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(54) **PACKAGE OF LIQUID CONTAINER.**

(57) This invention relates to a package of a liquid container which stores therein a liquid and whose walls have steam permeability. In order to prevent dewing in the package, a humidity controlling agent is stored together with the liquid container. This agent is produced by wrapping a resin agent having steam absorptivity, water absorptivity and a steam evaporation property, such as an acrylic resin consisting principally of polypotassium acrylate between water/steam permeable sheets. A resin agent which absorbs water in a quantity of 10 to 1,000 cc/g is

used.

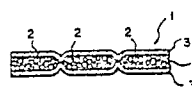


FIG. 1

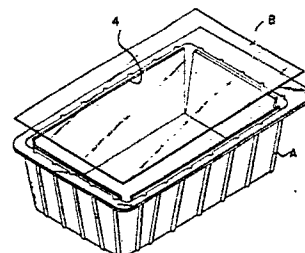


FIG. 2

S P E C I F I C A T I O N

Liquid container package

Technical Field

This invention relates to a package for liquid containers, e.g., blood bags, and more particularly, to a liquid container package, which can prevent moisture
5 condensation from forming inside the package.

Background Art

Heretofore, for preserving blood bags it has been the practice to lay Japanese paper as a water absorption sheet beneath the blood bags to absorb the condensed water droplets. The blood bag is made of a soft
10 plastic material permeable by water vapor. Water vapor penetrates the blood bag as condensed moisture inside a sealed container package due to, for example, a difference in temperature between the sealed container
15 package and the environment. The amount of condensed water can be much as 8 to 10 cc in the case of a single container package, in which five sets of 200-cc blood bags (a total blood content amounting 140 cc) are sealed. Heretofore, Japanese paper has been used by
20 laying it beneath the bottom of the blood bag to absorb the condensed moisture. Japanese paper, however, has a poor water absorption property and can not absorb water unless it is contacted by water, that is, it can not absorb water in the state of vapor, and it is only when

this vapor condenses, that the paper is sufficiently able to absorb water.

Further, the Japanese paper lacks a water-retaining capacity, i.e., it lacks an absorbent quality. Therefore, water once absorbed by the paper can readily dissipate due to a temperature rise or like cause. Therefore, an over-saturation state is produced inside the blood bag, and evaporation, dissipation, and condensation of water repeatedly take place. Further, the surface of the blood bag which is not in contact with Japanese paper has no ability what so ever to absorb water. Therefore, affixing labels indicating the blood type and other data to the bags is difficult due to the moisture which collects on the surface of the blood bags when collecting blood. Further, a label once applied is liable to fall off. There is a further problem in that water that has not been absorbed by the Japanese paper beneath the blood bags in the package may be mistaken as leakage of the blood bag content.

Disclosure of the Invention

An object of the invention is to provide a liquid container package, which can maintain an adequate humidity therein and which can also prevent moisture from condensing on the inside of the bag.

To attain the above object of the invention, there is provided a liquid container package, which comprises a liquid container having a wall permeable to water vapor and containing a liquid, a package for hermetically wrapping one or more of said liquid containers and a humidity control member disposed between said liquid container or containers and said package and comprised of a water- and water vapor-permeable sheet and resinous material enclosed by said water- and water vapor-permeable sheet and having a water vapor absorption property, water absorption property, and a water vapor dissipation property.

It is one feature of the invention that the

humidity control member has properties which are highly absorbant of water as well as water vapor and that it also has a water vapor dissipation property, and that this humidity control member is used in lieu of Japanese paper which has a poor water absorption property and has substantially no water vapor absorption property.

It is another feature of this invention that the humidity control member can be used in a versatile fashion, i.e., it can be disposed on the bottom, the side walls or the entire inner wall surfaces of a liquid container package.

Brief Description of Drawings

Fig. 1 is a sectional view showing a relative humidity control member accommodated in a liquid container package according to the invention;

Fig. 2 is a perspective view showing an example of use of the humidity control member;

Figs. 3 and 4 are perspective views, each showing a different example of use of the humidity control member;

Fig. 5 is an exploded perspective view showing the liquid container package according to the invention;

Fig. 6 is a perspective view showing the assembled form of the liquid container package shown in Fig. 5; and

Fig. 7 is a perspective view showing a prior art liquid container package.

