United States Patent

[11] 3,592,245

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[54] **UNIVERSAL DISPENSING DEVICE FOR INTRAVENOUS MEDICATIONS**
7 Claims, 4 Drawing Figs.

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[51] Int. Cl. A61j 1/00
[50] Field of Search ..... 128/272; 141/18, 19, 21—26, 114, 313, 329, 330; 222/563; 215/47

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ABSTRACT: The disclosure is directed to a universal dispensing package for medicaments to be dissolved in a parenteral container prior to use. A container is provided with a cap which first, has a hollow piercing device for dispensing a contained medicament into a "closed system" parenteral solution container, and, second, has a frustoconical shank adapted to engage the interior surface of the neck of an "open system" parenteral solution container. A membrane filter may be disposed between the container and the cap. An outer sheath is provided over the cap and is scaled in place.

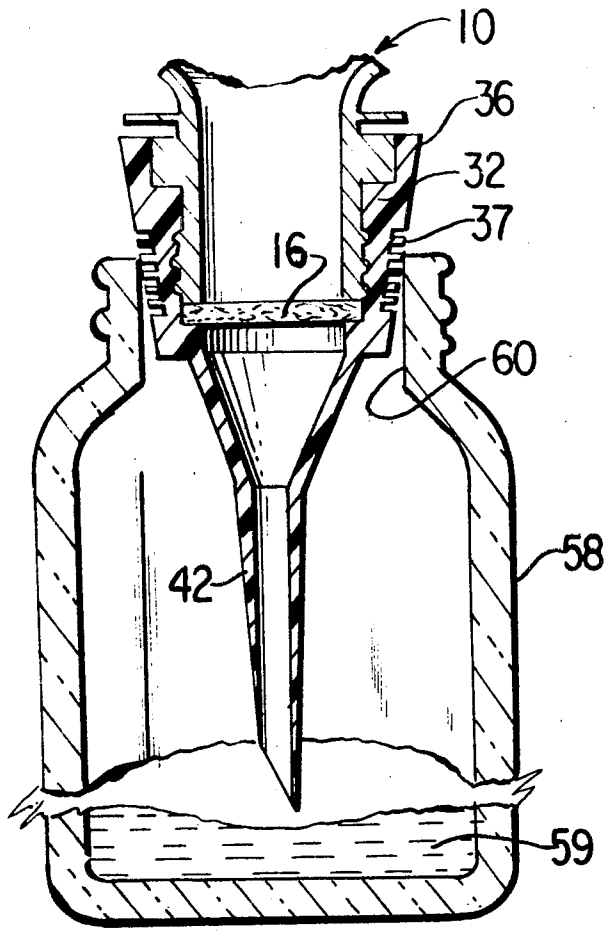


FIG. 1

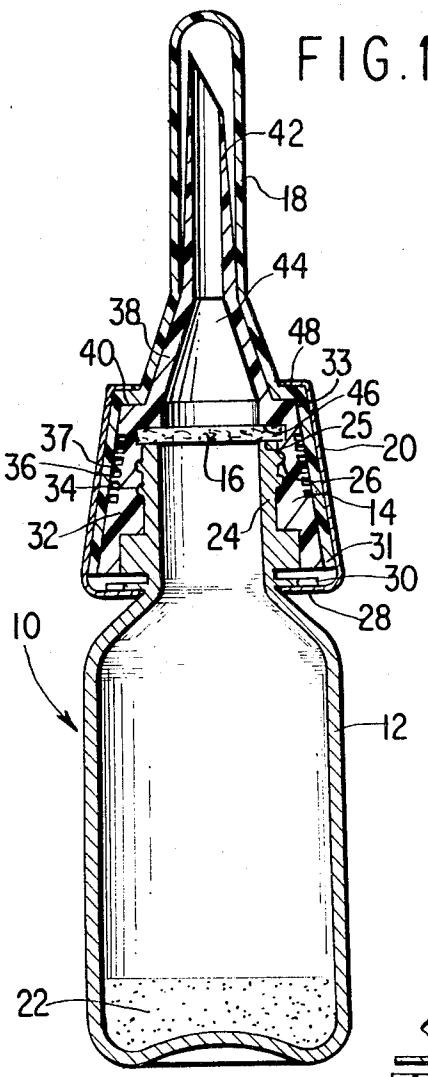


FIG. 2

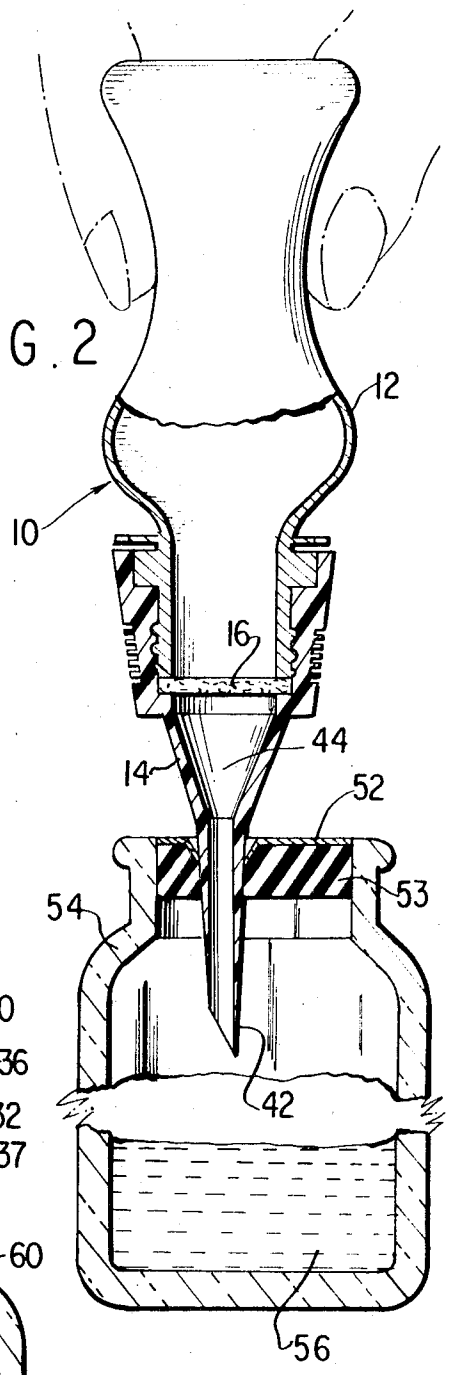
