

Nov. 14, 1961

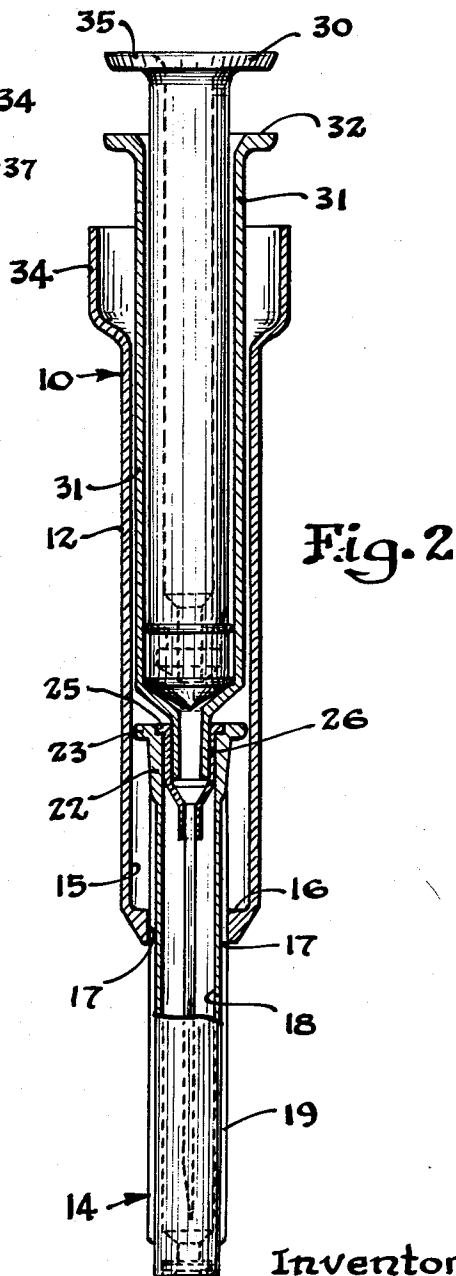
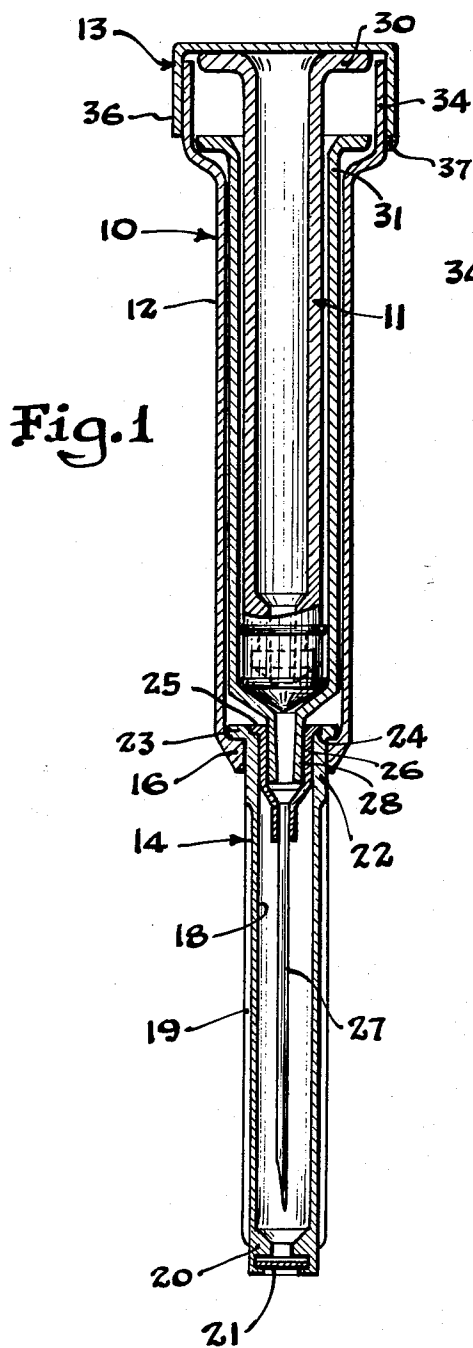
Z. M. ROEHR ET AL

3,008,570

EJECTOR PACKAGE

Filed March 30, 1960

2 Sheets-Sheet 1



Inventors
Zbislav M. Roehr
John L. Higgins
George Trapper
August J. Schildbach
By Davis, Lindsey, Hilborn & Hayes
Attorneys

