

[54] **DISPOSABLE SYRINGE WITH SLIT VALVE**
[76] Inventor: **Milton J. Cohen**, 7111 Connecticut Ave., Chevy Chase, Md. 20015

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Related U.S. Application Data

[60] Continuation of Ser. No. 86,807, Nov. 4, 1970, abandoned, which is a division of Ser. No. 732,622, May 28, 1968, Pat. No. 3,557,787.

[52] **U.S. Cl.**..... **128/218 M**
[51] **Int. Cl.**..... **A61m 5/22**
[58] **Field of Search** 128/218 R, 218 M, 218 NV,
128/216, 272, 220, 219; 137/525.1

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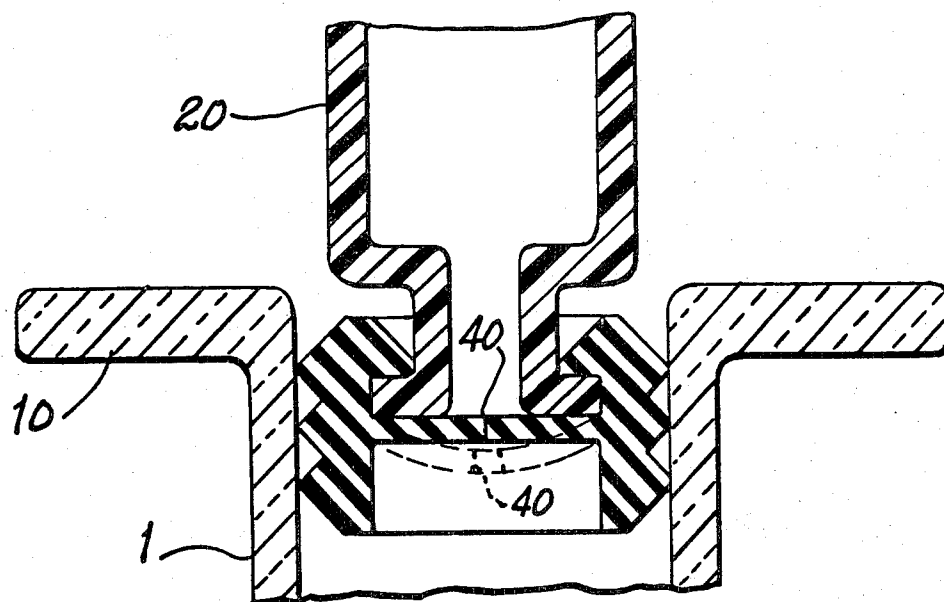
Primary Examiner—Richard A. Gaudet

