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(54) COMPOSITE CONTAINER

(57) To provide, without the use of materials that would be environmentally problematic, composite containers that can be utilized as food cans and beverage cans having pressure resistance. The composite containers are a metal lid made from sheet metal the internal face of which is coated with polypropylene or polyester, and a container body the inner surface of which is composed of polypropylene or polyester, which are respectively joined by high-frequency welding.

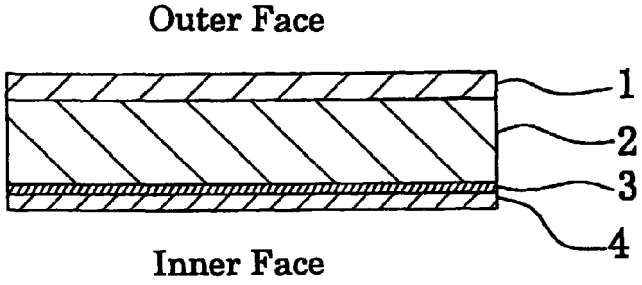

Fig. 1

EP 1 033 315 A1

Description

Technical Field

[0001] The present invention relates to containers utilized for beverage cans and food cans to which part-opening lids and full-easy-open lids are joined.

Background Technology

[0002] Conventional metal cans for beverage and food canning wherein the seal is secured by dual-ply roll crimping a metallic lid onto a metallic body with intervening packing are well known. To prevent the metal odor from migrating into the interior contents, and at the same time to prevent the interior contents from corroding the metal, polyepoxyphenol thermosetting resin paints are coated on the inner face. Polyepoxyphenol thermosetting resin paints are coated on by heating several minutes at 150 - 250 °C. Problems of unsatisfactory food-item health and safety have been pointed out, however, wherein as residual solvents and raw materials, unreacted and low-molecular weight matter from the substances utilized, and as additives, low-molecular weight components from the hardeners and plasticizers utilized, migrate into the contents of the metal can, spoiling the original taste and flavor that the food items and beverages possess; or else unreacted bisphenol A matter that is a polyepoxyphenol raw ingredient said to be an environmental hormone dissolves out.

[0003] In recent years, laminated sheet metals such as PET/sheet iron, PET/sheet aluminum, PP/sheet iron and PP/sheet aluminum have been developed as substitutes for inner-surface paints in metal cans (Japanese Laid-Open Pat. App. Nos. 58-82717, 61-149340, 63-111048, 63-111049, 06-320669, and Japanese Pat. No. 2515581).

[0004] These sorts of laminated sheet metal are draw-worked to make two-piece can bodies, welded to make three-piece can bodies, and made into metal lids (Japanese Laid-open Pat. App. No. 07-331196). Such laminated sheet metals and laminated metal lids are joined by dual-ply roll crimping; in which instances packing is interposed in the joint. Herein, health and safety problems by transmission to the food-item contents from the body and lid, because they are polymer-laminated, disappear. Packing is nonetheless utilized in the dual-ply roll crimp portion, however, and residual organic solvents form the packing, low-molecular weight components from the packing, and low-molecular weight components from the plasticizer additives migrate into the contents. Health and safety problems by transmission from the can as a whole are therefore not solved.

[0005] Further, an example is known wherein a metal lid whose joint surface is coated with a thermoplastic polymer is joined to the metal body by high-frequency heating (Japanese Laid-Open Pat. App. No. 01-254545). Apparently, however, since ordinary paint is applied on the metal containers overall, which are to be food-item containers, the environmental issues are not taken into consideration.

[0006] Accordingly, in order to overcome problems in the conventional technologies such as noted above, an object of the present invention is to provide pressure-resistant containers that can be utilized as food cans and beverage cans, wherein environmentally problematic materials such as epoxyphenol resins and packings are not used.

Brief Description of the Drawings

[0007]

Fig. 1 is a sectional view of a sheet-steel metal laminate concerning the present invention;
Fig. 2 is a sectional view of a laminated metal lid concerning the present invention;
Fig. 3 is an enlarged sectional view of a roll crimp portion in a second embodiment of the present invention;
Fig. 4 is a sectional view of a container body concerning the present invention; and
Fig. 5 and Fig. 6 are enlarged partial views of a container body.

