

[54] **PACKAGE FOR STORING AND DISPENSING LIQUIDS**

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[52] **U.S. Cl.**..... **222/95, 128/214 F**

[51] **Int. Cl.**..... **B65d 83/00**

[58] **Field of Search**..... 222/94, 95; 128/214 F, 128/DIG. 12

[56] **References Cited**

UNITED STATES PATENTS

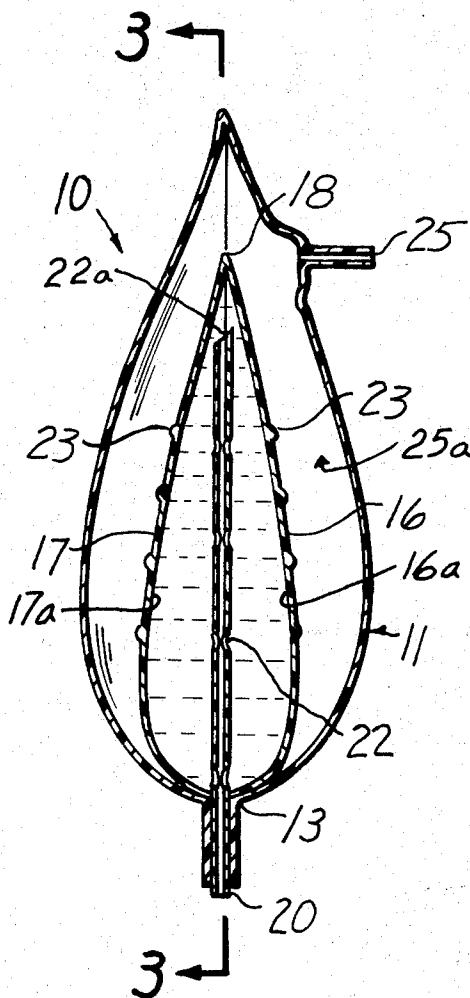
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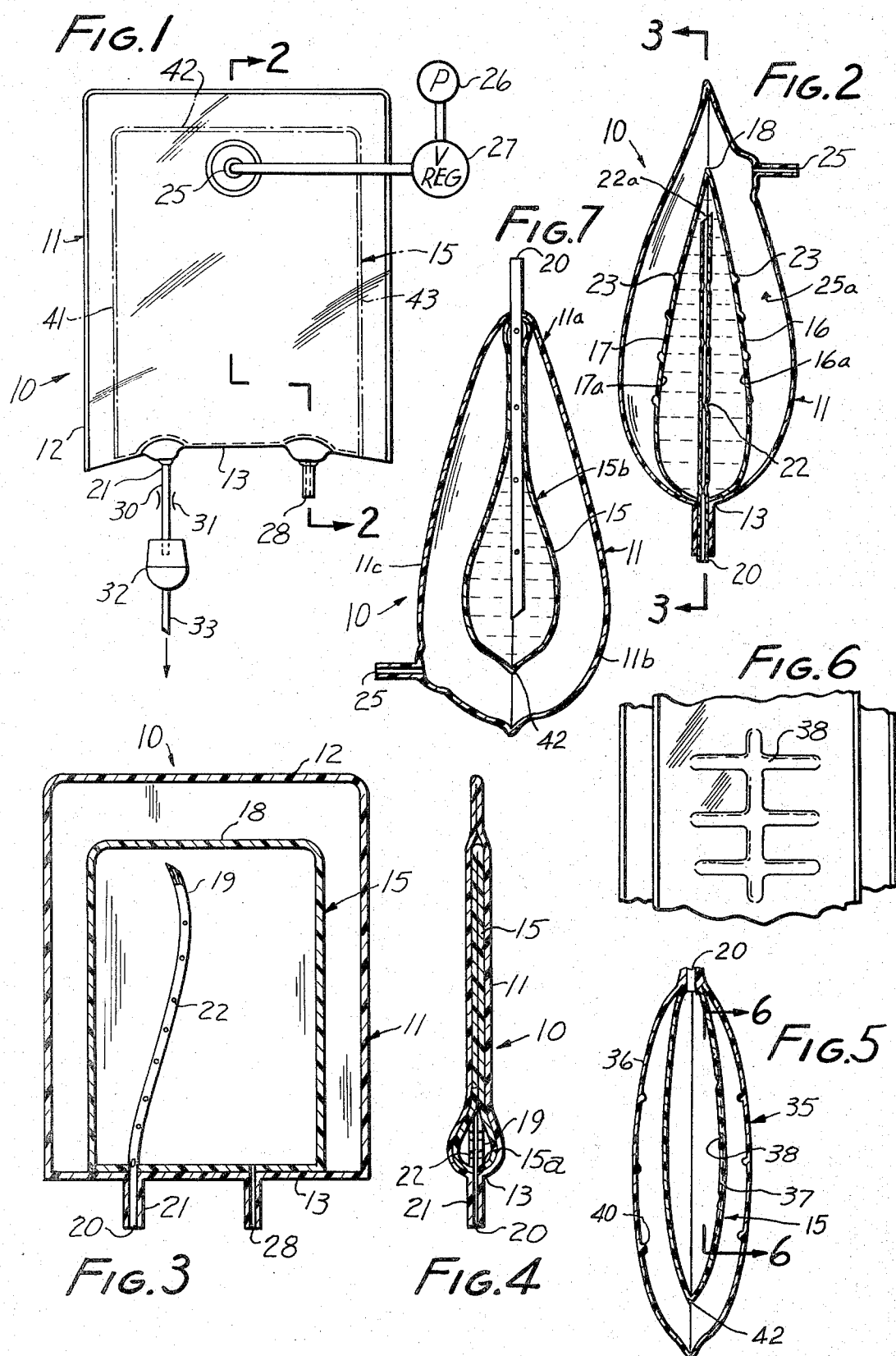
Primary Examiner—Donald F. Norton
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[57] **ABSTRACT**