Best Mode for Carrying Out the Invention

The invention will now be described in conjunction with the preferred embodiments thereof with reference to the drawings.

Fig. 1 is a sectional view showing a humidity control member accommodated as a liquid or water absorber in a liquid container package according to the invention. Resinous material 2 having a water vapor absorption property, a water absorption property, and a water vapor dispersion property is provided in

an embossed form between two water- and water vapor-permeable sheets 3 (such as paper sheets). Resinous material 2 has a water absorption capacity of 10 to 1,000 cc, preferably 100 to 800 cc, more preferably 300 to 700 cc, per one gram. Such a water-absorptive resinous material as noted above is well-known; for example, an acrylic acid resin mainly composed of potassium polyacrylate (marketed under a trade name "Arasap 800A" by Arakawa Kagaku Kogyo Co., Ltd.).

10 This humidity control member has a mesh-like structure constituted by resinous material 2, water being trapped in the mesh structure. It can cope with a temperature rise or like changes to maintain a saturation state inside the package by releasing water vapor. 15 When water vapor is increased beyond the saturation state, it positively absorbs moisture. When such humidity control member is provided in the sealed liquid container package, water generated due to various causes is absorbed and dispersed by the resin particles, so 20 that it is possible to maintain at all time the saturation state inside the sealed liquid container package. In other words, it is possible to suppress dispersion of water by evaporation from the liquid container such as a blood bag and also suppress generation of water drops.

25 Now, an embodiment of the invention and a comparative example will be described with reference to the drawings.

Fig. 1 shows a humidity control member for a package for blood bags (liquid containers) according to the invention. Reference numeral 1 designates the humidity control member. Humidity control member 1 consists of an embossing of a pair of slightly water- and water vapor permeable paper sheets 3 with resinous material 2 being disposed between the paper sheets 3. Resinous material 2 has a water vapor absorption property, 35 a water absorption property, and a water vapor dissipation property; for instance, it may be a highly

water-absorptive acrylic acid resin (in the form of particles mainly composed of potassium polyacrylate [available under a trade name "Arasap 800A" by Arakawa Kagaku Kogyo Co., Ltd.,] with a water absorption capacity of 950 cc/g). Humidity control member 1 contains 20 g of the highly water-absorptive resin per 1 m².

Fig. 2 shows how the humidity control member according to the invention is used in an embossed form. As is shown, molding 4 of humidity control member 1, which has substantially the same shape as package A, is prepared and disposed in package A. After humidity control molding 4 has been set in package A, blood bags (not shown) are enclosed in package A, which is then sealed with lap B.

The method of disposing the humidity control member in package A as shown in Fig. 2 is by no means limited. For example, it is possible to use humidity control molding member 5 as shown in Fig. 3, or disposed relative humidity control molding member 6 only on the bottom of package as shown in Fig. 4.

The shapes of humidity control molding members 4 to 6 obtained from humidity control member 1 are by no means limited, and member 1 may be processed to any shape and size which conforms to package A.

Fig. 5 shows an example of packing blood bags (not shown) by using a package as shown in Fig. 2. As shown, this package is formed by using two humidity control members 4 as shown in Fig. 2. More particularly, humidity control members 41 and 42 are set in respective packages A₁ and A₂. Then, after setting the blood bags in packages A₁ and A₂, packages A₁ and A₂ are sealed with respective laps B₁ and B₂. Thereafter, packages A₁ and A₂ with the blood bags sealed therein are overlaid, face-to-face, with laps B₁ and B₂ and then their edges are heat-sealed together, thus completing the package as shown in Fig. 6.

Packages A₁ and A₂ each have a volume of 65 mm by 105 mm by 180 mm. When each of packages A₁ and A₂ contains five sets of blood containers with 200-cc of collected blood (a total liquid content of 140 cc), it
5 suitably contains 0.05 to 5 g, preferably 0.1 to 2 g, of the highly water-absorptive resin. If the resin is excessively contained therein, the moisture in package A is excessively absorbed so that the blood bag content eventually begins to lack water content. If the resin
10 is insufficiently contained therein, on the other hand, failure of the resin to sufficiently absorb the moisture is liable.

