March 14, 1967 R. E. HUBBARD 3,308,820

DISPOSABLE MEDICINAL SYRINGE

Filed April 6, 1964

FIG. 1

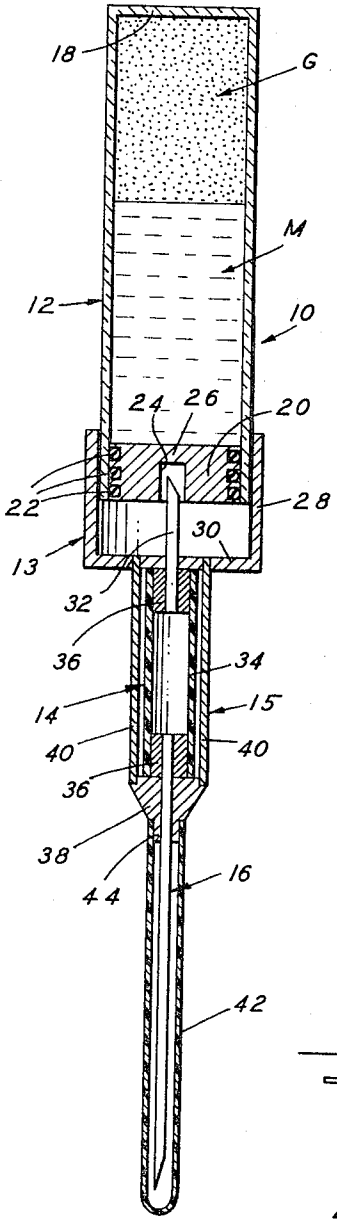


FIG. 2

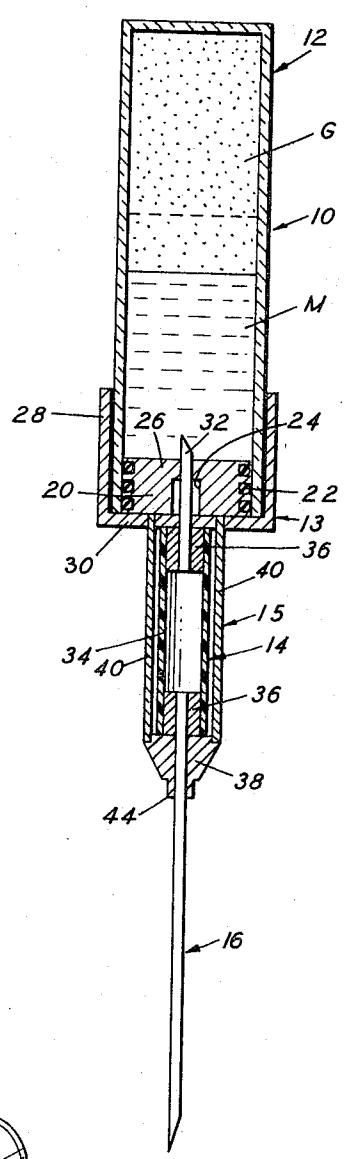
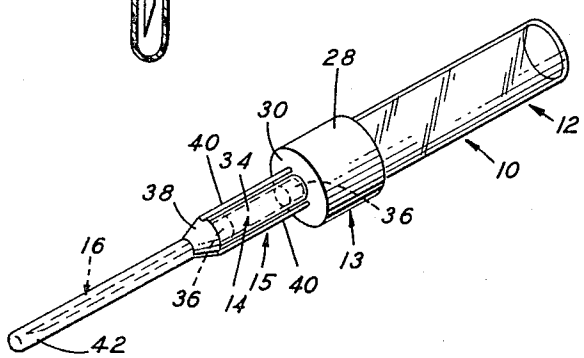


FIG. 3



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DISPOSABLE MEDICINAL SYRINGE

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The present invention relates to an improved medicinal hypodermic syringe which, by reason of its simplicity of construction and economy of parts, may be used once in the administration of a liquid medicament to a patient, then disposed of. More particularly, the invention relates to such a disposable medicinal syringe which incorporates in a single unitary structure three basic components, namely, a sealed vial unit containing a charge of liquid medicine or other liquid to be injected into the patient's tissue under sealed gas pressure; a hollow injection needle or cannula; and a mechanically stabilized, transparent and flexibly compressible aspiration sleeve or tube unit sealingly applied between the vial unit and the cannula, for checking by vacuum inducement against the possibility that the cannula has penetrated a blood vessel, prior to the discharge of the medicine under gas presure into muscular tissue. However, if desired, the syringe may also be used for intravenous injection.