A package for storing and dispensing liquids, for example, parenteral solutions. The liquid is contained in a flexible container, which container is enclosed in an outer vessel. The container has a pair of sidewalls (sometimes called "sidewall members") which can make surface-to-surface contact with one another, and expulsion of the liquid from the container through an outlet port is caused by fluid pressure exerted in the vessel that presses the sidewalls toward one another. The container is so disposed that fluid pressure in the region between the container and the vessel can contact substantially the entire outside area of the sidewalls, and so that the movement of the sidewalls towards surface-to-surface contiguity is not substantially impeded by the vessel. If desired, a bypass means is disposed in the container so that the liquid can be expelled from the outlet port whatever the position of the bag, without concern that the bag might pinch closed between the outlet port and a region containing a substantial volume of liquid. This assures complete expulsion of contents.

14 Claims, 7 Drawing Figures





PACKAGE FOR STORING AND DISPENSING LIQUIDS

This invention relates to a package for storing and dispensing liquids, for example, parenteral solutions. Parenteral solutions are intended for infusion into the human body. Such solutions are presently sold in various types of packages. Known examples are rigid glass bottles and flexible envelopes. Such devices are in widespread usage despite their considerable disadvantages, because there is nothing presently available which is better.

The existing packages are inherently very wasteful of the solutions they contain. In fact it is not at all unusual for as much as one-fourth to one-third of the contents of these packages to be discarded for various reasons, some of which reasons are inherent in the packages, and some of which are inherent in the administrative practices involved in their usage. It is bad enough to waste relatively inexpensive solutions, such as saline solutions, but it is potentially calamitous to waste whole blood or very costly or rare medicants.

One of the reasons why such wastage is tolerated is administrative in nature. The giving of medication often requires a continuous supply of solution at a constant rate of feed over a considerable period of time. The rate of delivery is variable and usually decreases in conventional systems as the contents are depleted. Because nurses are so busy, they cannot continuously monitor the rates of flow, and it is conservative practice to assure the full flow rate by working with nearly full packages. Furthermore, nurses tend to replace partially filled packages when they have time to do so, rather than to wait for exhaustion of the previous container. Because the variable rate of discharge makes it uncertain just when the container will be empty, the nurses will tend to replace the package sooner rather than later, and wastage is an inherent result.