A temperature cycle test was conducted on a liquid container package consisting of two packages A₁ and A₂
15 with blood bags sealed therein and sealed together, face-to-face, with laps B₁ and B₂. The test was conducted by transferring the package, every 3 hours, between a temperature controller at 60°C and a refrigerator at 6°C and repeating this cycle ten times,
20 and subsequently checking the extent of wetting to the surface of the blood bags. A like temperature cycle test was conducted under the same conditions on a package (refer to Fig. 7), which was formed in the same manner as the package shown in Fig. 6, except that
25 conventional Japanese paper (or Japanese art paper) was used in lieu of humidity control member 4 according to the invention and was disposed under the bottom of the individual blood containers.

With the package according to the invention, the
30 surface of the blood bags on the upper side of humidity control member 4 was proven to be only slightly wet, and the blood bag surface on the lower side of humidity control member 4 was perfectly dry. With the contrasting package formed by using Japanese paper, the blood
35 bag surface on the upper side of the Japanese paper was considerably wet, and the blood bag surface on the lower side of the Japanese paper was proven to be extremely

wet.

It was thus confirmed that the wetting of the blood bag surface can be extremely remedied in cases where humidity control member 4 is used as compared to the case where the Japanese paper was used.

As has been described in the foregoing, according to the invention, it is possible to maintain the saturation state of humidity in a sealed package containing blood bags or like liquid containers. It is thus possible to prevent water vapor from condensing inside the package as well as to suppress the dispersion of water content from the liquid container. Further, since the liquid container surface is not wet, a label indicating the blood type or like data can be reliably applied to the liquid container surface.

Industrial Applicability

As explained above, a liquid container package according to this invention is useful for every kinds of sealed package which is required to keep the inside thereof free from the generation of moisture condensation, and in particular for a package which is adapted to keep a vapor permeable liquid container therein for a long period of time.

Claims:

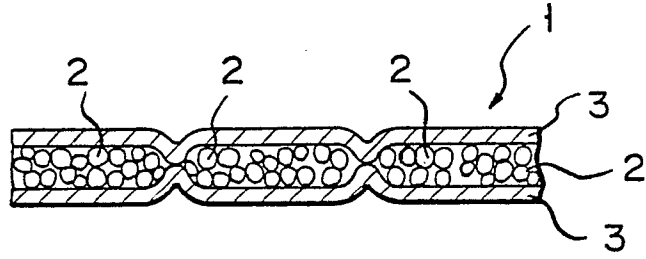
1. A liquid container package comprising a liquid container having a wall permeable to water vapor and containing a liquid, a package for hermetically wrapping one or more of said liquid containers, and a humidity control member disposed between said liquid container or
5 containers and said package and comprising a water- and water vapor-permeable sheet and resinous material enclosed by said water- and water vapor-permeable sheet and having a water vapor absorption property, a water
10 absorption property and a water vapor dissipation property.
2. The liquid container package according to claim 1, wherein said resinous material is in the form of resin particles.
- 15 3. The liquid container package according to claim 2, wherein the water absorption capacity of said resin particles is 10 to 1,000 cc/g.
4. The liquid container package according to claim 3, wherein the water absorption capacity of said
20 resin particles is 100 to 800 cc/g.
5. The liquid container package according to claim 4, wherein the water absorption capacity of said resin particles is 300 to 700 cc/g.
6. The liquid container package according to
25 claim 1, wherein said liquid container is a blood bag.
7. The liquid container package according to claim 1, wherein said resin particles are contained in a quantity such that the liquid container surface is not substantially wetted and that the water content is not
30 excessively absorbed in the liquid container content.
8. The liquid container package according to claim 1, wherein said humidity control member is disposed on the bottom of said package.
9. The liquid container package according to
35 claim 1, wherein said humidity control member is

disposed on the bottom and side walls of said package.

