United States Patent [19]

Lhoest

[11] **3,926,341**

[45] **Dec. 16, 1975**

[54] **BOTTLES IN SEMI-RIGID PLASTIC MATERIAL**

[75] Inventor: **Willy Lhoest,** Rixensart, Belgium

[73] Assignee: **Recherche et Industrie Therapeutiques,** Belgium

[22] Filed: **Nov. 28, 1973**

[21] Appl. No.: **419,847**

[30] **Foreign Application Priority Data**

Dec. 8, 1972 Belgium 125060

[52] **U.S. Cl.** ..... **222/95;** 222/105; 222/107; 222/181; 215/100 A; 150/.5; 128/214 D; 128/272

[51] **Int. Cl.**[2] **B65D 35/28**

[58] **Field of Search** ..... 222/92, 107, 95, 103, 105, 222/185, 215, 210, 214, 181; 128/272, 214 D, 227, DIG. 24; 215/100 A, 100 R, 1 C; 150/.5; 206/806; 248/359, 360

[56] **References Cited**

UNITED STATES PATENTS

2,595,441	7/1971	Grosjean	222/107
2,858,051	10/1958	Cunningham	222/105 X
3,097,677	7/1963	Mitchell	222/107 X
3,288,334	11/1966	Corsette	222/107
3,319,684	5/1967	Calhoun	128/272 X
3,354,924	11/1967	Birrell et al.	222/92 X
3,367,380	2/1968	Dickey	222/107 X
3,727,803	4/1973	Cobb	150/.5 X

FOREIGN PATENTS OR APPLICATIONS

1,449,600	7/1966	France	128/272
3,336	6/1908	United Kingdom	222/107

Primary Examiner—Stanley H. Tollberg
Assistant Examiner—Charles A. Marmor
Attorney, Agent, or Firm—Janice E. Williams; Alan D. Lourie; William H. Edgerton

[57] **ABSTRACT**

Bottles in semi-rigid plastic material intended more particularly for containing and dispensing physiological liquids comprising two opposed transversal walls constituting respectively the base of the bottle and a narrowing of the body of the bottle, this latter one comprising one or several access devices to the inside and four sidewalls higher than broad, at least two -and to a maximum all- of these walls having at least a groove extending, bellow-shaped, on the higher part of the height of the wall and giving to the section of the bottle the shape of a concave polygone, the concavity of which is increasing when, under a slight internal depression, the walls tend to join together.