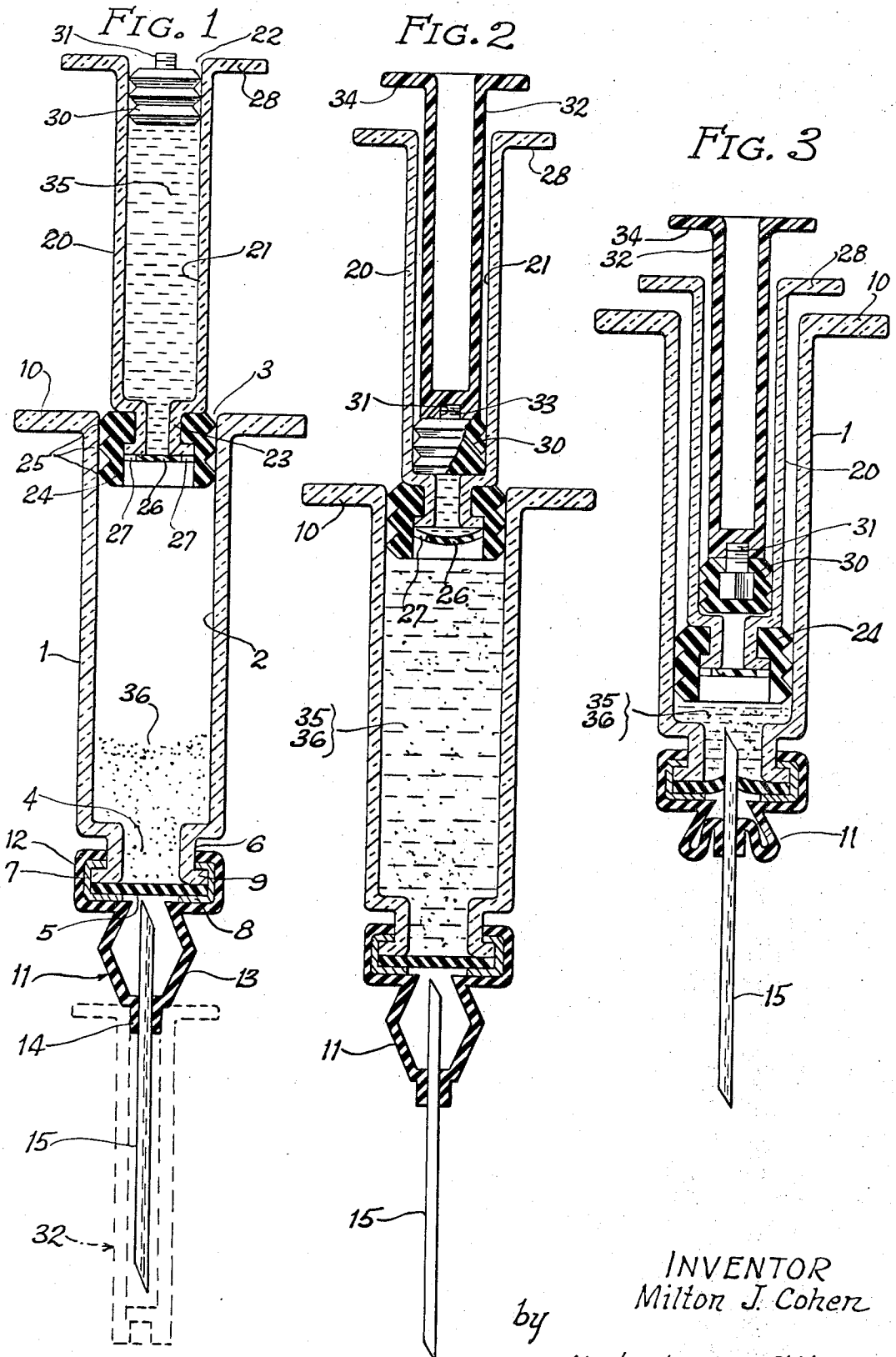
Assistant Examiner—J. C. McGowan

[57] **ABSTRACT**

A syringe device formed of inner and outer tubular members with the inner member adapted to be telescoped within the outer and sealed therefrom by a displaceable seal while the outer member is formed with a rupturable seal having an injection needle in alignment therewith for rupture in use with the inner tubular member adapted to contain a liquid carrier and the outer tubular member a dry medicant to be taken up with the carrier for injection whereby the materials are freshly mixed immediately prior to injection for operation of the device.

10 Claims, 5 Drawing Figures





INVENTOR
Milton J. Coker
by
McDermott, Herd & Smith Attys

FIG. 4

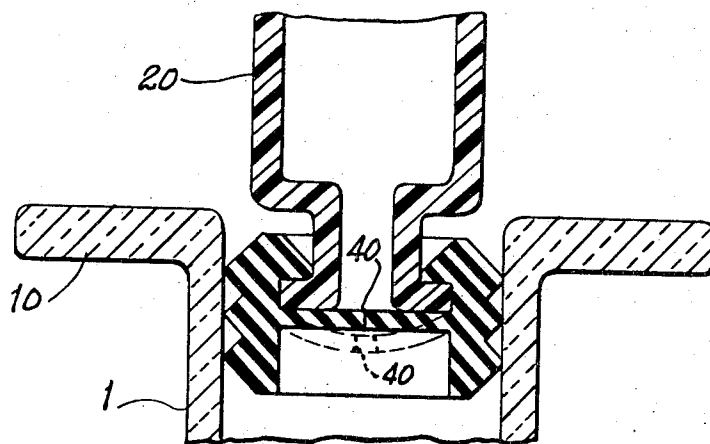
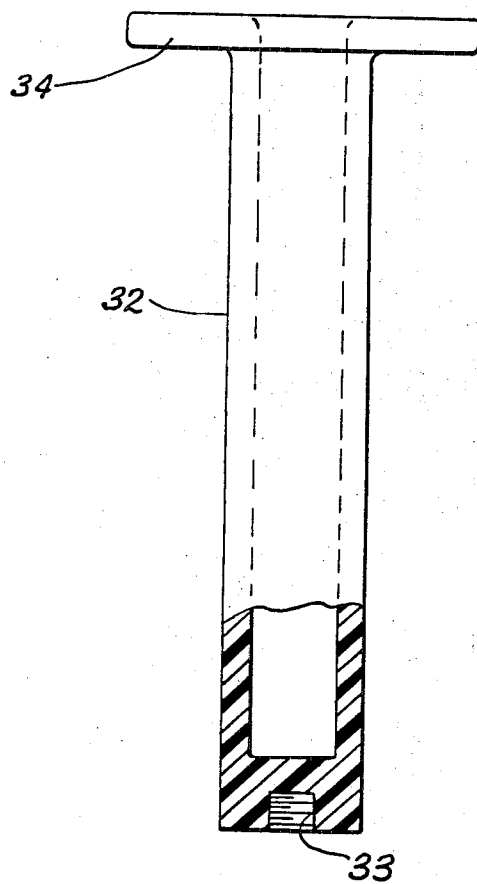