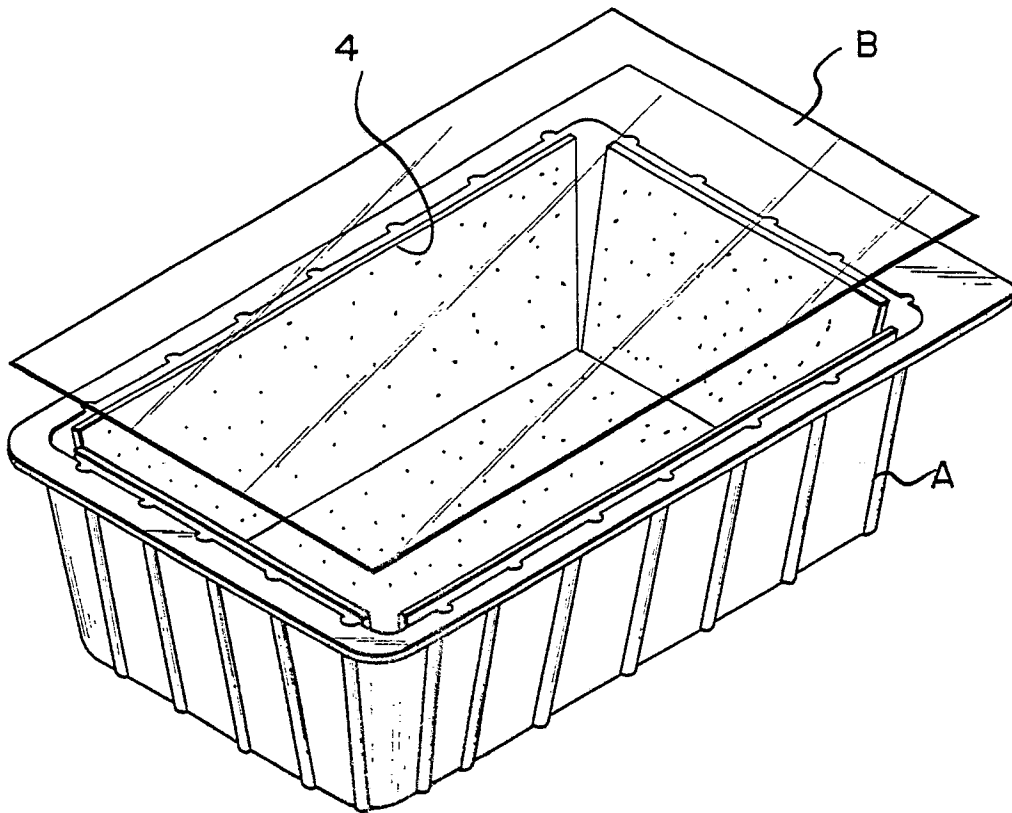
10. The liquid container package according to claim 1, wherein said humidity control member is disposed on substantially the entire inner wall surfaces of said package.

11. The liquid container package according to claim 1, wherein said resin particles are contained by 20 g per 1 mm² of said humidity control member.

12. The liquid container package according to claim 1, wherein said resinous material consist of an acrylic acid resin mainly composed of potassium polyacrylate.