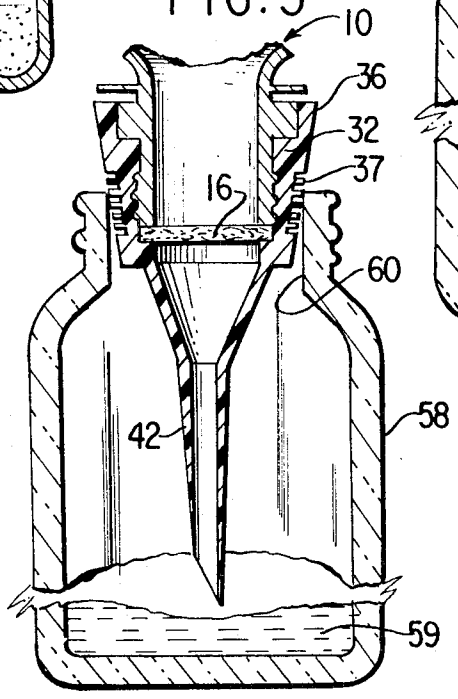


FIG. 3



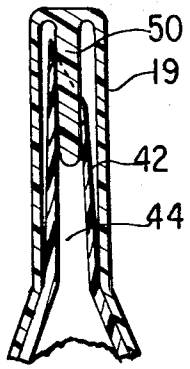


FIG. 4

UNIVERSAL DISPENSING DEVICE FOR INTRAVENOUS MEDICATIONS

This invention is directed to a universal dispensing package for dispensing sterile medicaments and to a method for preparing injectable solutions of such medicaments by transferring the medicament from the dispensing package to a parenteral solution container under substantially aseptic conditions. The dispensing package is adapted to aseptically transfer its contents to both "open system" and "closed system" parenteral solution containers. An "open system" parenteral solution container, typically glass, is one having a threaded closure which is removed in order to discharge the contents. A "closed system" parenteral solution container, typically glass, is one having a fixed plug, typically rubber, which is perforated by a sharp conduit, typically a hollow plastic needle, in order to remove the contents. Another type of closed system which has recently become available is made of flexible plastic and has a plastic membrane closure which is perforated by a sharp conduit.

