

[54] CAP FOR A MEDICAMENT VIAL

3,378,008 4/1968 Ogle128/220

[72] Inventors: **Kenneth H. Knox**, Libertyville; **Robert J. Ries**, Waukegan, both of Ill.

Primary Examiner—L. W. Trapp
Attorney—Sherman and Shalloway

[73] Assignee: **Abbott Laboratories**, North Chicago, Ill.

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[57] **ABSTRACT**

[21] Appl. No.: **84,851**

A cap for use with a medicament vial of the type having an externally threaded plug therein disposed adjacent an open mouth thereof, the cap including a base member, an internally threaded cylindrical wall extending from an inner surface of the base member and threadedly engaging the externally threaded plug, a grip extending from an outer surface of the base member, an annular rib projecting from the inner surface of the base member and abutting a contact surface at the end of the plug to provide a seal therefore, and a skirt extending from the internally threaded cylindrical wall to prevent deformation of the externally threaded portion of the plug.

[52] U.S. Cl.128/220, 128/218 D, 128/272

[51] Int. Cl.A61m 5/00

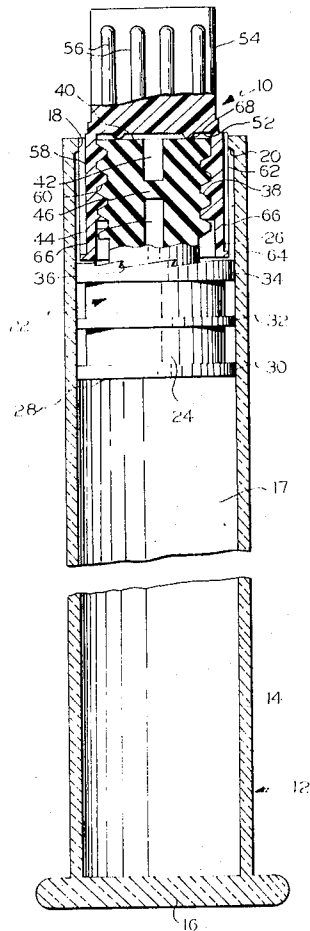
[58] Field of Search.....128/220, 272, 215, 218 D

[56] **References Cited**

UNITED STATES PATENTS

2,556,331	6/1951	Lockhart	128/220
2,708,438	5/1955	Cohen	128/220
3,376,866	4/1968	Ogle	128/220

