

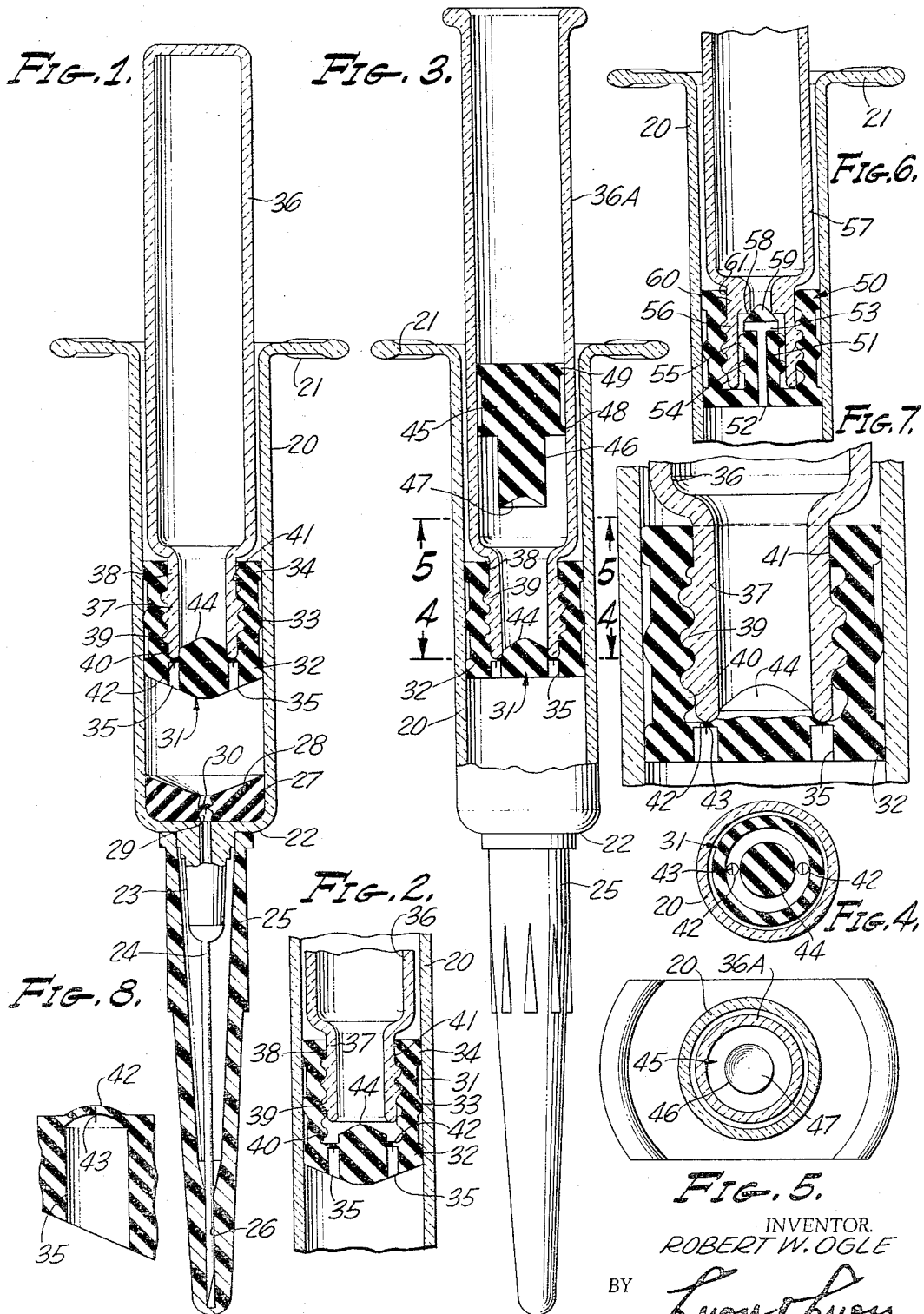
Feb. 14, 1967

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MIXING SYRINGE HAVING SEPARATE COMPARTMENTS
FOR INCOMPATIBLE MEDICAMENTS

3,303,846

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2 Sheets-Sheet 1



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Fig. 9.