Disclosure of the Invention

[0008] A composite container by the present invention is formed from a metal lid made out of sheet metal the inner face of which is covered with polypropylene or polyester, and a container body the inner face of which is constituted by polypropylene or polyester, which are respectively joined by high-frequency heating.

Materials

[0009] A sheet-steel metal laminate as an example of a material used in the present invention is shown in Fig. 1.

[0010] This laminated steel sheet is provided with an external paint-coating layer, a PP/modified-PP layer, or a

PET/adhesive-resin layer **1** on the external side of a steel sheet or aluminum sheet **2**. Further, a PP or PET covering layer **4** is provided on the internal side of the steel sheet or aluminum sheet **2**, on an intervening adhesive resin layer **3**.

[0011] In the present invention, the joining surfaces of the lid and the container body, as well as the container inner surface that is in contact with the can contents, are formed with polypropylene (which is abbreviated to PP) or polyester. This accordingly makes thermal joining by high-frequency heating possible; moreover, despite contact with food items, there is no dissolving out of harmful components. To obtain strong welds by high-frequency heating requires that the surfaces of the lid and body are both together formed with either polypropylene or polyester.

[0012] As polypropylene utilized in the present invention, other than ordinary propylene homopolymers for molding, ethylene copolymers are utilized. Polypropylene lamination onto the metal lid and body can be implemented by known techniques; it is done ordinarily, however, by co-extruding PP/modified-PP (a modified PP is, for example, maleic anhydride graft copolymer), and heat-welding the film onto sheet metal. Utilizing modified PP ensures adhesiveness between the face of the metal and the polymer layer.

[0013] Among polyesters, as those utilized in the present invention, preferable are polyethylene terphthalate (which is abbreviated to PET), as well as copolymers wherein ethylene terphthalate repeating monomers are dominant. The method of laminating the polyester onto the face of the metal can be the implementation of a known technique. One of these, as disclosed in Japanese Laid-Open Pat. App. No. 07-90094, is the method in which the face of the metal is heated to heat-weld a PET laminating film thereon. Another means, furthermore, is the method of applying to one face of a polyethylene terephthalate film an adhesive polymer having metal as well as polyester affinity, with which a polyester facing is formed onto the face of a metal with an adhesive polymer layer intervening. As a lamination method wherein such an adhesive polymer is employed, utilizing the method disclosed in Japanese Pat. No. 2515581 is preferable.

[0014] Sheet iron and sheet aluminum ordinarily employed as a container raw materials are utilized as metals for forming the container lids or bodies utilized in the present invention. The foregoing publicly known processes can be carried out for the polymer lamination.

Lid

[0015] To ensure necessary pressure resistance in food cans or beverage cans for long-term preservation, the lids are made from sheet metal (ordinarily, 0.10 - 0.40mm sheet thickness, suitably 0.15 - 0.30mm), and at least the surface that joins with the body, as well as the inner faces comprising the container, are laminated with polypropylene or polyester. The lids require being laminated on the internal side that contacts the body with a film of the same sort of plastic as the body: wherein the plastic material composing the body is PP, they are laminated with a PP film, and wherein it is PET, with a PET film. For rust prevention, the same plastic film as on the internal side may be laminated, or paint coated onto, the external side of the lid. Examples that may be given of preferable compositions are: PP/modified-PP/metal/modified-PP/PP; PET/adhesive agent PET/adhesive agent layer/metal/adhesive agent layer/PET; PET/metal/PET. The thickness of the film for the lamination layer is from 10μm to 200μm; suitably 20 - 70μm.

[0016] Laminated sheet metal made accordingly is worked into an ordinary metal lid by means of a metal mold. Herein, the flange portion formed circumferentially on the metal lid, wherein it is joined only by high-frequency heating, inasmuch as it is heat-welded with the flange portion of the body should be the same form as the flange shape of the body, and most commonly should be a flat shape. Wider widths for the flange, being that it is heat-welded with the body, are more stable, but if too wide, the attractiveness of its outward appearance worsens; likewise if too narrow its heat-welding stability worsens. The flange width here is ordinarily 1mm - 10mm; suitably 2mm - 7mm. Wherein roll crimping is also employed, the shape should be suited to ordinary dual-ply roll crimping. Moreover, depending on need, to obtain an easy-opening seal the metal portion on the lid can be scored with a score line in a way that does not damage the laminated PP or PET film. And the lid can be made part-opening or full-opening by attaching a pull-tab.