FIG. 5



DISPOSABLE SYRINGE WITH SLIT VALVE

This is a continuation, division, of application Ser. No. 86,807, filed Nov. 4, 1970, now abandoned, which is a division of my copending application Ser. No. 732,622, filed May 28, 1968, and entitled "A Disposable Syringe," now U.S. Pat. No. 3,557,787, issued Jan. 26, 1971.

This invention relates to a device for the administration of parenteral solutions and more particularly to a hypodermic syringe adapted to contain dry solids separate and apart from the dissolving or carrier liquids until, immediately prior to administration, the liquid is caused to flow into the compartment containing the solids for injection of the formed mixture.

To the present, it has been the practice to make use of stock solutions housed within a container of relatively large capacity, from which increments can be removed, as desired, for administration by a suitable syringe. This procedure is deemed to be unsatisfactory because most such solutions are of insufficient stability to militate against change before the stock solution has been used up. With a solution of short "shelf life," its utility may become dissipated before the solution has been completely utilized.

The most effective means for maintaining the "shelf life" over extended periods of time is to maintain complete separation between the liquid carrier and the solids to be incorporated therein, until immediately prior to use. Maintenance of solid - liquid separation until time of use presents other problems with respect to ejecting and administering the solution containing the necessary concentration of ingredients and under the most sanitary conditions. The usual practice is to introduce the solids into the liquid for solution in a suitable container from which the solution can be withdrawn into a syringe for injection. This procedure required the use of at least three separate containers and maintenance under sterile conditions as well as accurate measurement of the ingredients.

It is an object of this invention to provide a single device in which accurately measured amounts of solid medicants and liquid carrier can be maintained in a completely separated relation, in which the measured amounts of liquid carrier and solid material can be brought together and in which the freshly formed mixture can be injected, all while maintaining the ingredients in a sealed and sanitary state, without exposure to the outside atmosphere, and in which the entire operation for mixture and administration can be carried out with one hand.

It is another object to provide a disposable syringe which houses the liquid and solids in separately sealed compartments and in which admixture of the liquid and solid can be effected entirely within the confines of the syringe to make a freshly prepared solution of the measured ingredients and from which the freshly prepared solution can be injected in the manner desired for use.

Other objects and advantages of this invention will hereinafter appear and, for purposes of illustration but not of limitation, an embodiment of the invention is shown in the accompanying drawings in which

FIG. 1 is a sectional elevational view of the syringe embodying the features of this invention, with the elements illustrated prior to use;

FIG. 2 is a sectional elevational view of the syringe shown in FIG. 1 with the syringe partially actuated to effect displacement of the liquid carrier from the liquid chamber to the solids chamber for solution or admixture;

FIG. 3 is a sectional elevational view of the syringe shown in FIGS. 1 and 2 with the syringe in fully actuated position to effect displacement of the freshly prepared solution from the solids compartment for injection;

FIG. 4 is a sectional elevational view of a portion of the syringe shown in FIGS. 1 to 3 and showing a modification in the closure for the liquid containing compartment; and

FIG. 5 is a sectional elevational view of the actuator which may also be used as a needle cover.

