Feb. 28, 1961 G. K. BURKE 2,972,991

DISPOSABLE SYRINGE

Filed Oct. 1, 1958 2 Sheets-Sheet 1

FIG.1

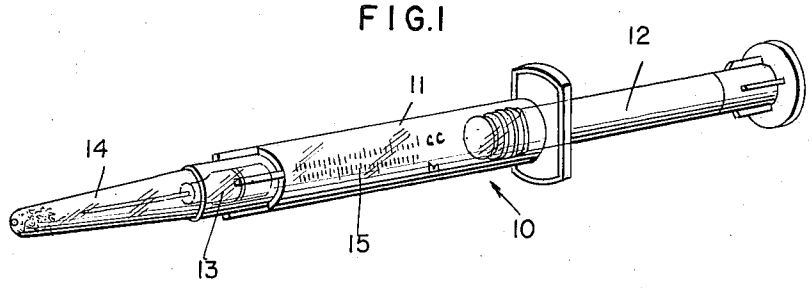


FIG.9

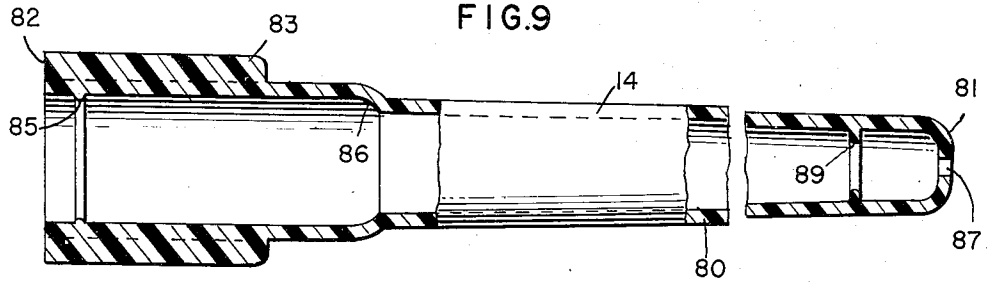


FIG.5

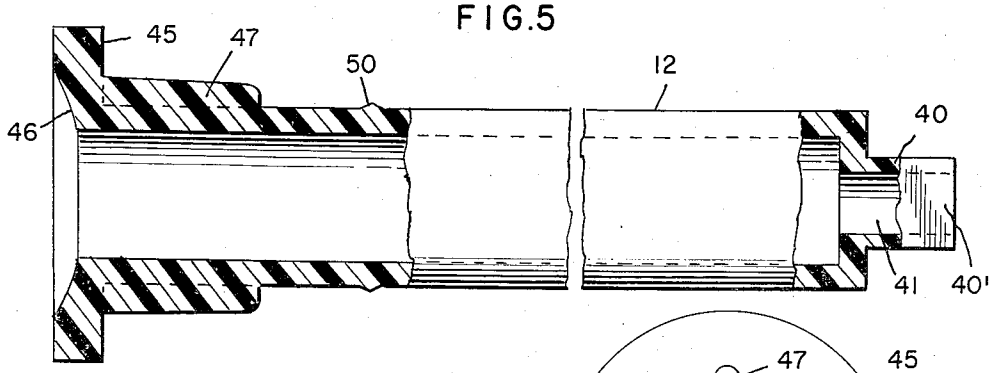


FIG.6

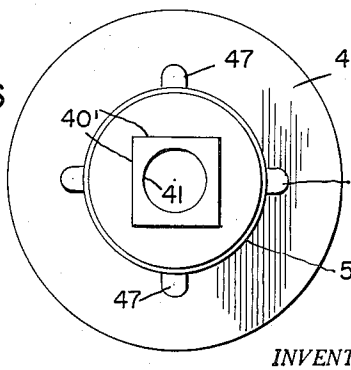
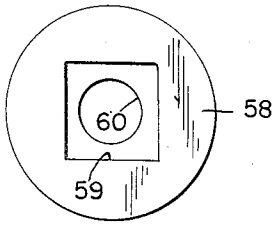