Nov. 14, 1961

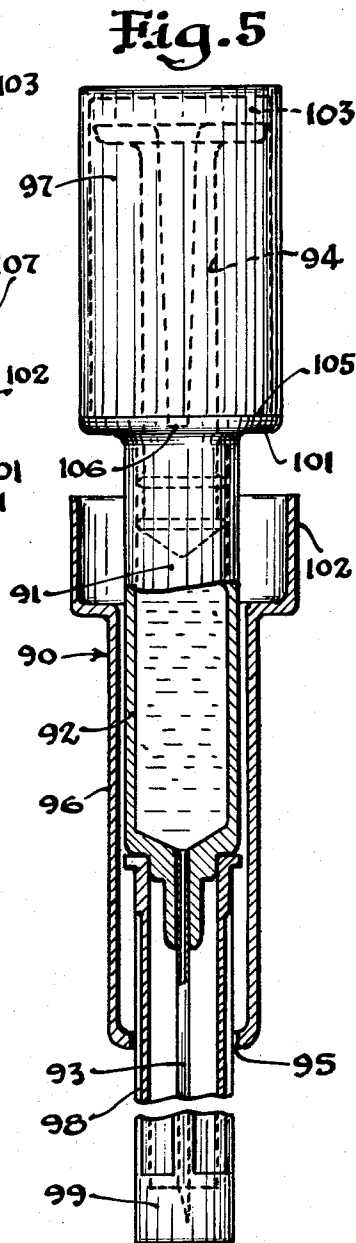
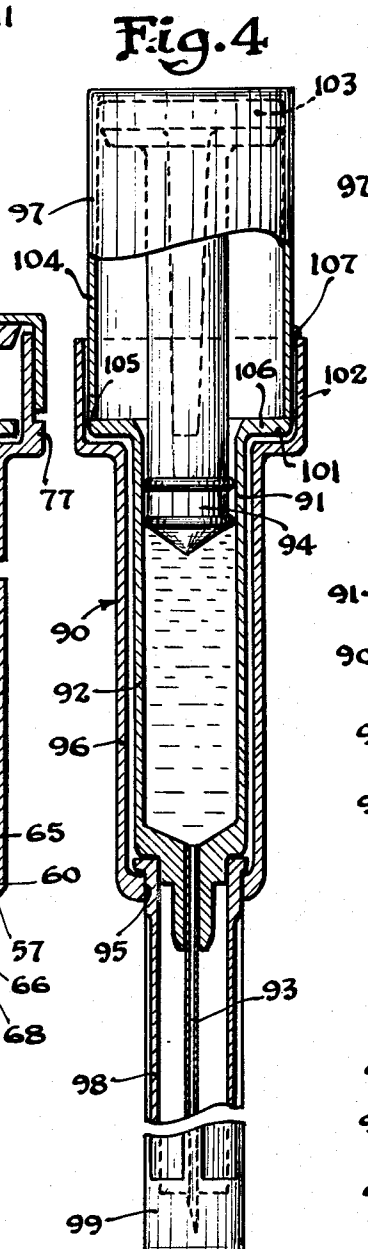
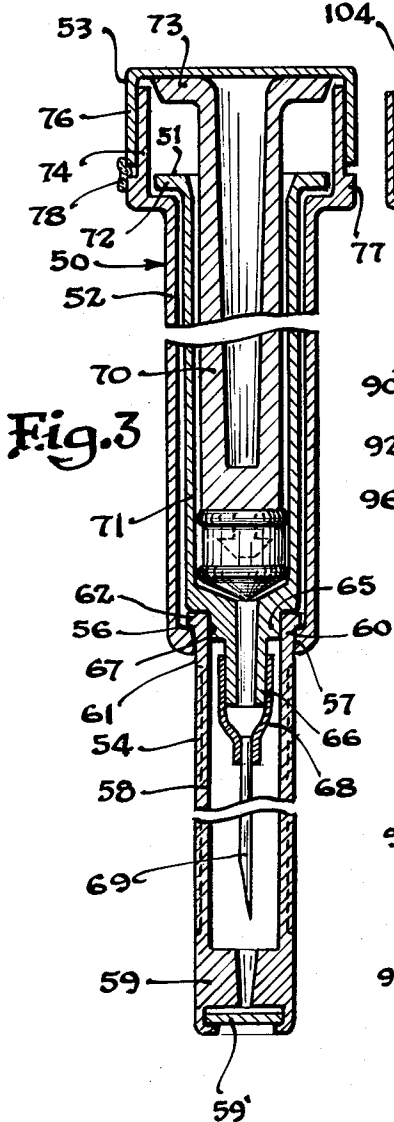
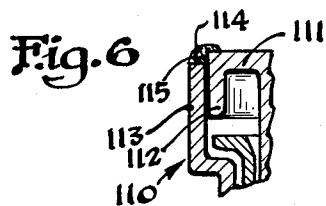
Z. M. ROEHR ET AL

3,008,570

EJECTOR PACKAGE

Filed March 30, 1960

2 Sheets-Sheet 2



Inventors
 Zbislav M. Roehr
 John L. Higgins
 George Trapper
 August J. Schildbach
 By Davis, Lindsey, Hitten & Noyes
 Attorneys

1

3,008,570

EJECTOR PACKAGE

Zbislav M. Roehr, Deland, and John L. Higgins, Daytona Beach, Fla., and George Trapper, Bethlehem, Conn., and August J. Schildbach, Daytona Beach, Fla., assignors, by mesne assignments, to Brunswick Corporation, Chicago, Ill., a corporation of Delaware
Filed Mar. 30, 1960, Ser. No. 18,719
13 Claims. (Cl. 206—43)

The present invention relates generally to a package for an article and more particularly, to an ejector package for clinical apparatus or other equipment which must be maintained in an essentially uncontaminated or sterile condition.

It is common practice in many hospitals and other institutions to administer parenteral drugs by means of hypodermic syringes which are discarded after a single use thereof. The disposable hypodermic syringes are generally sterilized by the pharmaceutical manufacturer or equipment supplier, and thereafter must be maintained in a sterile condition until used. Frequently the sterile disposable syringe is packaged by sealably enclosing in a cellophane envelope or other plastic film package which is impervious to bacteria. The packaging of sterile syringes in cellophane envelopes is objectionable, however, as the cellophane becomes embrittled by age and thereafter readily develops cracks with the consequent loss of sterility. Cellophane envelopes and other plastic film packages also are prone to have unnoticed punctures and small openings therein which permit the entry of bacteria. The film packages also fail to protect an enclosed syringe against crushing or other physical damage and often require the use of shears or other tools to open the package. It will thus be evident that a plastic film envelope does not provide the most desirable package for an article which must be maintained in an essentially uncontaminated or sterile condition.

Rigid plastic containers which are adapted to receive an individual hypodermic syringe have also been devised, as shown in U.S. Patents Nos. 2,812,231 and 2,884,123. And, while certain of these rigid containers protect a syringe against bacterial contamination, crushing and other physical damage while the syringe remains in the container, the hypodermic syringe or other article contained therein cannot be rapidly and conveniently removed therefrom without danger of contaminating the syringe. Moreover, when a syringe having a hypodermic needle mounted thereon is removed from the foregoing container, it must be handled with extreme care to avoid contamination of the exposed needle cannula. If, prior to packaging, a protective sheath is mounted on the syringe so that the needle will be enclosed when it is removed from the container, an additional part is required. This is particularly objectionable with a rigid container, since the container must be substantially enlarged to accommodate the sheath, thus further adding to the cost of packaging.