With reference now to the drawings, the syringe of this invention is formed with an outer casing 1 in the form of a tubular member, formed of glass, plastic or the like, having a continuous bore 2 extending there-through from an open rearward end portion 3 to a neck portion 4 of smaller cross-section, at the forward end. The forward end is sealed by means of a disc member 5 held in place in sealing relationship across the open neck 6 of the tubular member 1 by means of a metal cap 7 which is crimped about the outer neck end portion of the tubular member while the inner portions 8 of the cap overlap the outer edge portions of the sealing disc member overlying the flattened end surface 9 of the tubular member. The rearward end of the tubular member is formed with an outwardly extending annular flange 10 which serves as a finger grip. A hub member 11 has a skirt portion 12 crimped about the skirt portion of the cap for securing the hub onto the neck end portion of the tubular member. The hub is also formed with an intermediate collapsible or corrugated portion 13 extending forwardly in axial alignment with the forward end of the tubular member with a hub 14 on the forward end through which a hollow needle 15 extends with a sharpened end portion of the needle projecting into the interior of the hub member 11 for a distance less than the spaced relationship between the hub end and the diaphragm 5, when in normal position, thereby to locate the rearward end of the needle immediately in advance of the center of the diaphragm.

A second tubular member 20 of glass, plastic or the like material is dimensioned to have an outer wall to wall dimension which is less than the inner wall to wall dimension of the tubular member 1 to enable the former to be telescoped through the interior of the outer tubular member 1. The second tubular member is similarly formed with a passage 21 extending from the open rearward end 22 through a neck portion 23 of smaller cross-section at the forward end. The forward neck end portion of the second tubular member is fitted with a rubber stopper 24 including an outer ribbed portion 25 fitted in gripping relationship about the neck and extending laterally beyond the walls of the second tubular member for a distance to effect sealing engagement with the inner walls of the outer tubular member 1 whereby the second tubular member is capable of the function of a piston movable axially relative the outer tubular member 1 thereby to provide a piston and cylinder arrangement between the two tubular members.

The rubber stopper 25 has a disc portion 26 which normally spans the forward end of the passage to seal

the tubular member. It is further formed with one or more openings 27 in the lateral portions beyond the passage to enable flow of liquid from the second tubular member into the first when the sealing disc 26 is flexed for displacement from sealing engagement with the end of the second tubular member. Again, the rearward end portion of the second tubular member is formed with an outwardly extending flanged portion 28 for use as a finger grip, as will hereinafter be described. The rearward end of the passage 21 is sealed with a rubber plug 30 mounted for axial displacement through the passage 21 as a piston within the cylinder defined by the second tubular member. Means, such as a threaded stud 31, is provided on the rearward end of the plug type piston for connection of an actuator 32 for displacement of the piston relative to the cylinder. In the illustrated modification, the actuator 32 is in the form of a third elongate tubular member dimensioned to have a cross-section less than the cross-section of the passage 21 through the second tubular member and formed at one end with an internally threaded female portion 33 for threaded engagement onto the threaded plug 31. The rearward end of the actuator is formed with an outwardly extending flanged portion 34, for use as a finger grip.

In the modification shown in FIG. 5, the actuator is capable of use as a needle cover to protect the needle when other than in position of use and which can be removed from the hub to expose the needle and for attachment to the plug for operation of the device, when in position of use. Thus the element supplies the dual function of a needle protector during non-use and as an actuator in use.

In the assembled relation, illustrated in FIG. 1, fluid 35 is housed in sealing relationship within the second tubular member while the dry medicant is housed in sealing relationship within the first tubular member. The loaded device can be shipped and stored for extended periods of time without deterioration of the ingredients and without exposure of the elements to non-sanitary conditions.

In use, the needle cover 32 is removed to expose the needle 15 and the cover is screwed onto the end of the piston plug 30 for use as an actuator. The device is held with the two needle fingers under the flanged members 28 of the second tubular member and the actuator is pressed by the thumb to effect displacement of the plug 30 through the cylindrical passage 21. This operates to place the liquid 35 under pressure which transfers to the resilient closure disc 26 to cause flexure and unset the disc for establishing communication between the chambers 21 and 2 through the openings 27 to enable flow of fluid under pressure from the chamber 21 in the second tubular member into the chamber 2 of the first tubular member for admixture with the dry medicant 36. This intermediate position is illustrated in FIG. 2. The liquid carries the medicant into solution or suspension, with shaking when necessary, to provide a freshly prepared fluid system ready for administration by injection.