FIG.7



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2 Sheets-Sheet 2

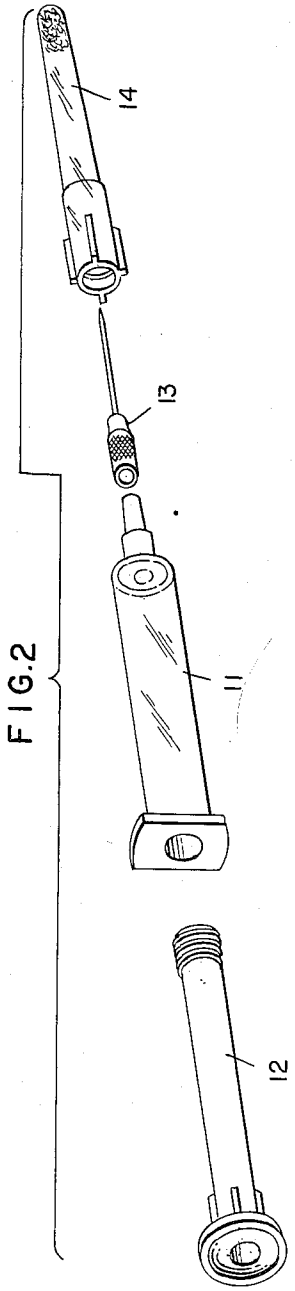

FIG.2

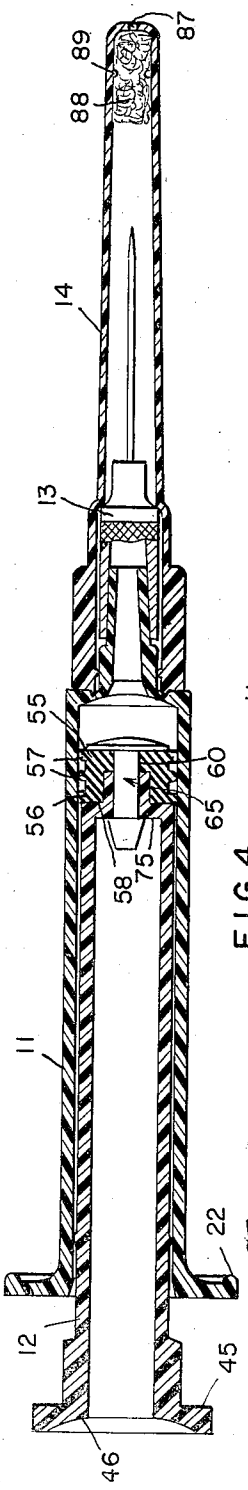

FIG.3

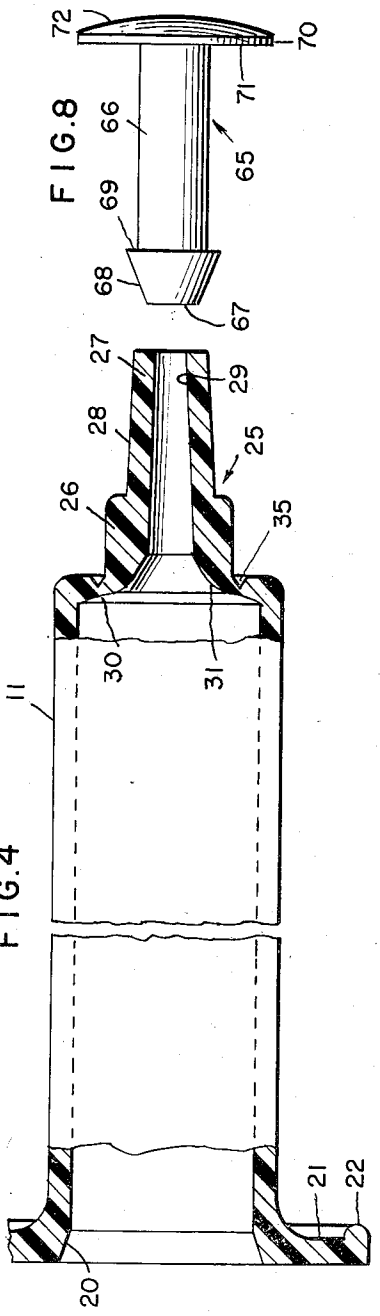

FIG.8

FIG.4

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DISPOSABLE SYRINGE

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12 Claims. (Cl. 128—218)

The present invention relates to a new and novel disposable syringe, and more particularly to a hypodermic syringe which is adapted to be used one time and then discarded.

It has been common practice for many years to employ relatively expensive hypodermic syringes and re-processing or sterilizing the needles and syringes for subsequent use. It is a primary purpose of the present invention to eliminate the use of conventional hypodermic syringes and avoiding the numerous disadvantages which have prevailed in the usage of this type of apparatus for many years.

The syringe according to the present invention is a completely disposable unit. The syringe is initially sterilized as by gas or the like and sealed in a suitable package such as transparent plastic. The components of the syringe itself are mainly plastic, the needle employed therewith being of conventional metallic construction. When it is desired to make a hypodermic injection, the package within which the sterilized unit is contained is opened, and the invention syringe is utilized for administering a dosage of suitable medicament. After this single use of the apparatus, the entire device may be discarded. This mode of operation is practical in the present case due to the fact that the construction, according to the present invention, is extremely simple and inexpensive in contrast to the hypodermic syringes which have been previously employed in the art. Accordingly, it is economically feasible to employ a new syringe for each injection, and as a matter of fact, the employment of separate units according to the present invention is actually cheaper than employing prior art type syringes and needles which must be constantly re-processed in order to give subsequent injections. The re-processing and sterilizing equipment employed in the art is in itself quite expensive, and the operation and maintenance thereof provide an additional expense such that the total cost involved is greater than that when employing the disposable syringes of the present invention.