The method may be practiced by transferring a sterile medicament, such as a powder, a lyophilized cake or a solution, to a parenteral solution container of diluent adapted for parenteral injection, irrigation or the like, the transfer being accomplished with maximum protection to sterility.

It is common practice to add medicaments to parenteral solutions in their containers at the time the parenteral solutions are administered. The additives may be antibiotics such as sodium ampicillin, muscle relaxants, such as succinylcholine chloride, and others. The parenteral solution may be a saline solution, glucose-saline solution or other isotonic solution, such as is commonly employed for parenteral administration. Such solutions are usually administered intravenously but may be otherwise parenterally administered or may be used for irrigation.

The added medicaments are usually solutions, powders, or lyophilized cakes. Previously available means for bringing the powders or cakes into solution and for transferring the resulting solution to the bulk parenteral solution have been cumbersome and complicated and not devoid of risk to the sterility of the product contained.

There are two principal forms of containers for the parenteral solutions. More than half of the total market for intravenous fluids is supplied in closed-system containers as they are defined above, while the remainder of the market is supplied in open-type containers as defined above. There are various dispensing packages for medicaments to be used in conjunction with parenteral solution containers. Typical packages are described in U.S. Pat. Nos. 2,957,501; 2,957,609; 3,059,643, and 3,143,251. There is, however, no dispensing package available which may be used conveniently with both the closed-system and open-system parenteral solution containers with complete assurance of maintenance of sterility.

Numerous parenteral powders for reconstitution containing antibiotics and other medicaments are commercially available. A problem has been that in the manufacture of such powders, it is extremely difficult to control the particulate matter content at a satisfactory level and consequently the solutions ultimately prepared from such powders often contain substantial particulate matter counts. Commonly available antibiotics and other powdered injectable products suffer from this disadvantage. Increasingly higher standards for parenterals indicate that the amount of particulate matter should be greatly reduced.

Even in the instances of drugs marketed in the form of solutions which may be originally packaged substantially free of particulate matter, it is well known to those skilled in the art that the amount of particulate matter may increase substantially during the shelf life of the product as a result of contact with package components, trace drug decomposition and the like. Such solutions after the development of the particulate matter are still suitable for their intended use if the particulate matter is removed. The particulate matter may not be visible

to the naked eye, and consequently the user may be unaware of its presence, and yet it might be potentially harmful. A dispensing package which overcomes this problem is described in copending application Ser. No. 742,872, filed by Howard J. Levin on July 5, 1968 and entitled "Package". In that application a package utilizing a membrane filter for the removal of particulate matter is disclosed.

It is an object of the present invention to provide apparatus for the addition of medicaments to both open and closed-system containers of intravenous parenteral mixtures which provides for the filtration of the medication added to the intravenous parenteral mixtures.

It is another object of the present invention to provide a universal dispensing package for medicaments which are to be added to parenteral solutions which may be used with powders that are not free flowing or are hygroscopic, and can be used with liquids and nonhygroscopic powders as well.

It is another object of the present invention to provide a method of dissolving medicaments in a parenteral solution in a convenient aseptic manner and which provides control of the particulate matter contributed by the added medication.

Other and further objects of the present invention will be apparent to those skilled in the art from reading the following description taken in conjunction with the drawings, in which:

FIG. 1 is a sectional view of a dispensing package embodying the features of the present invention;

FIG. 2 is a partial sectional view showing the embodiment of FIG. 1 in use in conjunction with a closed-system intravenous container;

FIG. 3 is a partial sectional view showing the embodiment of FIG. 1 used in conjunction with an open-system intravenous container; and

FIG. 4 is a detail view of an alternate embodiment of the dispensing package of FIG. 1.