The problem of securing a relatively constant rate of delivery arises in part from the fact that the existing systems utilize gravity forces for transfer of the solution from the container to the patient. A conventional technique is to utilize a stand to hold the bottle at a given level and to adjust a metering valve at the outlet of the bottle to establish an approximate drip rate. Of course, this drip rate decreases as the head of fluid above the restrictor decreases. This explains the requirement for frequent adjustment of these valves and the reason for the premature discarding of the various packages.

Gravity feed is also a cause for the proliferation of adjustable stands around hospital beds in order to hold containers at suitable elevations, and also is a cause for the requirement that the patient remain in one place during the infusion of liquids. If the patient has to be moved around, such as to travel to x-ray, an orderly or nurse must trail along with him carrying the container at an approximation to the correct elevation.

It is quite evident there is need for a package which stores and dispenses solutions and can be carried by the patient himself, in which the rate of feed is independent of elevation relative to the patient, and which will feed solution at a constant rate regardless of the quantity which remains in the container so long as there is any solution at all left in the package. It is an object of this invention to provide such a package.

As still further advantages, the system is closed and does not require atmospheric venting. Also, it can be

provided in a flexible form which will not break if dropped.

A package according to this invention comprises an outer vessel and a container within the vessel. The container is flexible and includes a pair of sidewall members which, when the container is empty, can make a substantially abutting contact with one another. Preferably, the contact is that of a flush surface-to-surface contact over the major portion of the area of the sidewall members. Both the vessel and the container are fluid-tight, and are ported so that the vessel can receive pressurized fluid and so solution can flow out of the container. The container and the vessel are so proportioned and arranged that, as the container is emptied of its solution, and it changes its shape and grows thinner and longer. There is no impediment which will prevent the said abutting contact from occurring. The vessel and container are formed from flexible and metallic sheet-like materials joined at their respective peripheries, and when both are empty, the sidewall members can form a flat stack.

According to preferred but optional features of this invention, spacer means is provided to prevent full surface-to-surface contact of the sidewall members with the vessel, and a bypass conduit is provided in the container which interconnects a plurality of its regions.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a plan view of the presently preferred embodiment of the invention and of the best mode contemplated by the inventor for carrying out his invention;

FIG. 2 is a cross-section taken at line 2—2 of FIG. 1;

FIG. 3 is a cross-section taken at line 3—3 of FIG. 2;

FIG. 4 shows the device of FIG. 1 before being filled;

FIG. 5 is a cross-section of another embodiment of the invention;

FIG. 6 is a cross-section taken at line 6—6 of FIG. 5; and

FIG. 7 is a cross-section showing the device of FIG. 2 inverted and discharging its contents.

A package 10 according to the invention is shown in FIG. 1. It includes an outer vessel 11 which may conveniently be formed of a folded piece of flexible and inelastic material. It has a seam 12 closing its three edges, and the fold 13 is, of course, impervious to fluid. By folding sheet 11a, two flat sheet-like vessel sidewall members 11b, 11c are formed, and these are joined at their periphery by the seams 12 along three edges, and by the fold along the fourth edge to form a fluid-tight closed bounding wall member comprising the two members 11b and 11c.

A container 15 is placed inside the vessel. It is conveniently formed of a sheet 15b of flexible and, if desired, elastic material. Inelastic material may also be used. By folding the sheet 15b to form a fold 15a, two flat sheet-like container sidewall members 16 and 17 are formed, and these are joined at their periphery by seam 18 along three edges, and by the fold along the fourth edge to form a liquid-tight construction. The fold 15a (FIG. 4) may be cemented or otherwise attached to the vessel, although the container can be completely separate

if desired. Joining the two at their folds makes a strong and rugged container, and will usually be preferred. The said three edges of the container and of the vessel are sometimes called "free edges".