The initial cost of this novel disposable syringe is, of course, much lower than the initial cost of conventional syringes, and the elimination of re-processing results in a substantial saving for the medicament-injection process as a whole. The employment of such a disposable syringe enables each syringe to be sterile and ready for use at all times, and yet the technique in operating the syringe is the same as with conventional syringes. The fact that the syringe is disposable also saves valuable time for hospital personnel and the one-time use of the scientifically sharpened needles assures maximum comfort for the patient. In addition, the one-time use of the syringe eliminates the danger of cross contamination and infection which often occurs when springes are used in connection with patients having communicable diseases.

An object of the present invention is the provision of a new and novel disposable syringe which is adapted to be used one time and then discarded.

Another object of the present invention is to provide

a disposable syringe which saves the time of the operator, is quite convenient to use and provides maximum comfort for the patient.

A further object of the invention is to provide a disposable syringe which eliminates the danger of cross contamination and which provides a dosage indicator which is very easy to read.

Yet another object of the invention is to provide a disposable syringe wherein the aspirated air is efficiently filtered and wherein a safety seal is provided until the plunger is withdrawn from the barrel.

A still further object of the invention is to provide a disposable syringe wherein a portion of the springe body is adapted to be broken off within the attached needle for preventing re-use of the apparatus.

Yet another object of the present invention is to provide a disposable syringe which may be quickly and easily assembled during manufacture.

A still further object of the present invention is to provide a disposable syringe which provides a solid seat for the plunger and insures complete aspiration during operation.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the accompanying specification and drawings wherein:

Fig. 1 is a perspective view of the disposable syringe according to the present invention.