2 Claims, 12 Drawing Figures

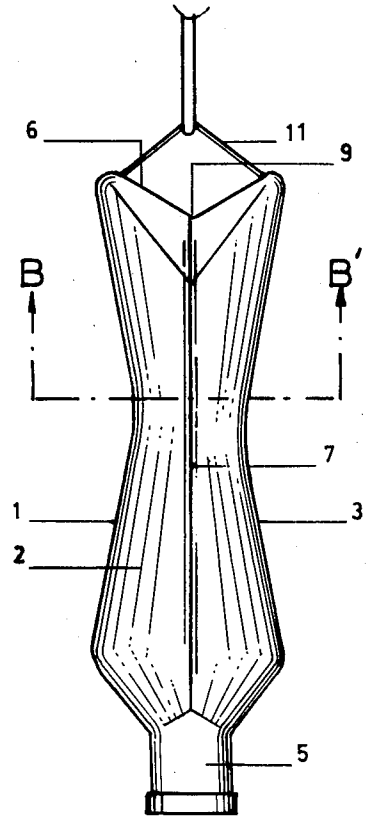


Fig. 1A

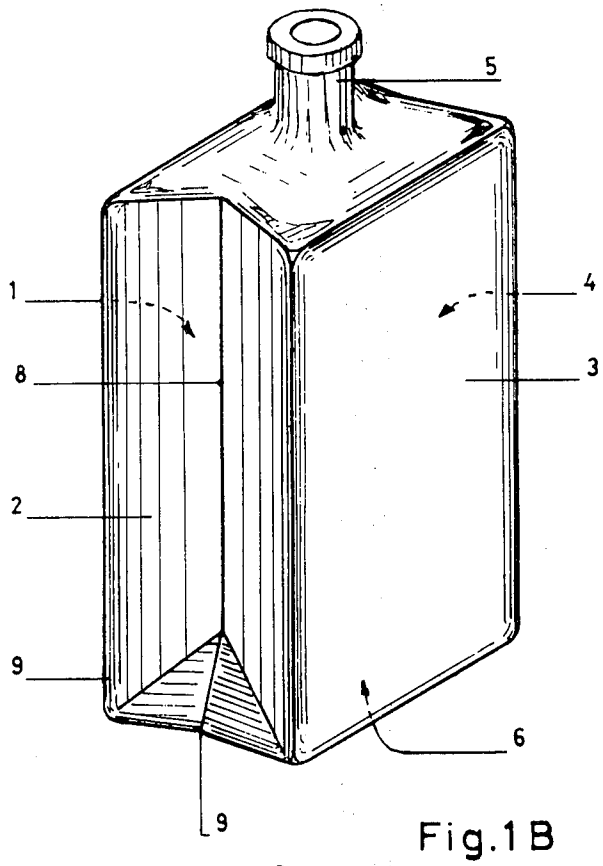


Fig. 1B

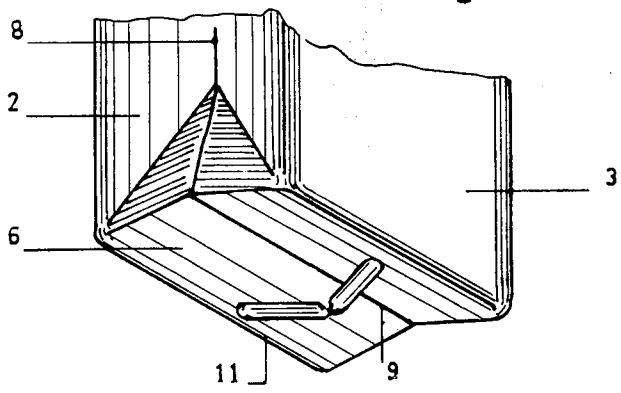


Fig. 2A

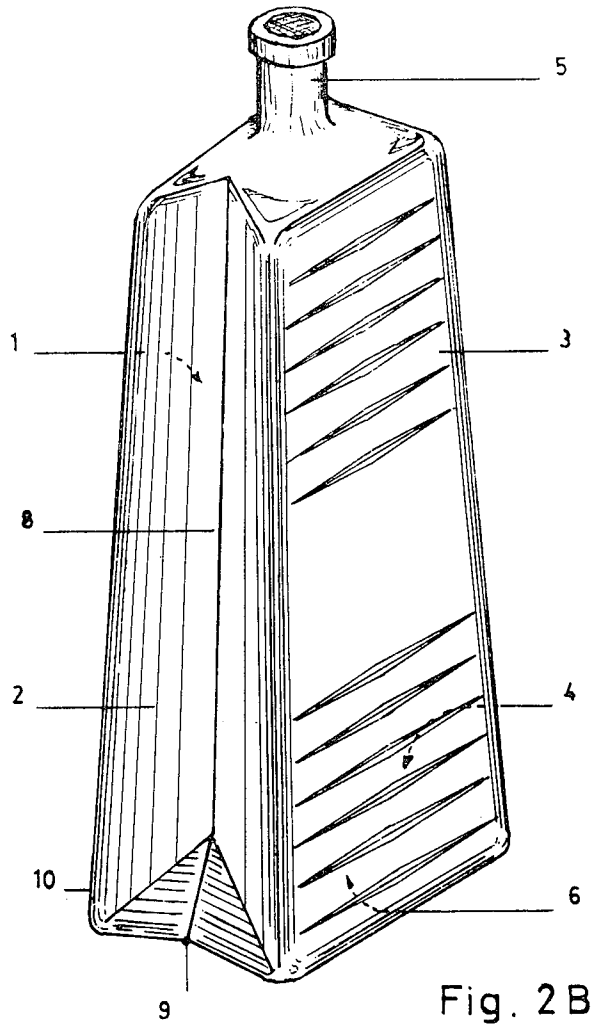


Fig. 2B

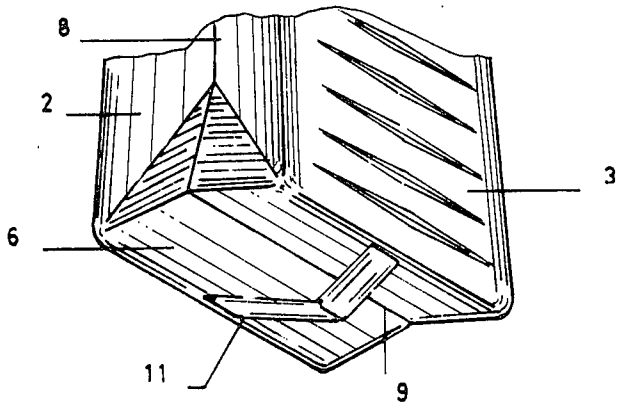


Fig. 3

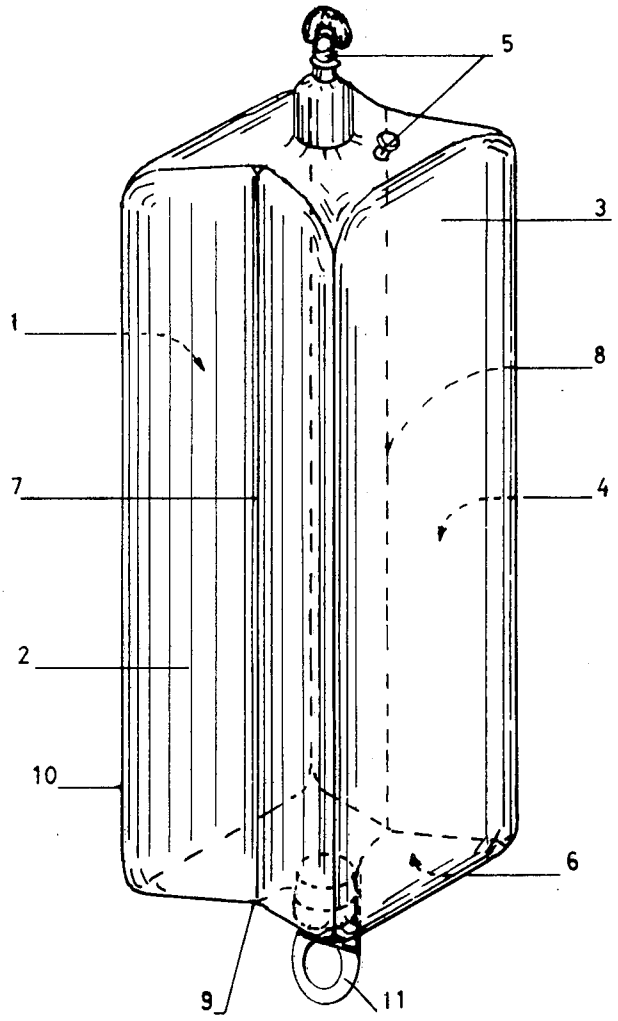


Fig.4

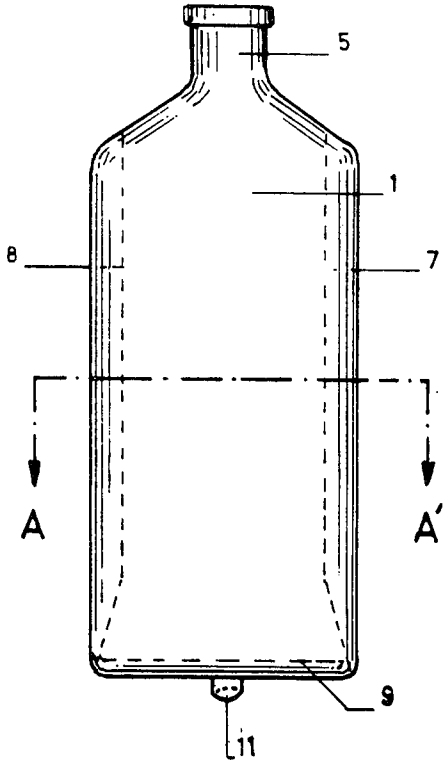


Fig.5

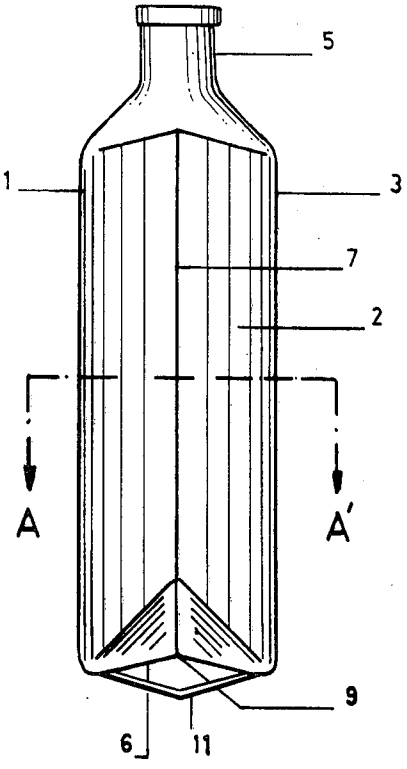


Fig. 6

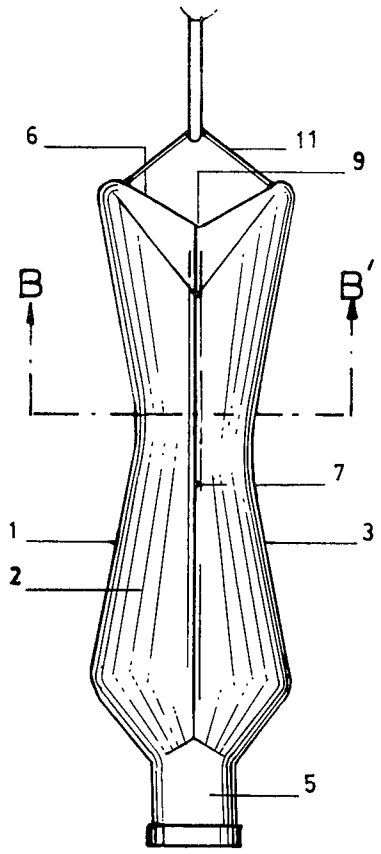


Fig.7

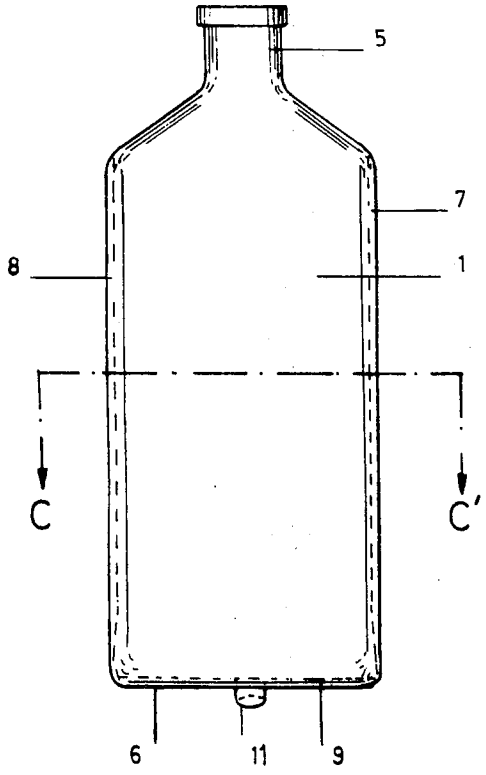


Fig. 8

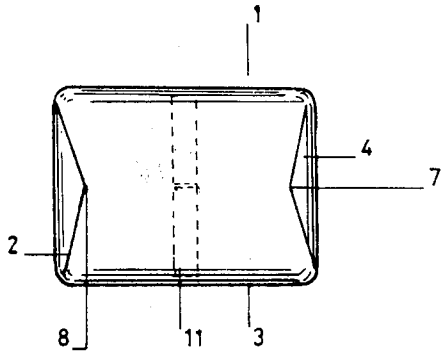


Fig. 9

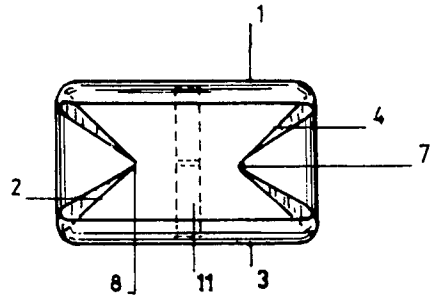
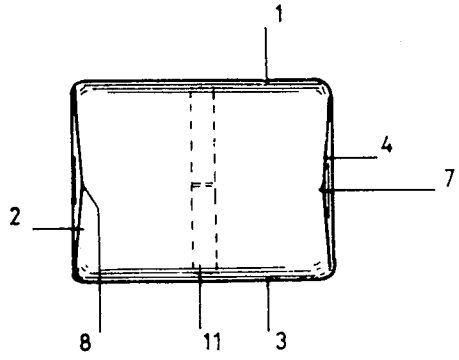


Fig. 10



BOTTLES IN SEMI-RIGID PLASTIC MATERIAL

The present invention relates to bottles of semirigid plastic material and intended more particularly for containing and dispensing physiological liquids for parenteral administration (more particularly for intraveinous administration) and irrigation of operative