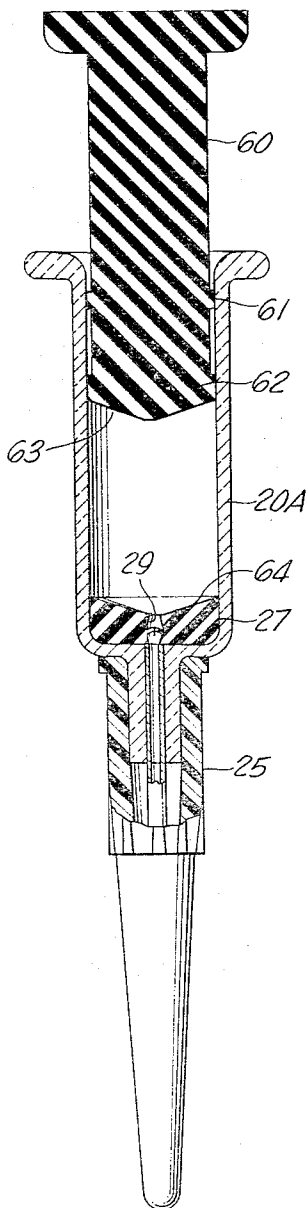


Fig. 10.

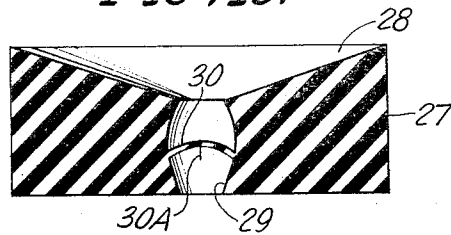


Fig. 12.

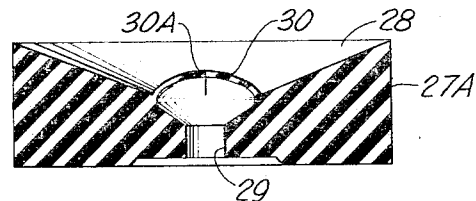
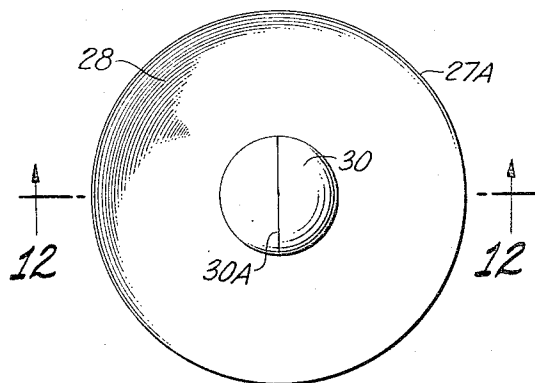


Fig. 11.



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MIXING SYRINGE HAVING SEPARATE COMPARTMENTS FOR INCOMPATIBLE MEDICAMENTS

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3 Claims. (Cl. 128—218)

This invention relates to a syringe and more particularly to a disposable syringe which is designed as a package for a medicament to be injected into a patient.

It is a feature of this invention that a valve is provided to insulate the barrel of the syringe from the needle when the instrument is not in use.

It is another feature of this invention that two vials may be provided in the barrel so that incompatible liquids may be packaged and mixed together just prior to injection or on the other hand a liquid and a dry powder may be separately packaged in the two vials for mixture just prior to use.

These and other objects, features and advantages will be apparent from the annexed specification in which:

FIGURE 1 is a central section taken through a syringe showing one embodiment of the present invention;

FIGURE 2 is a partial section of the syringe shown in FIGURE 1 showing the plunger retarded;

FIGURE 3 is a section similar to FIGURE 1 through another embodiment of the present invention;

FIGURE 4 is a section taken along the line 4—4 of FIGURE 3;

FIGURE 5 is a section taken along the line 5—5 of FIGURE 3;

FIGURE 6 is a partial central section through another embodiment of the present invention;

FIGURE 7 is an enlarged partial central section of the rubber plunger and the lower end of vial in one position;

FIGURE 8 is an enlarged fragmentary detail illustrating one of the perforated membranes used with this invention;

FIGURE 9 is a central section through a still further embodiment of the present invention;

FIGURE 10 is a section through one of the needle barrier valves;

FIGURE 11 is a plan view of one of the needle barrier valves; and

FIGURE 12 is a section taken on the line 12—12 of FIGURE 11.

Referring now more particularly to the drawings and particularly to the embodiment shown in FIGURES 1 and 2, the syringe is illustrated as including a cylindrical barrel 20 open at its upper end and provided with finger grip flange 21 and closed at its bottom end 22 and provided with a depending boss 23 through which a needle 24 extends. The needle 24 extends through the boss 23 and terminates exactly at the end of the inner wall of the end wall 22. A needle cover or sheath 25 is provided adapted to surround the needle 24 and receive the last few millimeters of the needle in a reduced hole 26 adapted to receive the end of the needle therein with a pressure fit so as to securely seal the needle. Seated on the lower end of the cylinder or barrel 20 is a needle barrier valve 27. The needle barrier valve is shown in two embodiments shown particularly in FIGURES 10, 11 and 12 and composes essentially a block of rubber or like material in the form of a round disc with a tapered concave upper end 28, a central bore 29 and a thin membrane 30 extending across the bore 29 and having a fine slit 30A formed therein as by means of a razorlike cutting tool. The membrane 30 is dome shaped as shown and may be either at the upper end of the bore 29 as shown in FIGURE 12 in

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the embodiment 27A or in the middle of the bore 29 as shown in FIGURE 10. The dome shape of membrane 30 results in a differential between the pressure required to open the slit in one direction over that required to open the slit in the other direction so that a rather large pressure is required to force fluid downwardly through the slit and a much smaller pressure is required to pass fluid upwardly as for instance in aspirating the needle.