Administration is made without change of devices and without exposure of the freshly prepared solution or suspension by inserting the needle into the vessel or tissue. For this purpose, the outer casing is grasped with the one hand with the needle fingers beneath the flanged portion 10. The needle is inserted and the hub is compressed to effect relative movement between the

needle 15 and the rubber sealing diaphragm 5 whereby the rearward end of the needle punctures the diaphragm to bring the end of the needle into the chamber 2 for direct communication with the freshly prepared liquid system. Thereafter, the thumb is pressed down onto the actuator which, at the end of its travel in the second tubular member, causes displacement of the second tubular member for movement as a piston through the cylindrical passage 2 of the first tubular member thereby forcibly to displace the freshly prepared liquid system from the interior of the first tubular member through the needle and into the tissue.

Upon administration of the freshly prepared solution, the entire device can be discarded.

In the modification shown in FIG. 4, the sealing disc 26 extends continuously in sealing engagement across the neck of the second tubular member but is provided with a slit 40 which maintains a sealing relationship until opened in response to the application of fluid pressure as the plug 30 is displaced forwardly through the passage 21.

It will be apparent from the foregoing that I have provided a simple disposable syringe capable of operation with one hand in which liquids and solids are maintained in separately sealed chambers and mixed immediately prior to injection by a simple operation of the device.

It will be understood that changes may be made in the details of construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. A syringe assembly for injection comprising:

inner and outer tubular members with the inner member having an outer wall to wall dimension less than the inner wall to wall dimension of the outer tubular member to enable the inner tubular member to be telescoped within the outer tubular member;

a rupturable closure sealing the forward end of the outer tubular member;

a flexible closure secured at its outer end portions to a narrow neck portion on the forward end of the inner tubular member with the central portion of said flexible closure normally extending straight across and adjacent the neck portion of the open end of the inner tubular member;

a slit in the relatively small central portion of the flexible closure which is not secured to the neck portion and which opens to provide a passage communicating the interior of the inner tubular member with the interior of the outer tubular member in response to pressure from within the inner tubular member, which flexes the central portion of the closure outwardly from its normal straight across position, and which remains in or returns to the normal straight across position to close the passage in the absence of said internal pressure;

a piston ring portion on the forward end of the inner tubular member in sliding engagement with the inner walls of the outer tubular member;

a piston plug slidably received within the inner tubular member in sealing engagement with the inner wall of the inner tubular member;

means connected to the piston plug and extending rearwardly beyond the inner tubular member for

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actuating the piston plug axially relative to the inner tubular member;

a hypodermic needle;

collapsible means on the forward end portion of the outer tubular member supporting the needle with the rearward end of said needle terminating a short distance in advance of the rupturable closure when in uncollapsed position and penetrating through the rupturable closure when in collapsed position; and

actuating means for axial displacement of the inner tubular member into the outer tubular member for displacement of fluid from within the outer tubular member.

2. A syringe as claimed in claim 1 which includes a removable cover over the needle.

3. A syringe as claimed in claim 1 in which the inner tubular member is adapted to contain a liquid carrier and in which the outer tubular member is adapted to contain a dry material to be taken up by the liquid carrier when the latter is forced from the inner tubular member into the outer tubular member in response to movement of the piston plug axially in the inner tubular member.

4. A syringe as claimed in claim 1 in which the collapsible means comprises a hub member secured at its rearward end portion onto the forward end of the outer tubular member and a forward end having an opening through which the needle extends with a flexible portion between the ends to enable displacement of the forward end between normal and collapsed position.

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5. A syringe as claimed in claim 1 in which the piston ring portion on the forward end of the inner tubular member comprises ring members of rubber-like material in sealing engagement with the outer walls of the inner tubular member and extending into sealing engagement with the inner walls of the outer tubular member.

6. A syringe as claimed in claim 1 in which the piston ring portion and flexible closure are of a unitary construction mounted onto the forward end portion of the inner tubular member.

7. A syringe as claimed in claim 1 in which the piston plug within the inner tubular member is formed of rubber-like material having circular ribs dimensioned to extend into sealing engagement with the inner walls of the inner tubular member.

8. A syringe as claimed in claim 1 wherein said means connected to the piston plug includes an elongate actuator dimensioned to exceed the length of travel of the piston plug through the inner tubular member.

9. A syringe as claimed in claim 8 in which the actuator comprises an elongate rod dimensioned to be received in telescoping relation within the inner tubular member and with means for attachment of the actuator to the piston plug.

10. A syringe as claimed in claim 1 wherein said actuating means includes flanged members extending radially outwardly from the rearward end portions of the inner and outer tubular members for use as finger grips.

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