F I G. 1



F I G. 2

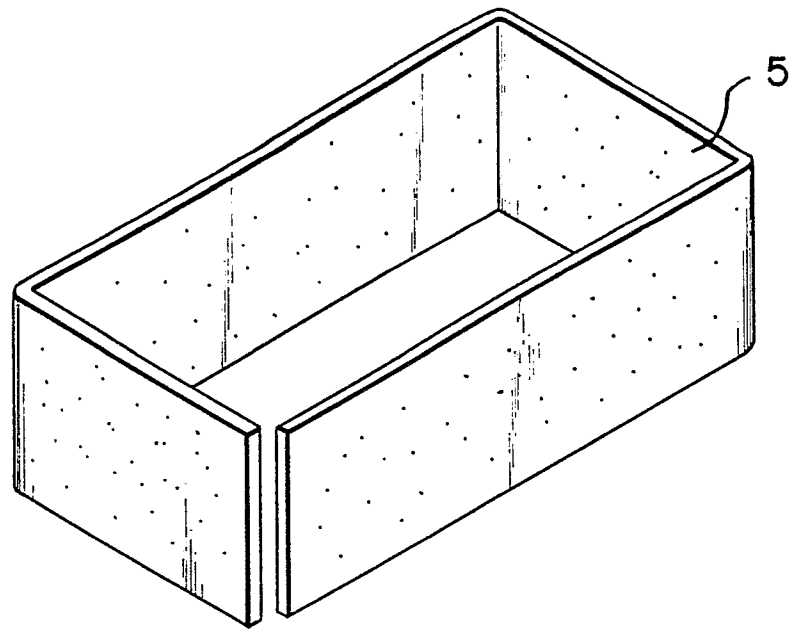


FIG. 3

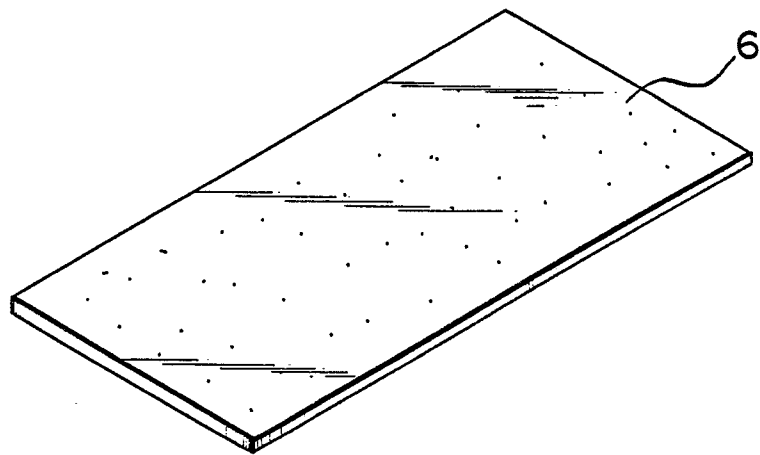


FIG. 4

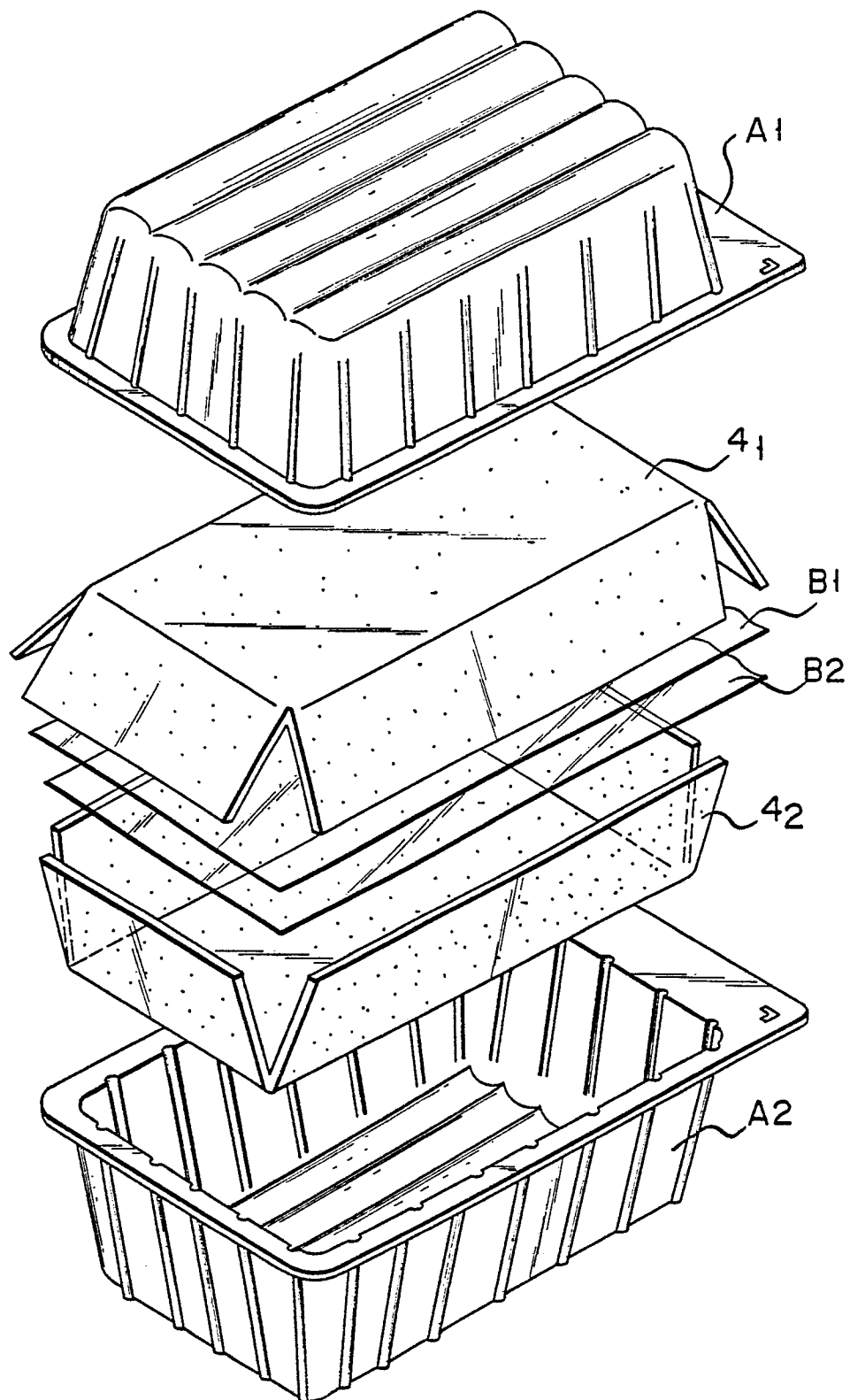


FIG. 5

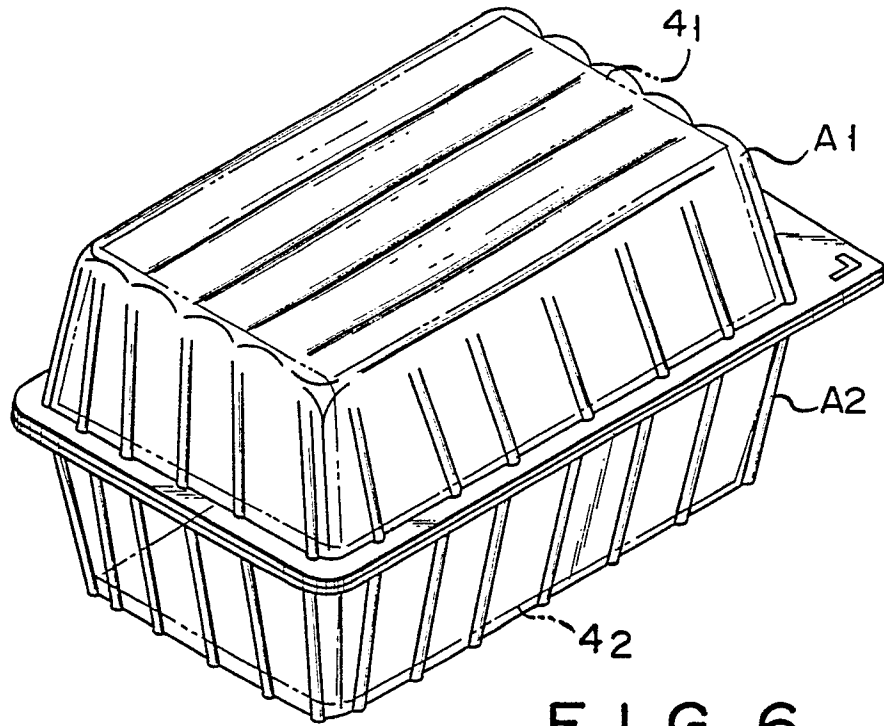


FIG. 6

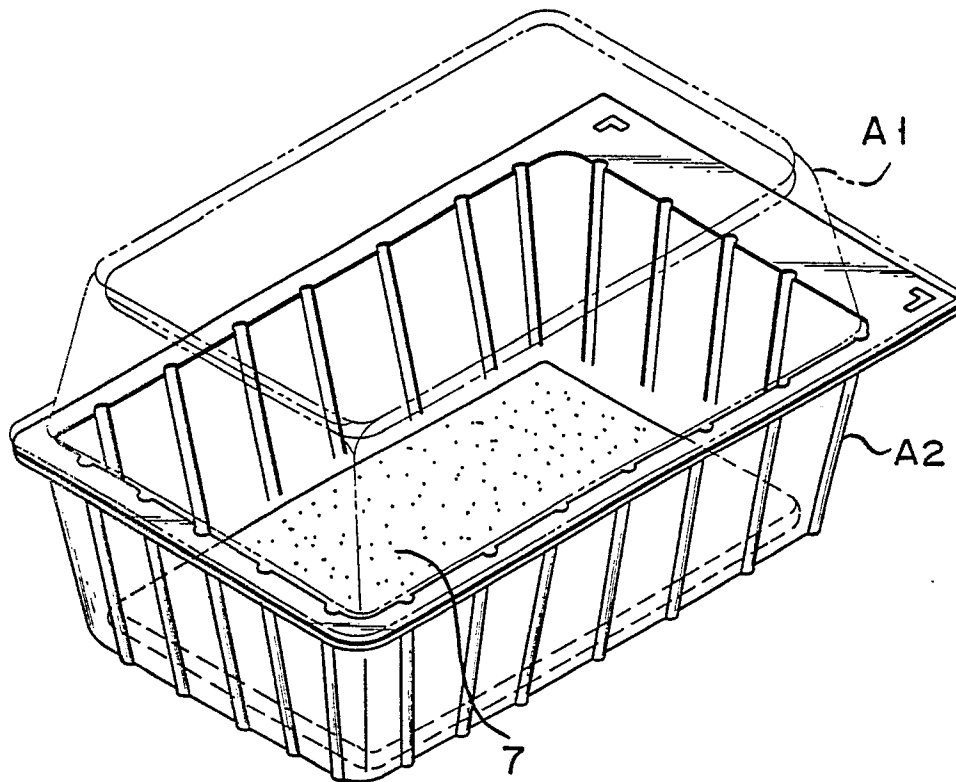


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP88/00497

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ¹ According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl⁴ B65D81/26		
II. FIELDS SEARCHED Minimum Documentation Searched ⁷ Classification System : Classification Symbols IPC B65D81/26, B01D53/14, 53/26, A61J1/00 Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched ⁸ Jitsuyo Shinan Koho Kokai Jitsuyo Shinan Koho 1926 - 1988 1971 - 1988		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	JP, B2, 58-29106 (Terumo Corporation) 20 June 1983 (20. 06. 83) (Family: none)	1