fields, such as for example physiological serum, blood, blood fractions, plasma and plasma substitute solutions, electrolytic and other solutions.

Containers intended for such uses and made of flexible or semi-rigid plastic material are already known: as flexible plastic material, compositions containing polyvinyl chloride are generally used; as semi-rigid plastic material, polyethylene, polypropylene, polypropylene and polyethylene copolymers and polycarbonate may be mentioned as not limitative examples. The physical properties of flexible plastics are generally counteracted by physical, chemical or toxicological disadvantages arising especially from ageing phenomena and/or from the presence of plasticizers, antioxidants, colouring agents and generally from any ingredient likely to diffuse in the solution which is contained in the bottle.

Semi-rigid plastic materials are generally chemically inert and are therefore particularly suitable for preparing, sterilizing, containing and dispensing such solutions. Semirigid plastic bottles are already known in which the relative flexibility of the material is exploited to allow the emptying of the bottles by self-collapsibility of the walls without it being necessary to equilibrate the flow of the liquid by bringing the inside of the bottle into contact with the atmosphere, as this is the case for the glass containers.

Nevertheless, the existing semi-rigid plastic bottles present some disadvantages such as for example a slowdown in the out-flow of the liquid, owing to the increasing resistance to the deformation of the bottle, resistance which appears during the emptying of the bottle and which can even stop the out-flow even though the bottle still contains an appreciable amount of liquid.

Another disadvantage of semi-rigid plastic bottles known sofar also resides in the fact that most of these bottles do not allow addition of another drug to the liquid contained in the bottles, because the volume of the internal residual air is very limited to reduce with a maximum of efficiency the risk of oxidation of the contents.

Known rigid or semi-rigid plastic bottles also present the disadvantage that they can not be sterilized in usual autoclaves, i.e. which are not equipped with a counterpressure system, allowing, for example, for a sterilization at 120° C, to exert a counterpressure of 1.5 to 2 kg/cm^2 on the outside wall of the bottle.

Without this expensive system, the bottles indeed explode or get irreversibly out of shape during the sterilization owing to the overpressure occuring inside.

It is also to be noted that, in some cases of surgical technique, the liquid must be administered within a relatively very short delay, possibly under pressure, and this is generally incompatible with the resistance of the semi-rigid walls to collapsibility.

The present invention relates to semi-rigid plastic bottles which avoid those disadvantages and present further advantages.