Fig. 2 is an exploded perspective view of the disposable springe;

Fig. 3 is a longitudinal section of the assembled syringe;

Fig. 4 is an enlarged longitudinal section, partly broken away, of the barrel of the apparatus;

Fig. 5 is an enlarged longitudinal section, partly broken away, of the plunger;

Fig. 6 is an end view of the plunger shown in Fig. 5;

Fig. 7 is an end view of the resilient plunger ring of the device;

Fig. 8 is an elevation of the pin member; and

Fig. 9 is an enlarged longitudinal section, partly broken away, of the needle guard of the device.

Referring now to the drawings wherein like reference characters designate corresponding parts throughout the several views, there is shown in Fig. 1 a disposable syringe according to the present invention indicated generally by reference numeral **10** and including a barrel member **11**, a plunger member **12**, a hypodermic needle **13** and a needle guard **14**. The barrel member **11** is preferably formed of transparent plastic material, such as polyethylene, and a plurality of calibrations or indicia **15** are formed on the surface of the barrel for indicating the dosage.

Referring now to Fig. 4 of the drawings, barrel **11** is seen to have a substantially cyclindrical hollow configuration, a tapered opening **20** being provided at one end portion thereof and a radially extending flange **21** also being formed at said one end of the barrel terminating in a laterally extending bead **22** for strengthening the outer edge of the flange **21**. The fingers of the user are ordinarily positioned under flange portion **21** for gripping the barrel when it is desired to expel the medicament from the syringe. At the opposite end of the barrel **11**, a boss indicated generally by the reference numeral **25** is provided, the boss including an enlarged portion **26** and an integral reduced portion **27** having a tapered outer surface **28** which receives a correspondingly tapered surface formed on the inner surface of an opening in the end of a conventional hypodermic needle. An opening **29** is formed through the boss and communicates with the hollow interior of the barrel. A seat **30** is provided at the end of the interior of the barrel, seat **30** having a convex

configuration for a purpose hereinafter more fully described. It should also be noted that opening 29 fairs smoothly into seat portion 30 through the intermediary of an arcuate portion 31. This smooth rounded portion 31 insures substantially smooth flow of the fluid as it enters into the interior of the barrel from the opening through the boss, thereby preventing the creation of undesired turbulence.

An additional novel feature of the barrel member lies in the provision of a substantially annular groove 35 of substantially V-shaped cross-sectional configuration which extends completely around boss 25. It is apparent that groove 35 provides a weakened portion of the end wall of the barrel thereby permitting the end wall to be fractured and the boss to be removed from the remainder of the barrel.

Referring now to Fig. 5 of the drawings, the plunger according to the present invention is also preferably formed of a suitable plastic substance, such as polyethylene, the plunger being substantially cylindrical and of hollow configuration. Plunged 12 has a reduced end portion 40 formed at one end thereof, an opening 41 being formed through end portion 40 and in communication with the hollow interior of the plunger. The opposite end portion of the plunger is open and is provided with a radially extending flange 45 having a substantially concave depression 46 formed in the upper surface thereof. Depression 46 is of substantial dimension and is adapted to receive the thumb of an operator during normal operation.

Referring now to Fig. 6 of the drawings, the outer surface of reduced end portion 40 is of irregular shape, and in this case is shown as having four substantially equal flat sides 40', opening 41 formed through the boss being substantially cylindrical in configuration. Four spaced ribs 47 extend downwardly from the undersurface of flange 45 along the outer surface of the plunger.

Referring again to Fig. 5 of the drawings, a substantially annular V-shaped rib 50 extends circumferentially about the outer surface of plunger 12 at a point remote from the reduced end portion thereof. Rib 50 is adapted to engage the inner surface of the barrel when the device is initially assembled, and maintains a sterile seal between the plunger and the barrel after the syringe has been removed from its protective package, this sterile seal being maintained until the plunger is withdrawn from the barrel.