Y	JP, A, 62-299265 (Terumo Corporation) 26 December 1987 (26. 12. 87) (Family: none)	1
Y	JP, U, 60-83026 (Marukyo Shoji Kabushiki Kaisha) 8 June 1985 (08. 06. 85) (Family: none)	2-12
Y	JP, U, 60-136739 (Dainippon Printing Co., Ltd.) 11 September 1985 (11. 09. 85) (Family: none)	2-12
Y	JP, A, 62-287865 (Yamani Yakuhin Kabushiki Kaisha) 14 December 1987 (14. 12. 87) (Family: none)	1-12
* Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "Z" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search July 25, 1988 (25. 07. 88)		Date of Mailing of this International Search Report August 8, 1988 (08. 08. 88)
International Searching Authority Japanese Patent Office		Signature of Authorized Officer

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	JP, A, 60-134877 (Showa Denko Kabushiki Kaisha) 18 July 1985 (18. 07. 85) (Family: none)	1-12
Y	JP, U, 57-13477 (Dainippon Printing Co., Ltd.) 23 January 1982 (23. 01. 82) (Family: none)	1-12
X	JP, U, 61-134969 (Tokyo Copal Kagaku Kabushiki Kaisha) 22 August 1986 (22. 08. 86) (Family: none)	2-12

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter¹² not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out¹³, specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X JP, A, 58-193678 (Kao Corporation)
 11 November 1983 (11. 11. 83)
 (Family: none)

12

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

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