10 Claims, 4 Drawing Figures



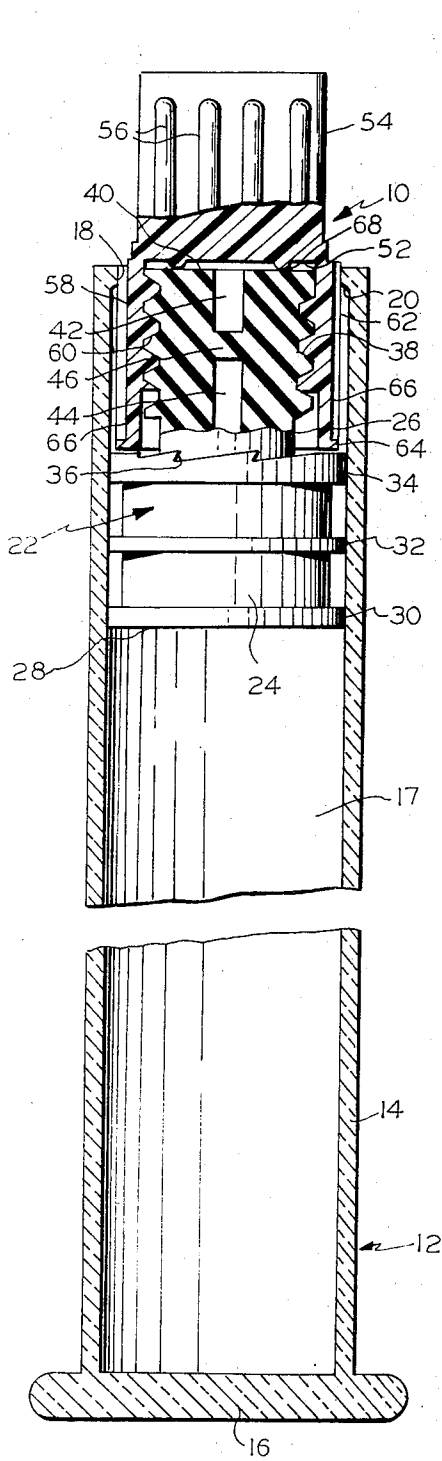


FIG. 1

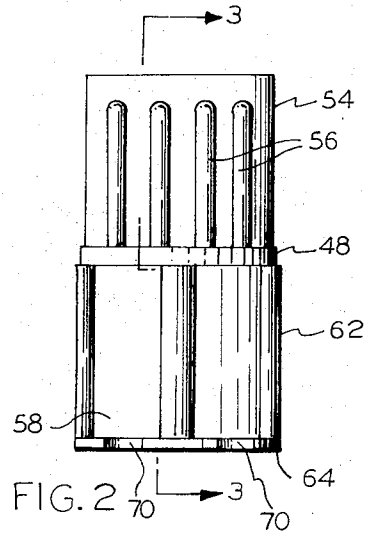


FIG. 2

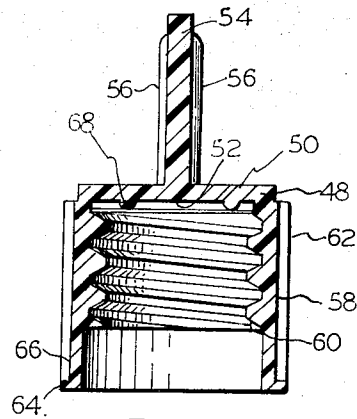


FIG. 3

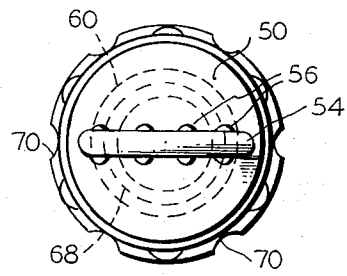


FIG. 4

INVENTORS

KENNETH H. KNOX
ROBERT J. RIES

BY

Sherman & Shalloway
ATTORNEYS

CAP FOR A MEDICAMENT VIAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to a cap for a medicament vial and more particularly to such a cap providing sterile barrier protection for a contact surface of a plug disposed in the vial.

2. Discussion of the Prior Art

One of the more recent developments in the medical supply industry that has received considerable acceptance by the medical profession is a combination package device including an injection syringe and a detachable medicament containing vial. These devices are particularly convenient in that they permit the shipment of a complete unit in a sterile package with the medicament being included therein. Thus, the user of the device merely has to break open the seal of the package and place the needle of the syringe in communication with the medicament in the vial in order to render the device operative for injection use. Accordingly devices of this type have been widely accepted especially for use in hospitals and emergency situations.

Reference is made to U.S. Pat. Nos. 3,376,866 and 3,378,008 both to R. W. Ogle which are exemplary of the above described combination devices and which provide a more complete description of the structural features and advantages of such devices. One disadvantage of the prior art combination devices as exemplified by the Ogle patents is that the combination devices are packaged in assembled form and are not separable in that the medicament vial is not properly sealed so as to provide sterile barrier protection over an extended period of time. Thus the advantages attendant the supplying of the vial independently of the syringes have as yet not been fully utilized.

One problem which must be solved in order to supply the medicament vials independently of the syringe is that the plug, which is disposed in the vial and must be retained therein, has an exposed outer contact surface for receiving the needle of the syringe and must be maintained sterile to prevent any contamination during needle penetration and use of the combined syringe and vial. Another problem which must be solved is that the plug must be prevented from being pushed out of the vial during handling; and, furthermore, the externally threaded portion of the plug must be protected against deformation during handling to assure precise engagement with the syringe.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to construct a cap for a medicament vial of the type to be assembled with a syringe.

The present invention is generally characterized in a cap for a medicament vial including a base member having an internally threaded cylindrical wall extending from an inner surface to threadedly engage a nipple portion of a plug in the vial, a grip extending from an outer surface of the base member, and a rib projecting from the inner surface of the base member to abut a contact surface at the end of a plunger portion of the plug to provide a seal therefor whereby the contact surface is provided with positive sterile barrier protection.

Another object of the present invention is to construct a cap for a medicament vial having a plug therein wherein the cap is provided with a rib to seal a contact surface of the plug.

A further object of the present invention is to provide a skirt at the bottom of a cap for a medicament vial which skirt is adapted to protect a threaded nipple portion of the plug during handling.

Some of the advantages of the present invention over the prior art are that medicament vials utilizing the cap of the present invention may be supplied independently of syringes for use therewith with sterile barrier protection provided over extended periods of time, the cap of the present invention permits handling of filled medicament vials without adverse ef-

fects to the critically threaded nipple portion of the plug, and the venting of air from the vial is facilitated to expedite packaging.

Other objects and advantages of the present invention will become apparent from the following description of the preferred embodiment taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation, partially in section, of a cap constructed in accordance with the present invention assembled with a medicament vial having a plug therein.

FIG. 2 is an elevation of the cap of FIG. 1.