Referring now to Fig. 3 of the drawings, a resilient plunger ring 55 is mounted about the reduced end portion of the plunger, and is provided with a first annular radially extending rib 56 having a flat radially outward surface and two similar spaced annular ribs 57 having rounded radially outward surfaces. These ribs 56 and 57 provide an efficient seal between the end of the plunger and the barrel during operation of the device. As seen most clearly in Fig. 7, one surface 58 of the ring is provided with a substantially square-shaped recess 59, and a cylindrical opening 60 is formed through the remainder of the ring and communicates with the recess 59. Recess 59 is complementary to the reduced end portion of the plunger, and the reduced end portion of the plunger is received within the recess in the plunger ring such that the plunger ring is mounted on the end of the plunger and relative rotation therebetween is prevented.

In order to securely lock the plunger ring on the end of the plunger, a pin member indicated generally by reference numeral 65 is seen most clearly in Fig. 8 and comprises a substantially cylindrical shank portion 66 having an enlarged head portion 67 formed at one end thereof, head portion 67 having a substantially frusto-conical outer surface 68 and defining an annular shoulder 69. A flattened enlarged head portion 70 is formed at the opposite end of the pin member and has an annular shoulder 71 formed by the undersurface thereof. The outer end surface 72 of flattened head portion 70 is of convex configuration complementary to the convex configuration of seat portion 30 of the barrel, whereby the head of the pin is adapted to seat firmly and snugly within seat portion 30.

When the resilient ring is assembled upon the plunger, the square recess of the ring is first mounted upon the square reduced end portion of the plunger and then pin 65 is forced through the aligned openings in the resilient ring and the plunger, the frusto-conical surface 68 of the enlarged head 67 being slightly deformed as it passes through these openings and then snapping into place behind surface 75 within the plunger such that shoulder 69 prevents withdrawal of the pin from the plunger. The pin is also preferably formed of plastic or similar pliable material such that it is adapted to be slightly deformed. The dimensions of the shank portion 66 of the pin are such that when shoulder 69 of the pin engages surface 75 of the plunger, shoulder 71 of the flattened head of the pin will slightly compress resilient ring 55 so that the ribs 56 and 57 thereof will be forced radially outward into engagement with the inner surface of the barrel, thereby effecting a very tight seal between the end of the plunger means and the interior of the barrel.

As seen in Fig. 3, the hypodermic needle 13 is shown in mounted position upon the boss of the barrel, the hypodermic needle being surrounded and protected by the needle guard 14. Hypodermic needle 13 is of a conventional construction including an enlarged hub having a bore formed therethrough and communicating with the interior of an elongated hollow needle portion having a sharpened point at the outer end thereof. As seen most clearly in Fig. 9 of the drawings, the needle guard 14 comprises an elongated hollow member preferably formed of plastic or the like, the portion 80 of the needle guard tapering slightly downward to a closed end portion 81, the opposite end portion 82 thereof being open for mounting the needle guard on the boss of the barrel. Four equally spaced ribs 83 similar to the ribs 47 of the plunger are provided on the outer surface of the needle guard. An annular inwardly projecting rib 85 is provided adjacent the open end of the needle guard, rib 85 defining an inner diameter slightly less than that of the enlarged portion 26 of the boss for firmly mounting the needle guard upon the boss of the barrel.

A tapered seat 86 is also provided on the inner surface of the needle guard which is adapted to engage a portion of the hypodermic needle for supporting the hypodermic needle in proper operative position therein.