The objects of the present invention may be achieved with a medicament dispensing package which is made up of a reservoir adapted to contain the medicament, a substantially frustoconical cap containing a conduit adapted to convey the medicament from the reservoir to a parenteral solution container, and means to retain the medicament in the reservoir during storage. The frustoconical cap is shaped to have, first, a tapered shank portion adapted to engage the interior surfaces of the mouth of an open-system parenteral solution container and, second, a piercing device adapted to pierce the closure of a closed-system parenteral solution container. While the preferred embodiment utilizes a variable-volume, plastic reservoir, a fixed-volume reservoir such as a glass or plastic bottle may also be utilized.

A preferred embodiment of the present invention is shown in FIG. 1. A universal dispensing package **10** is made up of a container, or reservoir, **12**, a cap **14**, a filter **16**, a protective sheath **18** and a seal band **20**, and contains a medicament **22**. The container **12** has a neck **24** provided with threads **26**. At the lower portion of the neck **24** is an external flange **28** having a series of knurls, or lugs, **30**.

The cap **14** has a shank **32** which has internal threads **34** adapted to cooperate with the threads **26** of the neck **24** to provide a screw-type engagement. The outer surface **36** of the shank **32** tapers from a proximal periphery **31** to a distal periphery **33** and generally defines a truncated cone, as shown. The outer surface **36** may have a patterned configuration such as fluting **37**, defined on it to adapt it better to cooperate with the interior of the neck of an open-system parenteral solution container as described below. A transition piece **38** extends from the shank **32** and with it defines a shoulder **40**. A piercing device **42** is provided at the end of the transition piece **38**. The piercing device **42**, the transition piece **38** and the shank **32** are hollow, and together define a conduit **44**. An inner surface **46** is defined in the shank and with the upper edge portion **25** of the container **12** defines a seat for the filter **16**.

The protective sheath **18** surrounds the entire cap **14** and is held in place by the sealing band **20** which may surround the

lower portion of the protective sheath **18** and extend from a shoulder **48** on the sheath to a point below the flange **28** and be crimped around the flange. The knurls **30** prevent rotation of the sealing band **20**.

The patterned configuration on the surface **36** may take one or more of a number of forms designed to make the surface sufficiently flexible sealably to engage the inner surface **60** of an open-system parenteral solution container. To provide an effective seal the form selected should be relatively short in extension from proximal periphery **31** to distal periphery **33**. The patterned configuration may be formed by lightly roughening the surface **36**. The surface configuration may be formed by making a series of short discontinuous cuts on the surface, for instance in the form of X's or Y's. Other configurations are also effective. The preferred form, however, is the fluting **37** which, as is shown in the drawings, is a plurality of annular yieldable protuberances, or depressions, defined in the outer surface **36**.

While the preferred embodiment utilizes the filter **16** to retain the medicament **22** and for other purposes, it is to be understood that the filter may be eliminated and other means used to retain the medicaments. In FIG. **4** is shown an alternative embodiment in which a sheath **19** has a stud **50** formed in it. The stud **50** is adapted to engage the channel **44** inside the piercing device **42**. The stud thus fills the end of the conduit, provides a tight seal, and retains the medicament. The filter **16** may be omitted, if desired, in such an embodiment.

The entire dispensing package **10** may be placed in an outerwrap of plastic, metal foil, or combinations thereof or a rigid, hermetically sealed container to control the ingress of water vapor or other gases and to further assure the maintenance of sterility.

In use the sealing band **20** and the protective sheath **18** are removed. When used with a closed system intravenous container as shown in FIG. **2**, the piercing device **42** is inserted through a sealing member **52** and a rubber stopper **53** of the closed-system intravenous container **54**. The conduit **44** provides communication between the interior of the container **54** and the contents of the dispensing package **10**. Where the medicament **22** is a liquid, it is readily discharged into the container **54** by compressing the sides of the flexible container **12**. The medicament **22** passes through the filter **16** where any particles are removed. The steps may be repeated to flush the container, if desired.