FIG. 3 is a sectional view of the cap of the present invention taken along line 3—3 of FIG. 2.

FIG. 4 is a top plan view of the cap of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The combination of a cap 10 constructed in accordance with the present invention and a medicament vial 12 is illustrated in FIG. 1. Vial 12 has a cylindrical wall 14 with a closed end 16 defining a chamber 17 for storing the medicament, and cylindrical wall 14 terminates at an open mouth 18 which is defined by an annular lip 20 extending inwardly from wall 14.

A plug 22 is disposed within chamber 17 adjacent mouth 18 thereof and includes a plunger portion 24 and a nipple portion 26. Plug 22 is integrally formed such that plunger portion 24 and nipple portion 26 are coaxially aligned with the outer diameter of plunger portion 24 being greater than the outer diameter of nipple portion 26. Plunger portion 24 has a bottom surface 28 defining a movable border for chamber 17 and is cylindrical with annular flanges 30, 32 and 34 extending radially therefrom to engage wall 14 of vial 12. Flanges 30, 32 and 34 are axially spaced from each other such that the bottom surface of flange 30 coincides with surface 28, and flange 32 is disposed intermediate flanges 30 and 34. A plurality of teeth 36 are formed in a saw-tooth fashion on the upper surface of flange 34 and are adapted to engage and cooperate with similar teeth on the mouth portion of an injector syringe (not shown) when the medicament vial is combined with the syringe immediately prior to use.

Nipple portion 26 is externally threaded at 38 and has an end contact surface 40 which is transverse to the longitudinal axis running through plunger portion 24 and nipple portion 26 and parallel to surface 28. A pair of coaxially aligned small diameter bores 42 and 44 extended transversely from surfaces 40 and 28, respectively; and, the bores are aligned with the longitudinal axis of plug 22. Bores 42 and 44 are separated by a membrane 46 such that chamber 17 is maintained sterile.

As best illustrated in FIGS. 2, 3, and 4, cap 10 includes a base member 48 having an outer surface 50 and an inner surface 52. A grip or handle 54 extends transversely from the outer surface 50 of base member 48 and has a plurality of longitudinal ribs 56 protruding from either side thereof. Grip 54 extends diametrically across base member 48 and has a relatively thin, rectangular cross section. A cylindrical wall 58 extends from inner surface 52 of base member 48 and is internally threaded at 60, and a plurality of longitudinally aligned ribs 62 protrude from the outer surface of wall 58 and extend from base member 48 to a bottom flange 64 which extends radially outwardly from wall 58. The unthreaded portion of wall 58 extending from the end of the threaded portion 60 to flange 64 defines a skirt 66 which has a length sufficient to sheathe the external threading 38 on nipple portion 26 to the upper surface of flange 34. An annular rib 68 protrudes from inner surface 52 of base member 48 to define a closed surface thereof and is adapted to abut end contact surface 40 of plug 22. Bottom flange 64 of cap 10 has a plurality of notches or recesses 70 in the periphery thereof spaced between adjacent ribs 62 for a purpose to be described hereinafter.

In use, the chamber 17 of vial 12 is filled with a medicament, and plug 22 is inserted in chamber 17 with cap 10

secured thereto. Cap 10 is secured to plug 22 by the threading engagement of cylindrical wall 58 with nipple portion 26, and cap 10 is screwed onto plug 22 such that rib 68 is tightly compressed against end contact surface 40 and bottom flange 64 is positioned adjacent the teeth 36 extending from flange 34. Thus, the threaded longitudinal length of nipple portion 26 is substantially completely confined within cap 10 even though the threaded portion 60 of wall 58 has a longitudinal length less than that of nipple portion 26. As plug 22 is moved toward the medicament, the air trapped between bottom surface 28 and the level of the medicament must be permitted to escape; and, accordingly, a vent wire or needle is placed in communication with the trapped air by sliding the vent wire along cap 10 through one of the notches 70 and between flanges 30, 32 and 34 of plunger portion 24 and wall 14 of vial 12.

If the filled vial is terminally sterilized, cap 10 may be advantageously utilized to protect plug 22 from being inadvertently removed from vial 12. That is, vial 12 and cap 10 may be separately grasped, such as by brackets to prevent relative movement therebetween which, accordingly, prevents plug 22 from moving within the vial. Thus, it will be appreciated that the cap 10 facilitates the handling of filled medicament vials by protecting plug 22 and providing a stable means to grip the assembled vial.