In general, it is an object of the invention to provide a unitary, disposable or throw-away type syringe of the sort described, which is very inexpensive and compact, and may be carried in a desired quantity in a physician's kit for immediate emergency use and disposal without refilling; and a major advantage of the syringe is that it may be activated by the physician or an attendant in seconds' time, which is usually of critical importance under an emergent circumstance. Naturally, for the purposes of use under an emergency condition or not, the syringe of the present invention is fully protected against contamination prior to or during administration of the medicament.

In further general accordance with the invention, it is an object to provide a compact portable and disposable syringe of the type described, the parts of which are so arranged in relation to one another that it can be readily and easily manipulated by a physician or attendant using only one hand. The person administering the medicine need not break a sealed vial or ampule in order to free the liquid medicament for syringe administration, obviously requiring the resort to two hands, as well as rendering the medicament subject to contamination from the exterior.

More specifically, it is an object of the invention to provide an improved syringe as referred to, which includes a rigid cylindrical vial or container member, preferably of glass or a rigid transparent plastic chemically inert to a gas-pressurized charge of medicine therein, which container is liquid-tight pre-sealed at one end by a suitable plug, also chemically non-reactive; a rigid cylindrical slip cap of cup-like cross section in the open end of which the vial operates slidingly in the manner of a plunger, said cap rigidly carrying a hollow penetration needle disposed coaxially of and facing the vial and its sealing plug and being adapted to penetrate the latter upon plunger movement of the vial toward the slip cap; and a flexible but stabilized, transparent aspiration tube or sleeve fixedly carried by the cap axially outwardly thereof and in communication with the penetration needle. This aspiration member is preferably in the form of a flexible plastic sleeve which is externally stabilized by one or two stabilizer bars or rods extending parallel thereto. Finally, an elongated injection or administration cannula extends from a fixed connection to the aspiration sleeve and its stabilizer means, the hollow cannula passage communicating with the space within the aspiration sleeve.

In further specific accordance with the invention, as defined in the preceding paragraph, the stabilizing means for the aspiration sleeve is fixedly connected at its opposite ends to the slip cap and an adapter piece on which the administration cannula is carried. The stabilizer bar or bars permit side access to the aspiration sleeve for manual squeezing and release to set up a vacuum desired to visually check against the possibility that the cannula has penetrated a blood vessel.

At the same time, the stabilizing bar means not only braces the aspiration sleeve against lateral flexure or bending, but it also constitutes a relatively rigid means connecting the cannula to the slip cap of the vial unit in a fixed and stable axial alignment and spacing relative to the cap.

The foregoing as well as other objects will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawing illustrating the invention, wherein:

FIG. 1 is a view in longitudinal axial section of the improved disposable syringe of the invention, illustrating the sealed vial of the latter in an initial position within the slip cap prior to use of the syringe; and also showing the use of a removable protective cover cap applied about the syringe cannula or injection needle;

FIG. 2 is a view in section similar to FIG. 1, showing the parts after manipulation of the plunger-like vial or sealed container to penetrate its closure plug and to permit gas discharge of the liquid medicament therefrom into the aspiration sleeve and cannula; and

FIG. 3 is a perspective view of the syringe in the condition of FIG. 1, better illustrating the aspirator sleeve stabilizer means referred to above.

The syringe, generally designated by the reference numeral **10**, basically comprises a rigid walled, cylindrical and barrel-like vial or container **12**; a rigid cylindrical slip cap **13** of upwardly opening cup-like cross section, in which the vial **12** has an axial sliding fit; an axially elongated aspiration tube or sleeve unit, generally designated **14**, which is externally braced by elongated stabilizer means **15**; and an elongated hollow injection needle or administration cannula **16** extending from the aspiration unit.

