of said ball, whereby movement of said ball in its circular path is free of said sleeve along the shorter portion but which carries the sleeve with it when the ball engages the sleeve longer portion; and

(f) a slot in said sleeve along one edge of said longer portion to permit said ball to move axially in said slot and escape from its recess when the ball is in registry with the slot.

4. A multiple capacity injection syringe as defined in claim 3 wherein the inner end of the plunger rod is internally threaded for connection to the threaded stem of an ampule piston, whereby when said plunger rod is threaded to the piston of a short ampule, said shorter sleeve portion will move over said ball to confine it in said annular recess.

5. A multiple capacity injection syringe as defined in claim 3 wherein said head is provided with a counterbore outwardly of said annular recess and wherein there are also provided a ring surrounding said sleeve and mounted in said counterbore for limited movement axially relative to said sleeve, said ring having a radial lug projecting inwardly to engage in said slot in the sleeve and a spring mounted in said head normally urging said ring in the outward direction.

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ROBERT E. MORGAN, *Acting Primary Examiner.*