It is, therefore, an object of the present invention to provide an improved package for an article of manufacture which offers increased protection to the article contained therein.

It is a further object of the present invention to provide a more economical package for an article of manufacture which maintains an article placed therein in a substantially uncontaminated condition.

It is another object of the present invention to provide a very inexpensive package which protects the article contained thereon against physical damage.

It is a further important object of the present invention to provide an improved package for an article which

2

permits rapid and more convenient ejection of the article from the package.

It is still another object of the present invention to provide a protective package for a sterilized article which permits ejection thereof with a minimum exposure of the article to bacterial contamination.

It is also an object of the present invention to provide an ejector package for an article of manufacture which continues to protect a portion of the article against damage after ejection from the package.

It is a further object of the present invention to provide an improved ejector package which is tamper-proof.

It is also a specific object of the present invention to provide a more convenient and more economical ejector package for a hypodermic syringe.

It is a further specific object of the present invention to provide a more economical medicinal-containing hypodermic syringe package for substantially prolonging the shelf-life of the package.

It is still another specific object of the present invention to provide a package for a hypodermic syringe which permits rapid and convenient ejection of the syringe with a minimum exposure thereof to contamination.

It is an additional specific object of the present invention to provide an improved package for sealably enclosing a hypodermic needle-syringe assembly to protect the assembly against contamination by airborne bacteria and which continues to sealably enclose the hypodermic needle portion of the assembly after the said assembly is ejected from the package.

It is still another specific object of the present invention to provide a more economical ejector package for a sterile hypodermic syringe containing a medicament which protects the plunger against being accidentally moved and discharging the medicament during both storage and ejection of the syringe from the package.

Other objects of the invention will be apparent to those skilled in the art, from the detailed description and claims to follow.

The foregoing objects of the present invention and other objects which will be apparent to those skilled in the art are readily achieved by providing a main body section or sleeve member which is open at both ends, having a removable closure means disposed at one end of the sleeve with a reciprocable closure member detachably secured in the other end of the sleeve but which is restrained against moving outwardly through the said other end of the sleeve. The reciprocable closure member, however, is movable within the sleeve toward and out said one end of the said sleeve and is adapted to supportingly engage an article disposed within the said sleeve to eject the said article through said one end of the sleeve when sufficient pressure is applied to the closure member to move the closure member toward said one end of the sleeve. And, since the closure member is adapted to remain in protective engagement with at least a portion of the article when the article is ejected from the sleeve, the closure member continues to protect the article even after removal thereof from the container sleeve. Thus, the package structure serves a dual purpose by providing a very convenient, safe and economical protective package for an article while the article remains therein and, after ejection of the article therefrom, a part of the package structure continues to provide protection for a portion of the article. In addition to having an end of the container sleeve preferably sealably closed against the entry of airborne bacteria or the like contamination by a reciprocable closure member, another end of the container sleeve is also provided with a removable closure means, such as a closure cap or sealing strip which also preferably pre-

vents the entry of airborne bacteria. The removable closure means can be further provided with a frangible seal which must be broken before the bacterial seal is broken or the article removed from the container sleeve, thereby providing assurance that there has been no bacterial contamination and that the article has not been tampered with subsequent to original packaging.

The present invention will be best understood by reference to the following detailed description when read in conjunction with the accompanying drawing illustrating several forms of the invention and wherein:

FIGURE 1 is a vertical sectional view of a hypodermic syringe disposed in a package embodying the present invention;

FIG. 2 is a vertical sectional view partially in side elevation showing the container of FIGURE 1 with the syringe in partially ejected position;

FIG. 3 is a vertical sectional view showing a modified form of the present invention;

FIG. 4 is a vertical sectional view partially in side elevation showing a further modified form of the present invention;

FIG. 5 is a vertical sectional view partially in side elevation showing the package of FIG. 4 with the syringe in partially ejected position; and

FIG. 6 is a fragmentary view of a modified form of an upper closure means for a package of the present invention.

In the embodiment of the present invention shown in FIGS. 1 and 2 of the drawing, a container or package assembly 10 for a hypodermic syringe 11 or other article which preferably must be maintained in an essentially uncontaminated or sterile condition is formed of a generally hollow cylindrical sleeve or main body section 12 which is closed at the upper end against contamination with airborne bacteria or the like by a removable closure cap 13 and is closed at the lower end by an elongated hollow cylindrical reciprocable closure member 14 which is adapted to be sealably mounted in the lower end of the sleeve 12, and is also adapted to be movable vertically within the cylindrical bore 15 of the sleeve 12. The lower end of the sleeve 12 is further provided with an inner tapered bore forming an inwardly extending shoulder 16 and a slightly tapered axial opening 17. The sleeve 12 is preferably made of a form-retaining plastic material which is somewhat resilient in thin sections, such as polyethylene.

The elongated lower closure member 14 is adapted to be sealably mounted in the axial opening 17 and is formed with spaced inner walls 18. The external surface of the closure member 14 is preferably provided with a plurality of longitudinally extending ribs 19 to facilitate manipulation thereof. The outer end section 20 of the closure member 14 is preferably provided with a fibrous filter disk 21 which prevents the passage therethrough of airborne bacteria while permitting the entry of air free of bacteria.

The upper end of the closure member 14 is provided with a gradually outwardly tapered exterior wall section 22 which is adapted to form a sealing engagement with the tapered lateral surface of the opening 17 of the sleeve 12. A laterally extending flange 23 is formed at the upper end of the tapered section 22. The flange 23 and the wall section 18 have a maximum diameter which permits longitudinal movement upwardly, and out through the upper end of the sleeve 12. The flange 23 is adapted to engage the shoulder 16 at the lower end of the sleeve when the closure 14 is moved downwardly in the opening 17, thereby preventing the closure member 14 being separated from the sleeve 12 by being moved downwardly through the opening 17. The flange 23 can, if desired, have a sufficiently large diameter to frictionally and slidably engage the inner surface of the sleeve 12 so that the closure member 14 will remain in

any longitudinal position within the sleeve 12 to which it is moved.