The container sidewall members are capable of lying in surface-to-surface contiguity as best shown in FIG. 4. More precisely, the inside surfaces 16a, 17a are the portions of the sidewall members which can be contiguous to one another. FIG. 4 illustrates the unfilled configuration of the package. When the container and the vessel are empty, the four sidewall members can lay in a flat stack in contiguity with any abutting sidewall member (see FIG. 4).

A bypass tube 19 extends inside the container and discharges fluid from the container through an outlet port 20 in a neck 21. The bypass tube is pierced by apertures 22 along its length, and an open end 22a, the apertures and open end providing for entry of solution at many locations along the length of the bypass tube and at its end.

Optional nibs 23 are formed on the outside of the container to prevent contiguous adherent contact between the inside surface of the vessel and the outside surface of the container. These nibs comprise "means" to prevent adhesion (adhesive or adherent contact) of the outside surfaces of the container with the inside surfaces of the vessel. A pressure inlet port 25 passes through the wall of the vessel and is supplied with an expulsion fluid from a pressure source 26 through a regulator valve 27. Thus, a continuous regulated gas pressure may be applied inside the vessel in the region between the vessel and the container, and will thereby be applied directly to the outside surface of the container. A filler neck 28 passes through the vessel and the container. It is closed after the package is filled. It permits air to be expelled from the container while the container is being filled, thereby expediting the filling of the package.

Neck 21 is extended by a hose 30 which includes an adjustable restrictor valve 31. It discharges liquid into a conventional drip chamber 32 from which the liquid passes through still another hose 33 to the user.

The device of FIG. 5 is similar to that of FIG. 1. It comprises a package 35 with a vessel 36 and a container 37, both having the features of the respective parts of FIG. 1. However, instead of being provided with a bypass tube, the inside surface of at least one of the container sidewall members is modified by a pattern of interconnected grooves 38. The pattern shown comprises a "plurality of channels", and also constitutes "bypass means". These grooves extend toward the side edges and also between the ends of the container, so that there will always be fluid access from the various regions of the container to its upper and lower parts. The fluid can always reach the port 20, no matter what the orientation of the package is. Nibs 40 are provided on the inside surface of the vessel to prevent adherent contact of the vessel and the container.

The operation of the invention will now be described. In its initial, unfilled condition, it will be as shown in FIG. 4, a flat, flexible body. The container will be filled by running the solution in through the filler neck 28 before closing port 20. This will permit expulsion of air from the container. When the container is filled, the filler neck is permanently closed, such as by crimping and heat-sealing the tube of which it is formed, and the outlet port is also closed in any desired manner. The filled package will be distended to the approximate

shape of the filled container, plus whatever overlapping edges of the vessel as exist. The vessel sidewall members will simply bear against the container sidewall members of the filled container. To discharge the contents, fluid under pressure is passed through pressure inlet port 25, and the package takes the distended shape shown in FIG. 2, wherein fluid under pressure in region 25a between the sidewall members of the container and the inside wall of the vessel completely surrounds and contacts the container sidewall members of the inside container, and liquid will discharge from the container as a function of this pressure and of the setting of the restrictor valve. It will be noted that the dimensions of the vessel are such that, as the members liquid is discharged, the container sidewall members of the container approach each other, and the container therefore elongates, still there will be no substantial impediment by the vessel to this change of shape of the type which would cause wrinkling of the container and perhaps prevent the full expulsion of the contents or in any way prevent the return of the container sidewall member to substantial surface-to-surface abutment. For example, in its preferred embodiment of the invention, three free edges 41, 42, 4 are provided on the container in order that there will be complete freedom of relative "shear" movement between the adjacent surfaces of the vessel and of the container. Then the container is free to assume any shape which circumstances would dictate but, because of its construction, its container sidewall members will ordinarily return to a contiguous surface-to-surface contact. The term "free edge" means an edge which is not attached to structure of another body, i.e., of the vessel.