The bottle according to this invention is a semirigid plastic container, having two opposed transversal walls constituting respectively the base of the bottle and a

narrowing of the body of the bottle, said narrowing presenting one or several access devices to the inside and four sidewalls higher than broad, at least two -and to a maximum all- of said sidewalls presenting at least a groove extending, bellows-shaped, on the greater part of the height of the wall and giving to the section of the bottle the shape of a concave polygon, the concavity of which is enhanced when, under a slight internal depression or external pressure, the walls tend to join together.

According to an embodiment of this invention, also the base of the bottle presents a groove, bellows-shaped, joining the bellows-shaped grooves of the two opposed sidewalls.

The bottle of this invention is thus a variable volume bottle, the variation of which is performed following the principle of the bellows.

The initial filling of the bottle and its sealing are preferably carried out maintaining a middle opening of the bellows in order to allow the eventual addition of some supplemental product by opening of the bellows.

According to a preferred embodiment of this invention, the bottle presents a bellows-shaped base equipped with a hanging device and four sidewalls, two opposed ones of which presenting at least one groove extending, bellows-shaped on the greater part of their height, the two other sidewalls being substantially flat and collapsing, owing to the out-flow.

These substantially flat sidewalls possibly present different geometrical shapes, more particularly a rectangular or a trapezoidal shape; they possibly may be strenghtened by a transversal wave, by a crinkling or by all other means known to the art to stenghten a flat surface through modification of its profile.

When sterilized in an autoclave, the bottle according to the invention contains the physiological liquid and counteracts the internal over-pressure by volume increase through opening of the bellows and, after cooling, gets back to its initial volume, i.e. before sterilization. So, the sterilization of the bottles according to the invention may be carried out in usual autoclaves or in continuous sterilizers which are not provided with special and expensive devices for pressure counterbalancing.

According to the invention, the bottle when filled up to a middle opening of the bellows does, owing to its configuration, also allow the eventual addition of another product without establishing over-pressure inside the bottle.

According to an embodiment of the invention, the narrowed transversal wall of the bottle presents a device providing access to the inside. This device may consist either in one or several tubulures sealed at their end, or in one or several necks containing a rubber closure device -especially an elastomer stopper- presenting one or several weakening areas allowing access by perforation with spontaneous reclosure.

It is obvious that one single bottle according to the present invention may simultaneously be provided with different access devices.

A number of such access devices are already known and are applicable to the bottle of the present invention.

For example, the end of the neck or necks is provided with a annular shoulder on which leans the lip of an elastomer stopper fitted to the neck by setting with a metallic or plastic cap; the central part of said cap being provided with a prepared crack allowing to un-

cover the external side of the cap when it must be punched.

According to another embodiment of the invention, the base of the bottle is preferably provided with a hanging device, said hanging device being for instance a folding handle.

Preferably, this hanging handle has a geometrical shape so that, the bottle being positioned for administration of its contents, i.e. inverted, the weight of the bottle exerts on this handle and through gravity effect, a traction force, a component of which tends to bring closer the flat sidewalls of the bottle and therethrough to still improve its collapsibility. For instance, such a handle can be curved and attached at its ends to the two flat sidewalls. This handle may be made during the moulding of the bottle and in the same material as the bottle itself, but variations of the same device can be conceived according to which, for example, the handle is not moulded at the same time as the bottle but attached subsequently to it, for example, by eyelets moulded the bottle and located on the edges common to the base and to two sidewalls, preferably to two flat sidewalls, an advantage of such embodiment being, as previously indicated, to improve the collapsibility.

The following description of a collapsible bottle according to the invention illustrates some embodiments of the invention.