The upper end of the closure member 14 has an interior diameter which frictionally engages the outer surface of the hub 26 of the hypodermic needle which is mounted on the discharge outlet 28 of the syringe 11 and forms a bacterial seal around the hub 26. The transverse end wall of the closure member 14 is also provided with an annular recess 24 which is adapted to receive the lateral extending flange 25 formed on the needle hub 26.

It will be evident that any upward axial force applied to the closure member 14 will tend to force the hub 26 more tightly onto the outlet 28 of the syringe 11. And, since the closure member 14 remains frictionally held on the hub 26 when the tapered section 22 of the closure 14 is disengaged from the opening 17 of the sleeve 12 when the closure member 14 is moved upwardly through the upper end of the sleeve 12, the closure member 14 remains sealably mounted on the hypodermic needle of the syringe when the latter is removed from the sleeve 12. Thus, the closure member 14 serves as protective sheath for the hypodermic needle 26 after the syringe is removed from the sleeve 12.

When the syringe 11 with the needle 26 sealably enclosed by member 14 is sealably mounted in the opening 17 of the sleeve 12, the piston 30 which is operatively mounted in the syringe barrel 31 and the finger grip section 32 integrally formed with the syringe barrel 31 are substantially enclosed within an enlarged end section 34 formed at the upper end of the sleeve 12. The outer transverse surface 35 of the piston 30 lies in about the transverse plane of the outer end of the syringe barrel 31 and preferably extends slightly above section 34.

With the syringe 11 fully seated within the sleeve 12 as above described, the removable closure cap 13 is mounted over the enlarged upper end section 34 of the sleeve 12 enclosing the piston 30. The lateral wall surface 36 of the cap 13 frictionally engages the outer lateral surface of the enlarged section 34 of the sleeve 12 forming a seal against the entry of airborne bacteria into the interior of the sleeve 12. It is also preferred to provide a frangible seal 37 between the lower edge of the lateral wall 36 of the cap 13 and the outer surface of the enlarged section 34 so that the bacterial seal cannot be broken and the cap 13 cannot be removed from the sleeve 12 without breaking the frangible seal 37. In this manner, a tamper-proof package is provided which guarantees the original sterility and that the syringe has not been removed from the package since leaving the manufacturer's plant.

In assembling the complete package, one simple procedure which can be used is to first assemble the syringe by fully inserting the piston 30 into the syringe barrel 31 and mounting securely the needle hub 26 with a cannula 27 on the discharge outlet 28 of the syringe 11. The lower closure member 14 of the package 10 is then mounted on the needle hub 26 with the flange 25 of the needle in seating engagement with the recess 24 formed in the transverse upper end wall of the closure member 14. The syringe assembly with the closure member 14 mounted therein is then inserted into the sleeve 12 through the enlarged upper end section 34 with the end section 20 of the closure member 14 extending outwardly through the axial opening 17 of the sleeve 12. The tapered wall section 22 is brought into sealing engagement with the inner lateral surface of the opening 17 by applying axial pressure downwardly on the end of the piston 30. Further movement of the syringe and closure member assembly outwardly through the opening 17 is prevented by the flange 23 of the closure member 14 engaging the shoulder 16 of the sleeve 12. The closure cap 13 is then placed over the end of the enlarged section 34 of the sleeve 12 with the inner surface of cap 13 engaging the transverse surface 35. A frangible seal 37 is formed between the cap 13 and the section 34, as by applying

heat to fusibly join the said parts, to insure member 14 remaining sealably engaged in the opening 17.

When it is desired to remove the syringe 11 from the package 10 shown in FIGS. 1 and 2, the sleeve 12 is grasped between the fingers and thumb of one hand and the lower or outer end of the closure member 14 is gently tapped against a support surface or other convenient object to break the frangible seal 37. When continued pressure is applied to the end of the closure member 14, the tapered section 22 at the upper end thereof is moved out of sealing engagement with the opening 17 of the sleeve 12 and the syringe 11 is simultaneously moved upwardly as the closure member 14 applies pressure to the hub 26 (see FIG. 2). When the closure member 14 is moved substantially into the interior of the sleeve 12, the barrel section 31 of the syringe 11 is ejected sufficiently from the upper end of the sleeve 12 to permit conveniently withdrawing the syringe 11 from the sleeve 12 with the closure member 14 remaining sealably mounted on and protectively enclosing the needle cannula 27. The closure member 14 is allowed to remain mounted on the needle hub 26 to protect the needle cannula 27 against contamination until a charge of medicament is to be drawn into the syringe. Thereafter, the closure member 14 can be replaced on the needle hub 26 until the medicament is to be administered.

After administration, the syringe 11 with the hypodermic needle thereon and the closure member 14 mounted on the needle hub 26 can be reinserted as a unit into the sleeve 12 and the cap 13 replaced over the enlarged section 34 to completely enclose the syringe 11 and the needle cannula 27. It will thus be evident that the package of the present invention also provides a very convenient, inexpensive and safe means of disposing of a single-use disposable syringe and hypodermic needle.

In the modified form of the invention shown in FIGS. 3 and 4, the package assembly 50 adapted to contain a hypodermic syringe 51 therein is formed of a generally hollow cylindrical main body section or sleeve 52 which is closed against bacterial contamination by airborne bacteria at the upper end by a removable closed cap 53 and at the lower end by an elongated reciprocable closure member 54 sealably mounted in the lower end of the sleeve 52. The lower end of the sleeve 52 is provided with an inward extending shoulder 56 and a slightly tapering axial opening 57 at the lower end of the sleeve 52.