As indicated above, the cylindrical rigid vial **12** is preferably of transparent glass, although a transparent rigid plastic or other material which is, like glass, inexpensively produced and chemically inert to its contents, may be employed. Vial **12** is integrally closed at one end by a wall **18**, and is at its other end provided with a sealed closure. This may be in the form of a plug **20** fixedly telescoped in the last named end, and liquid-tight sealed thereto, as by a series of O-rings **22**. In the alternative, an appropriately sealed threaded connection may be employed; or the plug may simply have tight frictional engagement in the vial end, or be specially constructed to seal, as desired.

The plug **20** may be of natural or synthetic rubber, or a suitable plastic or other material chemically inert to the contents of the vial **12**; and the plug **20** has an axial downwardly opening recess **24** in its center portion and terminating short of its top, resulting in a relatively thin, penetrable wall partition portion **26**.

The slip cap **13** is of cup-like cross section, including a rigid cylindrical wall **28**, in the open end of which the plug end or vial **12** is slidingly received, in the manner of a plunger. The sliding fit should be such as to normally maintain the vial in its withdrawn or un-activated position of FIG. 1 under frictional grip, but sufficiently free to permit the egress of air trapped between its plug end and the bottom wall **30** of the cap, between the wall **28** and the vial **12**.

A pointed hollow penetration tube **32** extends through a

central opening in the slip cap wall **30**, the tube being of sufficient axial length to be received within the plug recess **24** when the vial **12** is in its most outwardly withdrawn position (FIG. 1), but not to engage and penetrate the plug partition **26**. Suitable provision is made to unite the needle **32** to the slip cap **13** as a unitary part thereof.

The aspiration tube or sleeve unit **14** comprises an axially elongated tube length **34** of a suitable inert, flexible and transparent material, for example a readily available plastic. The tube or sleeve **34** is telescoped externally at each end about an annular hub or plug element **36**, in fixed relation to the latter; and the sleeve **34** may be externally compressed by the administrator's thumb and forefinger, prior to final injection. This enables a partial vacuum to be set up in aspiration unit **14** to withdraw a slight amount of visible blood into sleeve **34**, in the event a blood vessel has been penetrated by injection cannula **16**, whereupon a further attempt to penetrate and inject muscular tissue alone may be made. This test may be made a fractional second after insertion of the cannula **16**.

This cannula is fixedly mounted in a central hole of a frusto-conical adapter piece **38** coaxial with aspiration sleeve unit **14**, so as to communicate the hollow passage of cannula **16** with the interior of aspiration sleeve **34** through the opening of annular hub or bottom plug element **36**. Adapter **38** and slip cap **13** are mounted in axially spaced and fixed relation to one another through the agency of one or more elongated stabilizer bars or rods **40** constituting the stabilizer means **15** referred to above. Two such rods are actually shown, although one might suffice; and their purpose is to externally brace and stabilize the flexible and compressible tube **13**, while permitting ready and convenient access to the latter for the compressive aspiration action mentioned above. In either case, the arrangement is such that initial penetration of the administration cannula **16** into the patient, subsequent aspiration action on sleeve **34** and final manipulation of vial **12** to discharge its contents, may be readily and easily performed by the physician or other administrator, using but a single hand. The syringe **10** is of course supplied in an entirely sterile condition of its internal parts, and with the sterile cannula **16** fully encased in an elongated, rigid cap or sheath **42** having a readily removable frictional fit at its top about a tubular integral extension **44** of the cannula supporting adapter piece **38**.

It is believed that the manner of use of the syringe **10** will be evident from the foregoing. The interior of vial **12** is pre-filled with a prescribed administration quantity of a liquid medicament, designated M, which has been placed under substantial pressure by a suitably compressed gas, such as air or other relatively inert gas, designated G. This content is held under desired pressure by the end plug **20**; and it is contemplated that vials **12** shall be made available in different axial lengths to contain different desired charges of the medicament M, as the physician deems appropriate. It is further contemplated that the slip cap and vial **12** shall be standard in diameter for the desired sliding fit of different content vials in a single design of slip cap.