A rubber plunger 31 generally in the form of an internally threaded rubber cylinder having a plurality of lands 32, 33 and 34 which engage the inner side of the barrel 20 and seal against the same. The lower end of the plunger 31 is tapered so as to match the taper of the upper end of the needle barrier valve so that upon actuation of the plunger all of the fluid contained in the barrel may be expelled through the needle. One or more holes 35 are formed in the plunger communicating the interior of the plunger with the lower portion of the barrel 20. A vial 36 preferably formed of glass is provided having an extension 37 which is perfectly cylindrical in a portion 38 and for the rest of the extension the vial is provided with a series of threads 39. The threads 39 are received in internal threads 40 in the plunger 31 and the plunger 31 has a perfectly cylindrical portion 41 adjacent its top to be received on the cylindrical portion 38 of the extension and form a seal therewith.

The embodiment shown in FIGURES 1 and 2 may be charged with a liquid in the space below the plunger 31 and with another liquid or a powder within the vial 36. The space below the plunger 31 will be sealed. This occurs as follows. Adjacent the top of each of the holes 35 is a membrane similar to the membrane 30 in the needle barrier valve and illustrated particularly in FIGURE 8 wherein the numeral 42 indicates the membrane and the numeral 43 indicates the thin slit which is cut in the membrane. The lower end of the extension 37 is aligned with and covers the holes 35 and the slit 43 when the vial 36 is screwed into the stopper 31 the full distance. However, by backing off the vial as shown in FIGURE 2 the holes 35 and slits 43 are uncovered. The backing off of the threads not only uncovers the holes 35 and slits 43, but also moves a hump or plug 44 from sealing engagement to the end and inner surface of the extension 37 while a seal is maintained on the cylindrical portion 38 and the cylindrical portion 41 of the plunger 31. Thereafter pressing the vial downwardly in the barrel will cause the fluid in the lower end of the barrel to pass upwardly into the vial where it can mix with the other fluid or the powder with which it is desired to mix. When the fluids or fluid and powder are satisfactorily mixed the operator will withdraw the vial 36 which will cause the mixture to pass downwardly through the holes 35 and into the space below the plunger 31 due to the compressed air in the vial 36. Thereafter the vial is screwed downward so as to close and seal the holes 35 and slits 43 and the needle cover or sheath 25 is removed. Thereafter the plunger may be pressed down to aspirate the needle or to inject the medicament into the patient. The interior of the plunger 31 is provided with an upwardly extending hump 44 which together with the inner wall of the threaded portion of extension 37 of the vial 36 forms an additional seal.

Referring now more particularly to the embodiment of the invention shown in FIGURE 3, all of the parts are formed as shown in FIGURE 1 with the exception that the vial 36 is replaced by an open ended cylinder 36A and there is contained within the vial 36A a floating pressure member 45 in the form of a rubber plug having a downwardly extending boss 46 dished in its end 47 to fit the hump 44. The member 45 has a pair of outwardly extending lands 48 and 49 to seal against the inner wall of the member 36A.

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The operation of the embodiment shown in FIGURE 3 is the same as that of FIGURES 1 and 2 with the exception that upon the backing off of the threads of the vial 36A to open the openings 35 and the slits 43 and the depressing of the plunger so fluid will pass into the space below the floating member 45. Thus, again a fluid may be stored below the plunger 31 and also below the floating member 45 or a powder may be stored below the floating member 45 and the two of them mixed as indicated. When it is desired to inject the mixture the vial is pulled back to cause the mixture to be withdrawn into the space below the plunger. The threads are then made up tight to seal the openings 35 and slits 43 and thereafter the plunger may be depressed to either aspirate or inject.

Referring now more particularly to the embodiment shown in FIGURE 6, there is employed a rubber plunger 50 generally similar to the plunger 31, but having a centrally disposed upstanding post 51 which has a central passage 52 communicating with a laterally extending passage 53. Lands 54 and 55 are provided on the post 51 to seal the post to the inner walls of the extension 56 of the vial 57. Extension 56 is provided with inwardly extending annular member forming a shoulder 58 which engages a conical end on the upstanding post 51 and forms an additional seal. It will be appreciated that in this embodiment when the screws are made up completely the vial 57 is sealed from the space below the plunger by the lands 54 and 55, the internal cylindrical portion 60 of the rubber plunger and the mating cylindrical portion 61 of the extension 56 as well as the shoulder 58 engaging the conical shaped tip 59.