The reciprocable closure member 54 is adapted to be sealably mounted in the axial opening 57 of the sleeve 52 and is formed with a cylindrical lateral wall section 58 and an outer end section 59 both having an exterior diameter not substantially larger than the opening 57 in the sleeve 52 to permit the closure member 54 being moved reciprocably in the opening 57. The end section 59 is provided with a fibrous filter disk 59' closing the passageway in the end section 59 against the entry of airborne bacteria.

The upper end portion 60 of the closure member 54 is provided with a gradually tapered wall section 61 which is adapted to form a sealing engagement with the lateral surface of the opening 57. A laterally extending flange 62 is formed at the extreme upper end of the tapered wall section 61. The flange 62 has a maximum diameter such that it is slidably within the sleeve 52 and permits the closure member 54 being moved upwardly and out of the sleeve 52. The flange 62, however, has a diameter larger than the diameter of the opening 57 and prevents the closure member 54 being entirely separated from the sleeve 52 by moving downwardly within the opening 57 of the sleeve 52, since the flange 62 moves into restraining engagement with the shoulder 56 at the lower end of the sleeve 52 preventing further outwardly movement thereof. If desired, the flange 62 can be provided with a diameter such that it frictionally but slidably engages the inner surface of the sleeve 52 and will be held

in any given position within the barrel 52 until further pressure is applied to move the member 54 axially therein.

The upper end section 60 of the closure member 54 has end section 67 with an interior diameter such that it frictionally and sealably engages the outer surface of the mounting post 65 formed on the syringe 51 above the tapered discharge outlet 66 on which the hypodermic needle hub 68 is mounted. The closure member 54 thus engages the post 65 of the syringe 51 and sealably encloses the hypodermic needle 69 without, however, engaging the said hub 68.

Since the closure member 54 remains frictionally and sealably engaged with the syringe 51 when the closure member 54 and the syringe 51 are moved upwardly within the sleeve 52 and out the upper end thereof, it is apparent that the closure member 54 also serves as a protective sheath for the hypodermic needle cannula 69 after the syringe 51 is removed from the sleeve 52.

When the syringe 51 is fully seated within the sleeve 52, the lower surface of the flange 62 is in engagement with shoulder 56 of the sleeve 52 and the lower edge of the syringe barrel section 71 is in engagement with the upper edge of flange 62. The piston 70 is also fully inserted in the syringe barrel 71 with the outer end 73 of the piston 70 and the finger grip section 72 of the syringe barrel 71 seated within an enlarged end section 74 of the sleeve 52. The outer end surface of the piston 70 preferably lies in about the plane of the outer end of the sleeve 52 or slightly above the sleeve 52 when the syringe 51 is fully seated in the sleeve 52. With the parts thus assembled, the end closure cap 53 is mounted over the end of the sleeve 52 with the lateral wall section 76 thereof frictionally engaging the sleeve 52 to form a bacterial seal therewith and having the lower edge of the lateral wall section 76 adjacent a stop shoulder 77 formed on the outer surface of the sleeve 52. It is also preferred to provide frangible seal 78 between the wall section 76 and the shoulder 77, so that the cap 53 cannot be removed without breaking the seal 78.

The several parts of the package 50 are assembled in substantially the same manner as for the embodiment shown in FIGS. 1 and 2. Thus, the piston 70 is inserted fully in the barrel of the syringe 51 and the hypodermic needle 69 is mounted on the tapered outlet 66 with the closure member 54 securely mounted on the tapered post 65 of the syringe 51. The syringe 51 and closure member 54 thus assembled is inserted into enlarged end section 74 of the sleeve 52 with the closure member 54 extending outwardly through the tapered axial opening 57. The tapered wall section 61 is brought into sealing engagement with the tapered axial opening 57 by applying pressure to the upper end of the piston 70 until the upper surface of the piston 70 lies about in the plane of the upper end of the sleeve 52. The cap 53 is then placed over the end of the piston 70 and sleeve 52 and a frangible seal 78 formed between the cap 53 and sleeve 52.

When removing the syringe 51 from the package 50 substantially the same procedure is followed as with the embodiment shown in FIGS. 1 and 2 of the drawing, and the sleeve 52 is grasped between the fingers and thumb of one hand and the outer end 59 of the closure member 54 is tapped against a convenient object to break the frangible seal 78. If preferred, the cap 53 can be grasped with the fingers of the other hand and twisted to break the seal 78 and the cap 53 is then withdrawn. When pressure is applied to the outer end 59 of the closure member 54 as by holding the sleeve 52 and pressing downwardly with the end of the closure member 54 contactly a non-yielding surface, the closure member 54 is moved upwardly into the interior of the sleeve 52 and simultaneously the syringe is moved upwardly and out of the upper end of the sleeve 52, since the upper end of the closure member 54 is in direct and fully supporting engagement with the syringe 51. The syringe 51

which projects from the upper end of the sleeve 52 is then withdrawn from the sleeve 52 with the closure member 54 remaining securely mounted on the syringe 51 and sealably enclosing the cannula 69 so as to protect it against contamination by airborne bacteria. The syringe 51 having the closure member 54 secured thereto is used in any of the conventional ways of the hypodermic syringe having a protection sheath mounted thereon and encloses the hypodermic needle. When the user is ready to discard the syringe, the package 50 can also be used to enclose the used syringe by following the same procedure for assembly of the package 50 described heretofore.

In the still further modified form of the present invention shown in FIGS. 4 and 5, the package 90 is adapted to contain a hypodermic syringe 91 having a medicament within the barrel section 92 thereof and sealably enclosed between the cannula 93 and the forward end of the piston 94 which is mounted in a retracted position in the upper end of the said barrel section 92. As in the previously described embodiments of the invention, the package 90 is comprises of a generally hollow cylindrical main body section or sleeve 96 which is closed against bacterial contamination at the upper end by a removable closure cap 97 and at the lower end by an elongated reciprocable closure member 98 sealably and slidably mounted in the sleeve 96. The structure and operation of the closure member 98, the sleeve 96 and the syringe 91 correspond precisely with that of the closure member 54, the sleeve 52 and the syringe 51, respectively. Since the syringe barrel section 92 contains a medicament, the cannula 93 is sealably imbedded in the lower end section 99 of the closure member 98 to prevent escape of medicament from the syringe.