Where the medicament **22** is dry, the walls of the container **12** may be compressed and the tip **42** submerged in the liquid **56** by inverting the assembled system. A suitable portion of the liquid **56** may be drawn into the container **12** in order to dissolve the dry medicament. To make this possible it may be necessary to relieve any vacuum present. The reconstituted medicament solution may be discharged from the package **10** by compressing the sides of the container **12**. The medicament **22** passes through the filter **16** where any particles are removed.

In FIG. **3** is shown the dispensing package **10** in position to discharge its contents into an open-system parenteral solution container **58**. The outer surface **36** of the shank **32** engages the inner surface **60** of the container **58** and with it forms a tight seal. The tightness of the seal may be increased by the formation of a patterned configuration on the outer surface **36** of the shank **32** in order to develop a suitable friction seal. The medicament **22**, when liquid, may be discharged directly into the container **58**. Where the medicament is a solid, the package **10** and the parenteral solution container **58** may be inverted and a portion of the fluid **59** drawn into the dispensing package **10** where, with gentle agitation as necessary, it dissolves the medicament **22**. The reconstituted medicament solution may be discharged by again returning the containers to the position shown in FIG. **3** and compressing the flexible sides of the container **12**.

The container **12** is preferably made of polyethylene, or similar elastically recoverable material but may also be made of rigid material such as glass if desired. The cap **14** is preferably made of rigid polyethylene but may be made of any other suitable plastic or metal. The piercing device **42** is typically made of the same material as the remainder of the cap **14**, but if desired may be of a different material such as a metal or alloy. The protective sheath **18** or **19** and stud **50** are typically plastic but may be made of rubber or other suitable materials. The seal band **20** may be made of metal or plastic, and preferably is a plastic that shrinks on drying.

The filter may be any suitable material, including sintered glass. However, membrane filters are preferred. Membrane filters are a class of thin filters composed of a porous matrix wherein the size of the pores prevents any insoluble matter larger than the pores from passing through the filter. When used for sterilization, membranes are composed of pores small enough to prevent the passage of microorganisms and thus render the solution sterile. The membrane filter is usually composed of cellulose esters such as cellulose acetate, cellulose triacetate, cellulose nitrate, combination of cellulose acetate and nitrate, regenerated cellulose, polyethylene, nylon, Teflon, polyvinyl chloride, fluorinated vinyl, polypropylene, epoxy glass, acrylic vinyl copolymer, or the like. The membrane filters useful in the practice of the present invention customarily range in thickness from 25 to 300 microns and have a pore size range from about 0.005 micron to 10 microns, preferably from about 0.2 micron to 10 microns. The filter may assume a variety of designs and embodiments to accomplish its function. A preferred embodiment of the filter is one that resembles a plate-and-frame filter and comprises at least one membrane supported at its periphery. Filters having a pore size range of 0.005 to 10 microns are commercially available. Filters having pore sizes smaller than about 0.2 microns sterilize by removing micro-organisms. Filters having a pore size range of about 3 to 10 microns are particularly useful in the preferred embodiment.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. A dispensing package for medicaments to be added to a parenteral solution prior to parenteral administration comprising:

A. A reservoir adapted to contain a medicament;

B. A conduit connected to said reservoir and adapted to convey said medicament from said reservoir to a parenteral solution container and having

1. A piercing device forming one end of said conduit and adapted to pierce the closure of a closed-system parenteral solution container, and

2. A tapered shank means having a taper of predetermined size to sealably engage the inside of the neck of an open-system parenteral solution container of predetermined size;

C. Means to retain the medicament in said reservoir; and

D. Means to retain said reservoir, said retaining means and said conduit in abutting relation.

2. A package as defined in claim **1** wherein said reservoir is a variable volume reservoir.

3. A package as defined in claim **2** in which said piercing device is plastic.

4. A package as defined in claim **2** in which said piercing device is metal.

5. A package as defined in claim **2** in which said tapered shank has a patterned configuration defined in its outer surface.

6. A package as defined in claim **5** in which said patterned configuration is fluting.

7. A package as defined in claim **2** in which said retaining means is a membrane filter.