[0017] An example of a lid is shown in Fig. 2. The lid is formed from a lid main body **11**, and a flange portion **13** formed on the outer peripheral circumference of the lid main body **11**. The lid main body **11** has a round, shallow-pan portion **12**. An encircling score line **16** is formed in the outer periphery of the shallow-pan portion **12**. Further, a pull-tab **15** for seal-breaking is provided on one side of the shallow-pan portion **12**. Also, the aforementioned flange width is the portion indicated in Fig. 2 with reference numeral **14**, and is, namely, the portion that is heat-welded with the body.

Body

[0018] The body is welded with the lid. Further, being that their joint is formed on the body inner face, at least the joint on the body inner face ought to made from the same sort of plastic material as the film that is laminated onto the lid. Then, wherein the film that is laminated onto the lid is of PP, a body made from a PP material is utilized; likewise, wherein the film that is laminated onto the lid is of PET, a body made from a PET material is utilized.

[0019] The body may be a single-layer plastic material or a multi-layer base material compounded with a barrier backing that does not pass oxygen or vapor. In the single layer instance, wherein the plastic film laminated onto the lid

is PP, PP injection-molded articles, vacuum/compressed-air-molded articles and blow-molded articles are utilized. Further, similar to the single-layer instance, wherein the film laminated onto the lid is PET, PET injection-molded articles, vacuum/compressed-air-molded articles and two-roll mill-molded articles are utilized. In particular, PET-laminated metal lids with two-roll mill-molded PET articles can be employed as pressure-resistant containers for carbonated beverages and beers by making the construction of the lid and the body respectively pressure-resistant.

[0020] Wherein the body is of multi-layered construction, its being adhesively joined with the lid requires that the same kind of plastic as the film laminated onto the lid is used on the side that becomes the internal face of the container that contacts the lid. Wherein PP is the film laminated onto the lid, PP is utilized, and wherein PET, PET is.

[0021] As bodies of multi-layered construction thus, bodies for two-piece cans obtained by extruding laminated sheet metal that is the same as the lids, and bodies for three-piece cans obtained by welding are utilized. Further, the bodies of multi-layered construction are made by inserting PP/barrier base material/PP, or PET/barrier base material/PET film laminate into a metal injection mold and insertion molding. Examples of barrier base materials used herein are films in which SiOx or Al_2O_3 is vapor-deposited onto metal foil such as aluminum foil or iron foil, or onto PET; and resin films of EVOH, PVDC, PAN or NY. Further, bodies of multi-layered construction may be made vacuum/compressed-air-molding sheets composed of PP/barrier base material/PP, or PET/barrier base material/PET. For the barrier base material in this case, EVOH, PVDC, PAN or NY resins that conform to the extension of the forming body molded by vacuum/compressed-air are utilized. Bodies of PP/barrier base material/PP composition may be made by blow molding. Moreover, by preparing parisons of PET/barrier base material/PET, setting and blow-forming the parisons in a metal blow mold, two-roll mill-molded articles are made accordingly. In particular, combinations of laminated metal lids with laminated metal trunks, as well as PET-laminated metal lids with two-roll mill-molded articles, can be employed as pressure-resistant containers for carbonated beverages and beers by making the construction of the lid and the body each pressure-resistant. The bodies, since they are only weld-joined with the lids, must be contoured to correspond with the lid flange. As to the width of the flange, that it is joined only by high-frequency heating limits the lid's flange width, wherein a width 1mm narrower than the ordinary width of lid flanges is best. The contour of the mouth must be suited to roll crimping wherein roll crimping is employed jointly. The shape, as with mouths on ordinary metal cans, should flare thin to match the contour of the flange on the lid.

[0022] Fig. 4 depicts an example of a body. Further, examples of a flange **20a** on the body **20** shown in Fig. 4 are shown enlarged in Fig. 5 and Fig. 6.