When the medicament-containing syringe 91 having the closure member 98 mounted thereon and with the cannula 93 imbedded therein is inserted into the sleeve 96, the closure member 98 extends through the opening 95 in the lower end of the sleeve 96 and forms a sealing engagement therewith, precisely as in the previously described embodiment. With the syringe barrel section 92 fully inserted in the sleeve 96, the finger-grip portion 101 at the upper end thereof is seated in the enlarged section 102 which comprises the upper end of the sleeve 96 and is freely movable in the section 102. Since the piston 94 is in a retracted position, the outer end section 103 thereof extends considerably above the end of the barrel section 92. An upper closure cap 97 is mounted over and spaced slightly from the outer end 103 of the piston 94 and has the cylindrical wall section 104 thereof inserted within the cylindrical enlarged section 102 of the sleeve 96 forming a sealing engagement therein to prevent entry of airborne bacteria. The lower edge of the cap 105 rests on the upper transverse surface 106 of the finger-grip portion 101 of the syringe 91. A frangible seal 107 is preferably formed between the upper edge of the sleeve section 102 and the contiguous lateral surface portion of the cap 104. It will be evident that the cap 104 prevents bacteria entering the upper end of the package 90 and also avoids application of pressure to the end of the piston 94.

When it is desired to remove the syringe 91 from its package, the sleeve 96 is held between the fingers of one hand and the lower end 99 of the closure member 98 is tapped against a stationary surface in order to break the frangible seal 107. Continued pressure on the end of the closure member 98 forces the syringe 91 upwardly and outwardly of the sleeve 96 sufficiently to enable the barrel section 92 being grasped so the syringe 91 can be withdrawn from the sleeve 96 (see FIG. 5). Since the cap 97 rests on the upper edge surface 106 of the syringe barrel 92, the upwardly movement of the syringe barrel 92 does not exert any pressure on the piston 94. The closure member 98 remains sealably mounted on the end of the syringe 91 and sealably encloses the cannula 93 after the syringe 91 is withdrawn from the sleeve 96. The en-

closure member 98 thus serves as a protective sheath after separation from the package as in the previous embodiments of the invention. When the medicament has been injected in the usual manner, the package 90 can be used as a receptacle for the syringe as previously described.

As shown in FIG. 6, the upper end of the main body section or sleeve 110 can be sealed against bacterial contamination by means other than a closure cap mounted over the end of the sleeve 110. Thus, it is possible to form a sealing engagement between the upper end of the piston 111 and the sleeve 110 by frictional engagement between an elongated depending flange 112 on the end of the piston 111 and the inner surface of the enlarged section 113 of the sleeve 110. It is also preferable to provide a frangible seal 114 between the upper end 115 of the sleeve 110 and the upper end of the piston 111, as by contacting the contiguous portions with a surface heated sufficiently to melt the plastic and cause a fusion therebetween. The heat seal, such as a spot heat seal, is readily broken when pressure is applied to the opposite end of the package.

In each of the foregoing specific embodiments of the present invention there is provided an improved package in which the closure member for the lower end of the main body section of the package performs one or more of a multiplicity of important functions including the formation of a bacterial seal with the main body section, the formation of an additional bacterial seal spaced from the seal on the main body section which sealably encloses a hypodermic needle cannula or cap mounted on the end of a syringe, operating as an ejector piston for a syringe or the like, while at the same time maintaining a sealing engagement about a hypodermic needle cannula, and serving as a protective sheath for the hypodermic needle cannula after complete separation from the main body section of the package.

Also, by providing a small but significant frictional engagement between the reciprocable closure member and the inner surface of the sleeve, the syringe can be held in any desired position of ejection within the sleeve, depending upon the extent to which the closure member is disposed within the sleeve and thereby facilitate the one-hand removal operation of the syringe whenever necessary.

It will also be evident that by providing a frangible seal at the upper end of the package, it is possible to guarantee that the bacterial seals at the upper and lower ends of the package have not been broken, that the contents of the package is in the original condition in which it was packaged, and that the packaged article has not been tampered with.

It should, of course, be understood that it is unnecessary for the syringe which is enclosed in the package to have a hypodermic needle attached thereto. Thus, for example, if the syringe 51 of FIG. 3 did not have a hypodermic needle mounted thereon, the package would function in the same manner as described and the syringe 51 would be ejected from the upper end of the sleeve 52 when pressure is applied to the outer end of the closure member 54. In some instances, it might be possible to shorten the length of the closure member when a hypodermic needle is omitted, provided that the closure member in each instance is made at least sufficiently long to push the syringe barrel out of the upper end of the sleeve section a sufficient distance and permit the syringe barrel being readily grasped for withdrawing from the sleeve.

The package of the present invention is preferably made from a plastic material which can be molded readily and which in thin sections exhibits a certain amount of resilience but does not readily take a permanent set due to cold plastic flow and which can be sterilized readily by conventional means. It has been found that polyethylene plastic satisfies the foregoing requirements. Polypropylene plastic is also well-suited for

molding the several parts of the present package. It should be understood, however, that several parts of the package do not have to be made from the same plastic, metal, or other materials. Thus, if desired, the upper cap and sleeve portion which comprises the main body of the package can be molded of nylon and the lower reciprocable closure member which encloses the hypodermic needle can be made of polyethylene. Other plastics suitable for use in the present invention will be apparent to those skilled in the plastic art.