It has been found that the device requires that opposing forces be exerted by fluid contact with opposite container sidewall members of the container without substantial shielding occlusive impediment by the vessel sidewall members. For example, if one of the container sidewall members 16 or 17 were common with a vessel sidewall member of the vessel, the objectives of this invention would not be achieved. This invention requires that opposed container sidewall members of the container be exposed to the expulsive fluid in region 25a and not be isolated therefrom by adherent contact with a vessel sidewall member (or "bounding wall member") of the vessel or otherwise, although this does not mean that stabilizing "tack welds" or the like might not join together some spaced-apart points. Whatever the arrangement, the container sidewall members must be free to move away from the vessel wall over most of their areas.

As shown in Fig. 7, if the package is inverted, the weight of the fluid will cause it to gather at edge 42, and the package will tend to close at the end adjacent to port 20. This is the reason for providing the apertures in the bypass tube and/or for providing the channels in FIGS. 5 and 6. With these provisions, it is certain that there will always be a flow channel from any location where liquid gathers to port 20. Accordingly, with this feature, there is an assured expulsion of the fluid regardless of the position of the package. If the package will always be held in an upright position (FIG. 2), then the bypass means need not be provided.

Any source of fluid under pressure can be used to expel the liquid. The most commonly used fluid will be a pressure regulated gas, such as carbon dioxide from a cartridge, or compressed air. Alternatively, fluid under static pressure, such as from a house water sup-

ply, could be used, although this is not ordinarily to be preferred.

This invention provides a simple package which is easy to manufacture, to fill and to use, and which assures the steady rate expulsion of its contents and the substantially complete emptying of the container at the anticipated rate.

This invention is not to be limited by the embodiments shown in the drawings and described in the description, which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

We claim:

1. A package for storing and dispensing liquids comprising: a closed flexible container for containing a liquid initially to be stored and later to be dispensed, said container comprising a pair of flat sheet-like flexible and inelastic container sidewall members which face each other and are joined together at their peripheries to form a liquid-tight construction in such manner that, when the container is empty, the inside surfaces of the container sidewall members can substantially abut one another, and when liquid is placed in the container, they move apart to receive liquid between them; and a vessel comprising a pair of flat sheet-like flexible and inelastic vessel sidewall members which face each other and are joined together at their peripheries to form a fluid-tight closed bounding wall member enclosing said container, all of the sidewall members being able to lie in a substantially flat stack in substantial contiguity with any abutting sidewall member when the container and vessel are empty, the vessel sidewall members being so proportioned relative to the container sidewall members that a region can be formed between them when both are distended by fluid, such that the container's enlargement is not prevented by the vessel, and as liquid is withdrawn from the container, the vessel does not interfere with the return of the container sidewall members to mutual surface-to-surface abutment; there being an outlet port from the outside of the vessel to the inside of the container, both of said container sidewall members being substantially fully exposed to pressure in the region which is formed between the vessel and the container, the container sidewall members being substantially unattached to the inside of the vessel sidewall members, there being a port providing for entry of fluid under pressure into said region between the container and the vessel.

2. A package according to claim 1 in which bypass means is provided inside the container which provides a fluid connection between various areas of the surfaces of the container sidewall members when they are substantially contiguous to one another.

3. A package according to claim 2 in which said bypass means is a tube pierced by apertures along its length.

4. A package according to claim 2 in which said bypass means comprises a plurality of channels in the wall of the container sidewall members.

5. A package according to claim 1 in which a filler port passes through the vessel and into the container for facilitating the filling of the package.

6. A package according to claim 1 in which means is provided between the outer surface of the container and the wall member of the vessel to prevent their adherent contact.

7. A package according to claim 1 in which the vessel and the container each comprises a folded sheet of ma-

terial having a folded edge to form the respective pair of said sidewall members, and three free edges sealed together, the lateral dimensions of the container sidewall members being less than the corresponding lateral dimensions of the vessel sidewall members when both are empty and flattened.

8. A package according to claim 7 in which bypass means is provided inside the container which provides a fluid connection between various areas of the surfaces of the container sidewall members when they are substantially contiguous to one another.