When it is desired to use the device the threads are backed off thus opening passage 52 and 53 to pass liquid into the vial 57 when the plunger is depressed. When the liquids or liquid and powder have been suitably mixed the plunger is withdrawn allowing the mixture to pass downward into the space below the plunger 50. The threads are then made up sealing the passages and the syringe is in condition to be used either to inject or aspirate.

Referring now more particularly to the embodiment shown in FIGURE 9, there is there disclosed a simplified syringe having a barrel 20A, a needle barrier valve 27 similar to either of those heretofore disclosed having an upwardly facing concave surface 64. A unitary rubber plunger 60 is provided having a pair of lands 61 and 62 to seal against the inner wall of the barrel 20A and a tapered end 63 adapted to mate with the concave upper surface of the needle barrier valve 27.

As heretofore described the needle barrier valve functions because of the resilient nature thereof to close off and separate the space below the plunger from the needle and prevent any liquid in that space from contacting the metallic needle as there are many fluids which are incompatible with metal over any period of time. However, because of the slit the fluid can be pressed through the valve when sufficient force is applied, but the resiliency of the valve is sufficient to hold the fluid away from the needle under the mere force of gravity or varying forces due to changes in climatic conditions or acceleration or deceleration.

While there has been described what are at present considered preferred embodiments of the present invention, it will be appreciated by those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention and it is intended herein to cover all such changes and modifications as come within the true spirit and scope of the appended claims.

I claim:

1. A syringe comprising a barrel; an extension on said barrel; a needle mounted in said extension and communicating with said barrel; a needle cover connected to said extension and covering said needle and sealing the open end thereof; a resilient plunger mounted in said barrel for reciprocation longitudinally thereof; said plunger having a central opening therein having female threads

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extending for a portion of the length of said opening; connected to said plunger a generally cylindrical vial having male threads on the open end thereof which mate with said female threads; said resilient plunger having at least one passage therein adapted to communicate said barrel and said vial, the upper end of said passage being sealed by the end of said vial when said threads are made up; said passage being spanned by a thin resilient membrane having a narrow slit therein normally held closed by the resilient material.

2. A syringe comprising a barrel; an extension on said barrel; a needle mounted in said extension and communicating with said barrel; a needle cover connection to said extension and covering said needle and sealing the open end thereof; a resilient plunger mounted in said barrel for reciprocation longitudinally thereof; said plunger having a central opening therein having female threads extending for a portion of the length of said opening; connected to said plunger a generally cylindrical vial having male threads on the open end thereof which mate with said female threads; said resilient plunger having at least one passage therein adapted to communicate said barrel and said vial, the upper end of said passage being sealed by the end of said vial when said threads are made up; said passage in said plunger being spanned by a thin resilient membrane having a narrow slit therein normally held closed by the resilient material; and a needle barrier valve mounted in said barrel between said plunger and said needle; said needle barrier valve being formed of resilient material and having a passage therein communicating said barrel and said needle, said passage in said valve being spanned by a thin resilient membrane having a narrow slit therein normally held closed by the resilient material.

3. A syringe comprising a barrel; an extension on said barrel; a needle mounted in said extension and communicating with said barrel; a needle cover connected to said extension and covering said needle and sealing the open end thereof; a resilient plunger mounted in said barrel for reciprocation longitudinally thereof; said plunger having a central opening therein having female threads extending for a portion of the length of said opening; connected to said plunger a generally cylindrical vial having male threads on the open end thereof which mate with said female threads; said resilient plunger having at least one passage therein adapted to communicate said barrel and said vial, the upper end of said passage being sealed by the end of said vial when said threads are made up; said passageway in said plunger being spanned by a thin resilient membrane having a narrow slit therein normally held closed by the resilient material; said vial being open at its outer end and having a plug therein adapted to move longitudinally thereof on movement of said plunger; and a needle barrier valve mounted in said barrel between said plunger and said needle; said needle barrier valve being formed of resilient material and having a passage therein communicating said barrel and said needle, said passage being spanned by a thin resilient membrane having a narrow slit therein normally held closed by the resilient material.

References Cited by the Examiner

UNITED STATES PATENTS

1,557,836	10/1925	Hein	128—220
1,563,627	12/1925	Hein	128—218
1,799,463	4/1931	Hein	128—220
2,577,780	12/1951	Lockhart	128—220
2,841,145	7/1958	Epps	128—218
3,052,239	9/1952	Silver et al.	128—218
3,089,490	5/1963	Goldberg	128—218
3,091,240	5/1963	McConnaughey et al.	128—218
3,255,752	6/1966	Dick	128—218

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