It should also be apparent that the present invention is particularly suited for packaging medicinal-containing plastic hypodermic syringes or other composition-containing plastic containers which normally have a limited shelf-life because of the loss of moisture or other volatile vapors through the plastic walls and the end closures thereof. Polyethylene plastic, for example, is widely used for plastic syringes, as it is relatively inexpensive, does not adversely affect the medicament, and has good molding properties. Because of the high vapor transmission of polyethylene, however, polyethylene syringes have only limited use as medicinal containers. When a medicinal-containing polyethylene syringe or other plastic container is packaged in accordance with the present invention, the lateral walls of the plastic syringe barrel containing the medicament, for example, are completely surrounded by a sealed air-space which provides an air barrier around the syringe barrel and substantially preventing the loss of vapor through the syringe barrel. The upper and lower closure members of the package of the present invention also sealably enclose the opposite ends of the syringe or other plastic container and provide an additional barrier against the loss or entry of vapor through the opposite end fittings or closures. Thus, with the package of the present invention it is possible to use the very economical polyethylene plastic and similar plastic materials having relatively high vapor transmission for medicament-containing syringes and the like, without shortening the normal shelf-life of the medicament, and in certain instances are able to substantially prolong the shelf-life thereof.

A further advantage of the package of the present invention is the great ease of operation afforded. Thus, it is possible to break the frangible seal and remove the hypodermic syringe from the container sleeve by using only one hand, as heretofore described. The one-hand operation is facilitated by having a portion of the needle sheath (the lower closure member) frictionally engaging the sleeve to hold the syringe in a position extending outwardly beyond the upper end of the sleeve. This frictional engagement can be provided by the flange on the upper end of the said closure member or, preferably, the longitudinally extending ribs formed on the outer surface of the lower closure member are formed so as to extend radially outwardly sufficiently to form a sliding frictional engagement with the tapered lower opening of the sleeve.

While the several specific embodiments illustrating the present invention have related to a package containing a cylindrical hypodermic syringe, the package of the present invention is also adapted to protect against physical damage and to sealably enclose a wide variety of articles and utensils of a cylindrical and non-cylindrical form, particularly any article which it is desirable to avoid exposing unnecessarily to bacterial contamination. Thus, the instant invention can be readily adapted to individually packaging clinical thermometers, sutures, scalpels, ampules, vials, and other clinical, pharmaceutical and surgical apparatus, or articles.

Others may practice the invention in any of the numerous ways which are suggested to one skilled in the art, by this disclosure, and all such practice of invention are considered to be a part hereof which fall within the scope of the appended claims.

We claim:

1. A package for a hypodermic syringe assembly containing a medicament held within a syringe barrel between a piston sealably mounted in one end and a fitment means mounted at the other end thereof which comprises a tubular container body section, a hypodermic syringe containing a medicament disposed in said body section, a removable cap member mounted on one end of the said body section enclosing said piston which extends upwardly from said one end of said syringe barrel and engaging said one end of the body section to prevent entry of airborne bacteria, a reciprocable closure member detachably secured to the syringe assembly sealably enclosing the fitment mounted on the other end of said syringe assembly and forming a sliding sealing engagement with the other end of said body section to prevent contaminating the interior of said body section by airborne bacteria, said closure member having limited longitudinal movement within said body section away from said one end of said body section and being movable within said body section without substantial restraining toward and out said one end of said body section after being moved longitudinally out of sealing engagement with said other end of the body section, and said closure member adapted to remain detachably secured to said syringe assembly when moved toward and out said one end of said body section; whereby the said closure member serves as an ejector for the said syringe assembly and also sealably protects said other end of the syringe barrel after the syringe assembly is removed from said body section.

2. A package as in claim 1, wherein said cap member has one end thereof engageable with said one end of the said syringe barrel, whereby movement of said syringe barrel toward and out said one end of said body section during ejection thereof from the said body section does not exert pressure upon said piston.

3. A bacteria-impervious package assembly for sealably enclosing an article comprising: a form-retaining container body section having bacteria-impervious lateral walls providing an article-receiving compartment with a lower axial opening and an upper axial opening as the only means of access to the interior of said compartment, an article disposed in said compartment which is adapted to be inserted into said compartment through said upper axial opening, a lower closure member mounted for relative longitudinal movement in said lower axial opening of said body section and having a portion thereof which normally extends axially through said lower axial opening beyond the end of said body section, said lower closure member having adjacent the upper end thereof an enlarged diameter section providing a lateral circumferential engagement surface which is adapted to form a complete circumferential bacteria-impervious sliding engagement with said body section adjacent said lower axial opening when said lower closure member is moved into seating engagement in said lower axial opening and thereby preventing the entry of bacteria into said compartment through said lower axial opening, said lower closure member also being detachably associated in supporting relationship with said article, and an upper closure element forming a complete bacteria-impervious engagement with said body section adjacent said upper axial opening to prevent the entry of bacteria into said compartment through said upper axial opening, and said article being movable with said lower closure member as a unit longitudinally through said compartment toward and out said upper axial opening by application of axial pressure on the lower end of said lower closure member without altering the relative position of said lower closure member and said article; whereby said article is held within said package assembly free of external bacterial contamination and which as a unit with said lower closure member is readily removable from said article-receiving compartment.

4. A bacteria-impervious package assembly as in claim 3 wherein said lateral engagement surface of said lower

11

closure member is tapered inwardly and said body section has the portion thereof defining said lower axial opening also tapered inwardly to facilitate said lower closure member forming a secure bacteria-impervious sliding engagement with said body section at the lower axial opening thereof when the lower closure member is seated within said lower axial opening.

5. A bacteria-impervious package assembly as in claim 3, wherein said lower closure member has an enlarged upper end section which frictionally engages an interior wall surface spaced axially from said lower axial opening of said body section to maintain said lower closure member at a desired position intermediate the ends of said body section during ejection of said article from said compartment; whereby removal of said article from said body section is facilitated.