Formed centrally through the closed end 81 of the needle guard is an opening 87 which permits the aspiration of air into the needle guard. As seen most clearly in Fig. 3, a body of filter material 88 is disposed within the end of the needle guard adjacent opening 87, the filter material being of a suitable substance such as cotton or the like. An inwardly projecting annular rib 89 is provided adjacent opening 87 for maintaining the filter material in proper operative position. The apparatus normally will be provided in assembled position within a package with the flattened head of pin 65 seated in the cooperating seat provided in the barrel. When it is desired to utilize the device, the syringe is removed from its protective package and while holding the barrel, the plunger is twisted and withdrawn from the barrel, thereby aspirating air through the filter in the end of the needle guard. In this manner, all the air drawn into the barrel during such operation is filtered thereby substantially reducing the possibility of such air being contaminated. Rib 50 on the exterior of the plunger maintains a sterile seal with the barrel even after the syringe is removed from its protective package until the plunger is withdrawn from the barrel. The needle guard is then re-

moved from surrounding relationship with respect to the needle. The needle is then placed in a suitable medicament vial and the filtered air is expelled within the vial. It is apparent that the insertion of the filtered air within the medicament vial is far superior to the insertion of contaminated air within the medicament since this has a tendency to produce undesired production of bacteria in the medicine. The plunger is then again withdrawn from the barrel to draw medicament upwardly through the hypodermic needle and into the interior of the barrel. The dosage may be quickly and easily read by observing the position of the flattened head of the pin mounted at the end of the plunger. To facilitate easy reading of the dosage, the pin and resilient ring are preferably of different colors so as to be more readily discernible. The device may then be employed in a conventional manner for administering a dosage of medicine.

Subsequent to use, the needle may be removed from the syringe if desired simply by turning it with respect to the syringe, or if it is desired to completely discard the apparatus and to destroy the device to prevent reuse, the needle guard is replaced on the boss and grasped about the upper rib portion thereof and bent with respect to the barrel to snap off the boss portion around the weakened portion defined by groove **35**. This completely destroys the effectiveness of the barrel and will cause the jagged boss portion to be locked within the end of the needle. Except for the needle, the remaining components of the device are preferably of plastic with the exception of the resilient plunger ring **55** which may be preferably formed of rubber or other suitable resilient material. The components other than the needle may accordingly be completely incinerated to destroy them, and the needle may be disposed of in any desired manner.

It is apparent from the foregoing that there is provided a new and novel disposable syringe which is very convenient to use and which saves time in operation and provides maximum comfort for the patient. The device prevents the danger of cross contamination, and the dosage is very easy to read. A safety seal is provided between the plunger and the barrel until the plunger is removed from the barrel and the aspirated air within the device is filtered to thereby reduce the possibility of contamination of medicaments stored in vials. The apparatus includes a portion which is adapted to break off to prevent subsequent re-use of the device, and it is apparent that the entire assembly may be quickly and easily assembled during manufacture. A seat is provided within the barrel such that the end of the plunger is snugly and firmly seated and, furthermore, complete aspiration is insured by this rounded seat portion. Additionally, smooth flow of fluid within the device is assured by the provision of a snugly secured surface between the opening in the boss of the device and the seat portion of the barrel. The device is quite simple and inexpensive in construction, and yet is very efficient and reliable in operation.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. A disposable syringe which comprises a generally cylindrical hollow barrel, a substantially cylindrical hollow plunger slidably positioned within said barrel, said plunger having a reduced end portion having an irregular outer surface, a resilient plunger ring having a plurality of substantially annular rings formed on the outer surface thereof, said ring having formed in one surface thereof an irregular recess complementary to the irregular configuration of said reduced end portion and preventing relative rotation between said plunger and said plunger ring, said plunger ring also having another opening formed in the opposite surface thereof and in communication with said recess, said reduced end portion having an opening formed therethrough in communication with the hollow interior of said plunger, and pin means extending through the opening in said ring and the opening in said reduced end portion for securing said resilient plunger ring to said plunger.

2. Apparatus as defined in claim 1 including a shoulder formed on the interior of said hollow plunger, said pin having an elongate shank portion extending through said openings, a tapered head portion formed at one end of said shank portion and defining an annular shoulder cooperating with the shoulder in said plunger for retaining the pin permanently in operative position, and an enlarged head portion formed at the opposite end of said shank and engaging said plunger ring for compressing the plunger ring between said last mentioned head portion and said plunger.