With the syringe in this initial condition, the administrator, acting rapidly under possibly emergent conditions, first inserts cannula **16** into the patient's tissue at a desired area. He then squeezes the aspiration tube or sleeve **34** to create a partial vacuum in the latter capable of drawing blood from a vessel into the sleeve. Upon instantaneous visual ascertainment that a blood vessel penetration has not been made, the administrator then thrusts the vial **12** axially into slip cap **13**. This can be done conveniently and rapidly, using the palm, thumb and forefinger of a single hand; and the thin walled partition portion **26** of sealing plug **20** is thus penetrated by the tubular needle **32**, as shown in FIG. 2. The result is that the charge of medicament M is discharged under substantial pressure of gas G, is indicated in dotted line in FIG. 2, into and through aspiration sleeve unit **14** and administration cannula **16**, thence into the patient's tissue. The entire operation may be performed in a matter of a second or so, as an emergency involving possible patient shock will often demand.

It is contemplated that the syringe **10** shall be sufficiently inexpensive of fabrication that it may be discarded in its entirety after a single use. However, short of this, it is also contemplated that only the emptied plunger vial or container **12** need be so thrown away, retaining the remainder of the syringe structure, for use, after appropriate sterilization, with the replacement of another vial **12** of selected content.

Thus, it is seen that the invention affords a unitary disposable syringe structure, including slip cap and sealed vial element coacting in the manner of a plunger and cylinder to discharge liquid medicine under gas pressure into and through an aspiration unit, which is externally braced and stabilized in relation to the slip cap, and a cannula-mounting adapter, by relatively rigid stabilizer bar means, which means also supports the said adapter in fixed relation to the vial-slip cap unit.

The arrangement permits of very low cost production, permits one hand manipulation for the entire aspiration and injection cycle, makes unnecessary the loss of time and possible contamination involved in the breakage and mounting of previously used ampules; and the syringe is by reason of these advantages, extremely well adapted as portable medicine kit equipment for use under emergency conditions.

What I claim as my invention is:

1. A syringe of the type described, comprising a sealed tubular vial to contain a charge of liquid medicament under sealed gas pressure, a cup-like slip cap having an open end in which said vial is slidably received, an end of said vial in said cap being covered by a penetrable wall member, said slip cap having a tubular needle coaxially facing said wall member to penetrate the latter upon movement of said vial in said cap toward said needle, administration cannula means coaxial with and spaced axially from said slip cap, and a tubular aspiration unit between said cap and cannula means and in communication with the interior of both thereof, comprising a flexibly compressible aspiration sleeve engaging the slip cap and cannula means at its opposite axial ends to communicate the same with one another, and means to support the cannula means in fixed axial spacing relative to said slip cap.

2. A syringe of the type described, comprising a sealed tubular vial to contain a charge of liquid medicament under sealed gas pressure, a cup-like slip cap having an open end in which said vial is slidably received, an end of said vial in said cap being covered by a penetrable wall member, said slip cap having a tubular needle coaxially facing said wall member to penetrate the latter upon movement of said vial in said cap toward said needle, administration cannula means coaxial with and spaced axially from said slip cap, and a stabilized tubular aspiration unit between said cap and cannula means and in communication with the interior of both thereof, comprising a flexibly compressible aspiration sleeve engaging the slip cap and cannula means at its opposite axial ends to communicate the same with one another, and at least one stabilizer member extending externally of said flexibly compressible sleeve between fixed connections to said cannula means and slip cap, thus to brace the aspiration sleeve and support the cannula means in fixed axial spacing relative to said slip cap.

3. A syringe of the type described, comprising a sealed tubular vial to contain a charge of liquid medicament under sealed gas pressure, a cup-like slip cap having an open end in which said vial is slidably received, an end of said vial in said cap being covered by a resilient penetrable wall member of reduced thickness having means sealing the same within said vial end, said slip cap having

a tubular needle coaxially facing said wall member to penetrate the latter upon movement of said vial in said cap toward said needle, administration cannula means coaxial with and spaced axially from said slip cap, and a stabilized tubular aspiration unit between said cap and cannula means and in communication with the interior of both thereof, comprising a flexibly compressible aspiration sleeve engaging the slip cap and cannula means at its opposite axial ends to communicate the same with one another, and at least one stabilizer member extending externally of said flexibly compressible sleeve between

fixed connections to said cannula means and slip cap, thus to brace the aspiration sleeve and support the cannula means in fixed axial spacing relative to said slip cap.

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