This description is given as a non limitative example with reference to the accompanying drawings in which:

FIGS. **1A, 2A** and **3** illustrate in perspective three possible shapes of bottles according to the invention the bottles being represented, filled and stoppered;

FIGS. **1B** and **2B** show views in perspective of the base of the bottles respectively represented by FIGS. **1A** and **2A;**

FIG. **4** is an elevation view of the bottle represented by FIGS. **1A** and **1B** and showing a flat sidewall (**1**);

FIG. **5** is an elevation view of the bottle represented by FIGS. **1A** and **1B** and showing a sidewall (**2**) with a bellows shaped longitudinal groove;

FIG. **6** is an elevation view of the bottle represented by FIGS. **1A** and **1B** during its discharge and showing a sidewall (**2**) with a bellows-shaped longitudinal groove;

FIG. **7** is an elevation view of the bottle represented by FIGS. **1A** and **1B** but supplemented with an additional volume of liquid and showing a flat sidewall(**1**);

FIG. **8** is a cross-section following AA′ of the bottle represented by FIGS. **4** and **5;**

FIG. **9** is a cross-section following BB′ of the bottle during its discharge represented by FIG. **6;**

FIG. **10** is a cross-section following CC′ of the bottle represented by FIG. **7.**

Referring to the description illustrated by the FIGS. **1** to **10,** semi-rigid plastic bottle, according to the invention, presents four sidewalls (**1,2,3,4**), one or several access devices (**5**) and one base (**6**).

The sidewalls (**1,3**) are flat while the sidewalls (**2,4**) show a groove (**7,8**) extending bellow-shaped on the greater part of their height.

The base (**6**) shows a groove (**9**). The edges (**10**) common to the flat sidewalls and to the sidewalls showing a longitudinal bellows-shaped groove are rounded-off and the grooves (**7,8**) and (**9**) of the sidewalls and of the base are rounded-off or with re-entrant sharp edge.

The bottle can be made by means of extrusion/blow machines generally used for the manufacture of various shapes of bottles in semi-rigid plastic material, more particularly polyethylene and polypropylene.

For employing a bottle according to the invention, the bottle may be filled according to any usual technique or preferably, directly at the last step of its manufacture, offering the advantage of a direct filling under sterile conditions and without any deformation of the bottle inasmuch as this one is still in the mould at this time.

The filling of the bottle may be adjusted to its optimum capacity and hermetically stoppered before complete cooling of the contents, so that the volume of the bottle at normal temperature is slightly smaller than the volume of the bottle when it was filled.

Before use, the bottle is inverted and suspended by the handle (**11**).

If supplemental liquid must be added to the contents of the bottle, either a syringe or an hollow needle with two points can be used for connecting the bottle with the vial containing the additional liquid. This connection can be carried out either before or after inversion of the bottle.

When, for specific reasons, it is desired to accelerate the discharge of the contents of the bottle according to the invention, this result can be obtained without connecting the inside of the bottle with the atmosphere —but simply by exerting a supplemental external pressure on the flat sidewalls. This supplemental pressure can be exerted either by hand or by means of a pressing-machine.

Although a graduation of such bottle has only a relative value and shows no linear ratio with the variation of the contents of the bottle during its administration, it is nevertheless possible to have such graduation on at least one and preferably on each flat sidewall of the bottle or at least on one of the edges of the sidewalls.

Without departing from the scope of the invention, the external surface of the bottle may also be treated, e.g. varnished for improving transparence of the semi-rigid material.

We claim:

1. An improved collapsible semi-rigid plastic bottle for containing and dispensing physiological liquids for intravenous administration of the type having four sidewalls joined at their respective ends by two opposed transversal walls to form a base and a narrowing top surface, said top surface containing at least one access device to the inside volume of said bottle, with two opposite sidewalls containing a bellows-shaped groove extending substantially the entire length of said sidewalls and said base also containing a bellows-shaped groove joined at each end to the bellows-shaped grooves of the attached sidewalls such that when under an internal-external pressure differential the remaining two flat sidewalls of said bottle collapse toward each other, wherein the improvement comprises a flexible hanging means oppositely attached to two edges formed by the joining of said base to said flat sidewalls so that, when said bottle is hanging in an inverted position, the weight of said bottle exerts a force on said flexible hanging means which, as a result of the positioning and flexing of said hanging means, materially aids in the collapse of said flat sidewalls.

2. The improved collapsible bottle of claim **1** in which said flexible hanging means is a curved handle oppositely attached at the center of said two edges formed by the joining of said base to said flat sidewalls.

* * * * *