3. Apparatus as defined in claim 2 wherein said last mentioned head portion of the pin has an outer end portion of arcuate configuration, said barrel having a seat portion formed at one end of the hollow interior thereof, said seat portion having an arcuate configuration complementary to that of the arcuate end portion of said last mentioned head portion.

4. Apparatus as defined in claim 1 including a circumferentially extending rib formed on the outer surface of said plunger at a point remote from said reduced end portion for engaging the inner surface of said barrel to provide a sterile seal therewith.

5. Apparatus as defined in claim 1 wherein said plunger has an enlarged radially extending end portion at the end opposite said reduced end portion, said enlarged end portion having a depression formed in the outer end thereof for receiving the thumb or finger of an operator.

6. A disposable syringe comprising a substantially cylindrical hollow transparent barrel, one end portion of said barrel being opened and the opposite end portion of said barrel including a longitudinally projecting boss connected to the cylindrical wall of the barrel by an annular wall portion, said annular wall portion including means for weakening said wall portion whereby said wall portion may be easily broken to separate the boss from the barrel, a plunger slidably mounted within said barrel, means mounted on one end of said plunger for sealing said plunger with respect to said barrel, and means on the outer surface of said plunger at a point remote from said last mentioned means for sealing said plunger with respect to said barrel.

7. Apparatus as defined in claim 6 wherein said means for sealing said one end of the plunger with respect to the barrel includes a resilient plunger ring mounted upon the end of the barrel and having a plurality of spaced annular ribs formed on the outer surface thereof, and pin means connected to said plunger and engagaing said plunger ring for compressing and expelling the plunger ring in a radial direction and securing the plunger ring permanently in operative position.

8. Apparatus as defined in claim 7 wherein said pin means has an enlarged head at one end thereof, said head having an outer convex surface, the interior of said barrel having a seat formed at one end thereof having a corresponding convex configuration for snugly receiving the convex surface of said head.

9. A disposable syringe comprising a substantially cylindrical hollow transparent barrel having an open end and a surrounding flange formed thereat, the opposite end of said barrel including an end wall having a longitudinally projecting boss formed integral therewith, said boss having an opening formed therethrough in com-

munication with the hollow interior of said barrel, a hollow substantially cylindrical plunger slidably mounted in said barrel, a resilient plunger ring mounted at one end of said plunger, means preventing relative rotation between said plunger ring and said plunger, pin means securing said plunger ring in operative position, means for sealing said plunger with respect to said barrel at a point remote from said plunger ring, the end wall of said barrel having a weakened portion for facilitating fracture if the end wall and removal of the boss, said boss being adapted to receive a hypodermic needle, an elongated hollow needle guard having an open end portion mounted on said boss, the opposite end portion of said needle guard being closed and having an opening formed therethrough, and filter means disposed within said needle guard adjacent the opening in the closed end thereof for filtering air aspirated into said filter guard.

10. Apparatus as defined in claim 9 including indicia formed on said barrel, said pin means having a flattened head portion formed on the outer end thereof, said head portion and said plunger ring being of different colors for permitting instant direct reading of dosage.

11. Apparatus as defined in claim 9 wherein said pin means has a flattened head formed at the outer end thereof, said head having a convex outer surface, the end wall of said barrel having a complementary convex surface formed therein for receiving the convex surface of said head, said opening through the boss fairing snugly into said convex surface.

12. A disposable syringe which comprises a hollow barrel, a plunger slidably disposed within said barrel, a resilient plunger ring mounted around one end of said plunger, and a pin member attached to said plunger for securing said plunger ring in operative position, said one end of the plunger being of reduced size, said plunger being hollow, said one end of the plunger having an opening formed therethrough in communication with the hollow interior of the plunger, the hollow interior of said plunger defining a shoulder, said pin member having enlarged head portions at opposite ends thereof, one of said head portions engaging said shoulder, and the other of said head portions engaging said plunger ring.

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