6. A bacteria-impervious package assembled for sealably enclosing a hypodermic syringe assembly comprising; a tubular form-retaining container body section having bacteria impervious generally cylindrical lateral walls forming a hypodermic syringe-receiving compartment with a lower axial opening and an upper axial opening at the opposite ends thereof providing the only access to the interior of said compartment, said lower axial opening being of a smaller diameter than the remainder of said body section, a hypodermic syringe assembly having a generally cylindrical barrel section disposed in said compartment which is adapted to be inserted into said compartment through said upper axial opening, a lower closure member mounted for relative longitudinal movement in said lower axial opening and normally extending axially beyond the end of said body section, said lower closure member also being detachably associated in supporting relationship with said hypodermic syringe assembly, said lower closure member having adjacent the upper end thereof an enlarged diameter section providing a lateral circumferential engagement surface which is adapted to form a complete circumferential bacteria-impervious sliding engagement with an inner lateral surface portion of said body section adjacent said lower axial opening when said lower closure member is moved longitudinally into seating engagement in said lower axial openings and thereby preventing the entry of bacteria into said syringe compartment through said lower axial opening, an upper closure element forming a complete bacteria-impervious engagement with said body section to prevent the entry of bacteria into the interior of said body section through said upper axial opening, and said syringe assembly and said lower closure member being movable as a unit longitudinally through said compartment toward said upper axial opening and out through said upper axial opening by application of axial pressure on the lower end of said lower closure member without altering the relative position of said lower closure member and said hypodermic syringe assembly to eject said syringe assembly from said body section through said upper axial openings; whereby said hypodermic syringe assembly is held within said package assembly free of external bacterial contamination and as a unit with said lower closure member is readily removable from said syringe-receiving compartment.

7. A bacteria-impervious package assembly as in claim 6 wherein said lateral engagement surface of said lower closure member is tapered inwardly and said body section has the portion thereof defining said lower axial opening also tapered inwardly to facilitate said lower closure member forming a secure bacteria-impervious engagement with said body section at the lower axial opening thereof when the lower closure member is fully seated within said lower axial opening.

8. A bacteria-impervious package assembly as in claim 7, wherein said lower closure member is detachably secured to said body section adjacent the lower end thereof.

9. A bacteria-impervious package assembly as in claim 6 wherein said lower closure member has an enlarged upper end section which frictionally engages the interior

12

lateral surface spaced axially from said lower axial opening of said body section to maintain said lower closure member at a desired position intermediate the ends of said body section during the process of ejecting said article from said compartment; whereby ejection of said article from said body section is facilitated.

10. A bacteria-impervious package assembly as in claim 6, wherein said upper closure element is a cap member having a transverse end wall in contact with the upper end of said hypodermic syringe assembly and having a depending wall section in engagement with said body section to form one of said bacteria-impervious engagements when said syringe assembly and said upper closure element are fully seated in said body section; whereby longitudinal pressure on said lower closure member effecting upward movement of said lower closure member relative to said body section simultaneously moves said hypodermic syringe assembly and cap member upwardly relative to said body section breaking both said bacteria-impervious engagements formed by said lower closure member and by said cap member with said body section and ejecting said hypodermic syringe assembly from within said body section.

11. A bacteria-impervious package assembly as in claim 6, wherein said lower closure member is detachably secured to a hypodermic needle which forms a part of said hypodermic syringe assembly.

12. A bacteria-impervious package assembly for a hypodermic syringe assembly which comprises; a generally tubular form-retaining cylindrical container body section having bacteria impervious lateral walls forming a hypodermic syringe-receiving compartment with a lower axial opening and an upper axial opening providing the only access to the interior of said compartment with the lower of said axial openings having a smaller diameter than the remainder of said body section, a hypodermic syringe assembly disposed in said compartment which is adapted to be inserted into said compartment through said upper axial opening, said syringe assembly comprising a barrel section having a hypodermic needle associated with the lower end of said barrel section and a sheath portion protectively enclosing said needle and normally extending axially through said lower axial opening, said syringe assembly normally sealably closing the lower end of said body section by forming a bacteria-impervious longitudinally sliding engagement with an inner lateral surface portion of said lateral walls of said body section adjacent said lower axial opening when said hypodermic syringe assembly is moved longitudinally into seating engagement in said lower axial opening and thereby preventing bacteria entering into the interior of said body section through said lower axial opening, an upper closure cap member forming a bacteria-impervious engagement with said body section adjacent said upper axial opening to prevent the entry of bacteria into the interior of said body section through said upper axial opening, and said syringe assembly being movable as a unit longitudinally in said body section toward said upper axial opening without altering the relative position of said sheath portion and said barrel section to break said bacteria-impervious engagements between said closure members and said body section to eject said hypodermic syringe assembly as a unit from said compartment through said upper axial openings by application of longitudinal pressure to said sheath portion of said hypodermic syringe assembly.

13. A bacteria-impervious container for an article comprising; a form-retaining container body section having bacteria-impervious lateral walls forming an article-receiving compartment with a lower axial opening and an upper axial opening providing the only means of access to the interior of said compartment, a lower closure member mounted for relative longitudinal movement in said lower axial opening of said body section and having a portion thereof which normally extends axially through said lower axial opening beyond the end of said body section, said

13

lower closure member having adjacent the upper end thereof an enlarged diameter section providing a lateral circumferential sliding engagement surface which is adapted to form a complete circumferential bacteria-impervious engagement with said body section adjacent said lower axial opening when said lower closure member is moved into seating engagement in said lower axial opening and thereby preventing the entry of bacteria into the interior of said compartment through said lower axial opening, said lower closure member also adapted to being associated in supporting relationship with an article adapted to be inserted into said compartment, and an upper clo-

14

sure member forming a complete bacteria-impervious engagement with said body section adjacent said upper axial opening to prevent the entry of bacteria into the interior of said body section through said opening.

References Cited in the file of this patent

UNITED STATES PATENTS

2,117,469	Woodyatt	May 17, 1938
2,456,001	Jones	Dec. 14, 1948
2,677,373	Barradas	May 4, 1954
2,915,063	Cutter	Dec. 1, 1959