With cap 10 tightly screwed onto plug 22, a sealed chamber is formed bounded by a portion of end contact surface 40, rib 68 and the closed portion of inner surface 50 of base member 48 such that end contact surface 40 can not be contaminated and sterile barrier protection is provided therefor. End contact surface 40 receives the needle of the syringe when cap 10 is removed from plug 22 and the medicament vial is assembled therewith such that the needle can pass through membrane 46 and bores 42 and 44 to communicate with chamber 17; and, due to the sterile barrier protection of end contact surface 40, the needle will not become contaminated if it engages surface 40 while the syringe is being assembled with the vial for administration of the medicament. Bottom surface 28 of plunger portion 24 of plug 22 operates in piston-like manner with chamber 17 to force the medicament through the needle when pressure is applied to closed end 16 of the vial relative to the syringe.

The skirt 66 extending from the threaded portion 60 of wall 58 may also be threaded as an alternative and is operative to confine nipple portion 26 of plug 22 to prevent deformation of threads 38 during handling and terminal sterilization. Longitudinal ribs 62 strengthen cap 10 and provide an effective outside diameter therefor which mates with the inside diameter of lip 20 at mouth 18 of the vial such that the cap can not be tilted or cocked after engagement with plug 22 to thereby protect the plug and add stability to the assembled vial. The effective outside diameter of cylindrical wall 58 is such that excessive radial movement of plug 22 is prevented during assembly, when the cap is being removed or under flexing forces with the cap on the plug. Ribs 62 also serve to permit a decrease in the required thickness of wall 58 without sacrificing strength or stability.

The preferred construction of the cap 10 of the present invention is to mold the cap as an integral and unitary member. The preferred materials for the cap are thermoplastics. Specific materials could be polyolefins (polyethylene, polypropylene, etc.) polycarbonates, polyamides, polyacetyl. It will be recognized that with the cap 10 of the present invention in combination with the medicament containing vial as previously described, the vial can be shipped as a unitary package with freedom from contamination insured. The plug 22 is designed to insure that the flanges 30, 32 and 34 prevent any contamination of the sterilized inside portion of the chamber 17 in which is contained the medicament, and the cap 10 insures that end contact surface 40 of the plug 22 is maintained sterile and free from contamination so that when

the needle of the syringe engages any portion of end contact surface 40, the needle and subsequently the medicament administered will not be contaminated.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter described in the foregoing specification or shown in the accompanying drawing, shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In combination with a medicament vial having a chamber with an open mouth and a plug disposed in said chamber adjacent said open mouth including a plunger portion engaging sidewalls of the chamber and an externally threaded nipple portion extending from said plunger portion toward said open mouth and terminating at an end contact surface,

a cap including a base member having an inner surface and an outer surface, an internally threaded cylindrical wall extending from said inner surface and threadedly engaging said nipple portion of said plug, grip means extending from said outer surface of said base member, and rib means projecting from said inner surface of said base member and abutting said end contact surface of said plug to provide a seal therefor whereby said end contact surface of said plug is provided with positive sterile barrier protection.

2. The invention as recited in claim 1 wherein said nipple portion has a first longitudinal length, said cylindrical wall is internally threaded for a second longitudinal length from said inner surface of said base member, said first longitudinal length being longer than said second longitudinal length, and said cylindrical wall having an unthreaded skirt extending from said internally threaded portion to said plunger portion of said plug and surrounding said nipple portion whereby said nipple portion is substantially completely confined by said cap.

3. The invention as recited in claim 2 wherein said cylindrical wall has a plurality of spaced, longitudinal ribs disposed thereon, said longitudinal ribs providing said cylindrical wall with an effective outside diameter substantially equal to the diameter of said open mouth of said vial.

4. The invention as recited in claim 3 wherein said skirt terminates in a flange extending radially outwardly therefrom, said longitudinal ribs extend from said base member to said flange, and said flange has a plurality of spaced notches in the periphery thereof.

5. The invention as recited in claim 4 wherein said outer surface of said grip means is flat, and said grip means includes a handle disposed across said outer surface and extending transversely therefrom, said handle having a plurality of projecting ribs on the sides thereof.

6. The invention as recited in claim 1 wherein said cylindrical wall terminates in a bottom flange extending radially outwardly therefrom, said bottom flange having a plurality of spaced notches in the periphery thereof.

7. The invention as recited in claim 1 wherein said cylindrical wall has a plurality of spaced, longitudinal ribs disposed thereon, said longitudinal ribs providing said cylindrical wall with an effective outside diameter substantially equal to the diameter of said open mouth of said vial.

8. The invention as recited in claim 1 wherein said rib means is an annular rib centrally disposed on said inner surface of said base member.

9. The invention as recited in claim 1 wherein said cap is integrally constructed of a plastic material.

10. The invention as recited in claim 1 wherein said nipple portion has a first longitudinal length, and said cylindrical wall has a longitudinal length substantially equal to said first longitudinal length whereby said cylindrical wall substantially completely sheathes said nipple portion.

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