9. A package according to claim 8 in which said bypass means is a tube pierced by apertures along its length.

10. A package according to claim 8 in which said bypass means comprises a plurality of channels in the wall of the sidewall members.

11. A package according to claim 8 in which a filler port passes through the vessel and into the container for facilitating the filling of the package.

12. A package for storing and dispensing liquids comprising: a closed flexible container for containing a liquid initially to be stored and later to be dispensed, a pair of sidewall members included in said container having inside surfaces which face each other and, when the container is empty, can substantially abut one another, and when the container is filled with liquid, move apart to receive the liquid between them, and bypass means giving a fluid connection between various areas of the inside surface of the sidewall members when they are contiguous to one another, comprising a plurality of channels in the inside surface of at least one of the sidewall members; and a vessel having a closed bounding wall member enclosing said container, the vessel being so proportioned relative to the container that the container's enlargement is not prevented by the vessel, and as the solution is withdrawn from the container, the vessel does not interfere with the return of the sidewall members to mutual abutment; there being an outlet port from the outside of the vessel to the inside of the container, both of said sidewall members being substantially fully exposed to the region which is formed between the vessel and the container, the sidewall members being substantially unattached to the inside wall of the vessel.

13. A package for storing and dispensing liquids comprising: a closed flexible container for containing a liquid initially to be stored and later to be dispensed, said container including a pair of sidewall members which face each other and, when the container is empty, can substantially abut one another, and when the container is filled with liquid, move apart to receive the liquid between them; and a vessel having a closed bounding wall member enclosing said container, the vessel being so proportioned relative to the container that the container's enlargement is not prevented by the vessel, and as the solution is withdrawn from the container, the vessel does not interfere with the return of the sidewall members to mutual abutment; there being an outlet port from the outside of the vessel to the inside of the container, both of said sidewall members being substantially fully exposed to the region which is formed between the vessel and the container, the sidewall members being substantially unattached to the inside wall of the vessel, there also being a filler port which passes through the vessel and through the container for facilitating the filling of the package.

14. A package for storing and dispensing liquids comprising: a closed flexible container for containing a liquid initially to be stored and later to be dispensed, a pair of sidewall members which face each other and, when the container is empty, can substantially abut one another, and when the container is filled with liquid, move apart to receive the liquid between them; a vessel having a closed bounding wall member enclosing said container, the vessel being so proportioned relative to the container that the container's enlargement is not prevented by the vessel, and as the solution is withdrawn from the container, the vessel does not interfere

with the return of the sidewall members to mutual abutment; and means between the outer surface of the container and the inside surface of the wall member of the vessel to prevent their adherent contact, there being an outlet port from the outside of the vessel to the inside of the container, both of said sidewall members being substantially fully exposed to the region which is formed between the vessel and the container, the sidewall members being substantially unattached to the inside wall of the vessel.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,838,794 Dated October 1, 1974

Inventor(s) James J. Cogley et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[76]	"1637" should read --6637--
Col. 2, line 15,	cancel "and"
Col. 3, line 14,	after "19" insert --(sometimes called
	"bypass means")--
line 56,	"The" should read --Then--
Col. 4, line 14,	cancel "members"
line 20,	"the" second occurrence should read --its--
line 20,	insert a comma after "contents"
line 22,	"member" should read --members--
line 23,	"its" should read --the--
line 24,	"42,4" should read --42, 43--
line 44,	after "be" insert --substantially fully--
Col. 5, line 41,	change the semi-colon to a comma
Cl. 1, line 27.	
Col. 5, line 60,	after "of" insert --at least one of--
Cl. 4, line 3.	
Col. 6, line 17,	after "of" insert --at least one of--
Cl. 10, line 3.	
Col. 6, line 17,	after "the" insert --container--
Cl. 10, line 3.	
Col. 6, line 4,	change the semi-colon to a comma
Cl. 12, line 19.	
Col. 6, line 60,	change the semi-colon to a comma
Cl. 13, line 14.	

Signed and sealed this 1st day of July 1975.

(SEAL)
Attest:

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