[0023] The body **20** has a main body **20b**, and a flange **20a** formed to project outward encircling the circumferential portion that is the opening end face of the main body **20b**. The body **20** then is a two-piece can obtained by extruding laminated sheet metal that is the same as the lid, and as shown enlarged in Fig. 5, is constructed by laminating modified pp **22** and pp **23** onto either face of sheet iron **21**. The flange **20b** may be composed as shown in Fig. 5, or it may be composed as shown in Fig. 6. In the example of a flange shown in Fig. 6, to prevent sheet-iron rust from exuding from the flange end face, the extremity has been wound inward.

Joint

[0024] Radiant heating, hot plate heating, ultrasonic heating and high-frequency heating would be means for supplying heat.

[0025] Nevertheless, the heat quantity is insufficient with radiation. Further, in the hot plate system, because metal lids are thick, it takes time for the heat to be transmitted to the contact interface between the lid and the trunk where they are welded. Moreover, with ultrasonic heating, the body and the lid must be held precisely on the jig, and further, the horn has to be kept from separating from the joint face. The trouble of doing so makes this undesirable as a means for supplying heat.

[0026] Against these, high-frequency heating is most suitable. High-frequency magnetic field induction-heats the lid, which transmits heat directly to the plastic that is laminated on the metal sheet and that contacts the body, and furthermore makes the appearance of the joint satisfactory. Nonetheless, to increase its stability a light supplemental roll-crimp should made in the joint.

[0027] The welding of the lid with the body is carried out as in the following. Namely, a high-frequency magnetic field from a high-frequency current strikes the joint portion, and the eddy-current Joule losses developing in the sheet metal of the lid heat the sheet metal, which fuses and accordingly weld-joins the laminated plastic and the plastic that is same kind as the body.

Embodiments

Embodiment 1

[0028] As the lid, a metal lid referred to as a #401-gauge was manufactured using a sheet metal laminate compris-

ing, from the internal-face side, PP (48μ)/modified PP (2μ)/sheet iron (200μ)/modified PP (2μ)/PP (28μ). The flange width was made 5mm, and the lid was notched with a score line and fastened with a pull-tab to make it full-opening. As the body, a body 40mm in height, referred to as a #401-gauge, was manufactured by extrusion-molding using a sheet metal laminate comprising, from the internal-face side, PP (48μ)/modified PP (2μ)/sheet iron (200μ)/modified PP (2μ)/PP (28μ). A flange was provided on the opening; the flange width was made 4mm. The body was filled with 250 ml distilled water, and the lid was fit on and the lid and body were welded with a high-frequency heat-welder. The container filled with distilled water was enclosed into a retorting vessel, wherein 125 °C/40-minute hot-water retort-sterilization was carried out. The F_0 value therein was 38.

[0029] Meanwhile, a body and a bottom lid were formed from sheet iron utilized in ordinary metal cans, coated on the inner face with epoxyphenol at a thickness of 0.23mm. With packing in between, these were dual-ply roll-crimped to form a container body, which was filled with 250ml distilled water. A full-easy-open lid from an A1 sheet on the inner face of which epoxyphenol is coated was roll-crimped, with packing intervening, onto the body to form a container, made to be a comparison sample. This was enclosed into a retorting vessel, wherein 125 °C/40-minute hot-water retort-sterilization was carried out. The F_0 value therein was 40.

[0030] Twenty-two panelists made a sensory appraisal of a variety of samples accordingly obtained, taste-drinking the distilled water contents for off-tastes and off-smells transmitted from the container to the content distilled water. Further, to compare the amount of dissolving out from the containers, the ultraviolet absorbance, and the evaporation residues due to the distilled water evaporative dry-hardening were assayed. Also, identification of the residues was performed by a gas-chromatograph mass analyzer. These results are shown in Tables 1, 2, 3 and 4.

TABLE 1

Distilled Water Sensory Appraisal

22-Member Panel

CONTAINER	CATEGORY				
	Off-taste strength	Off-taste Unpleasantness	Bitter Taste Strength	Bitter Taste Unpleasantness	Desirability As Drinking Water
Present Invention	3 Pers.[1]	3[1]	5[2]	5[2]	19[1]
Conventional Metal Can	19 Pers.	19	17	17	3

[1]: Level of significance at 1% critical probability
[5]: " 5% "

[0031] Blindfold test in accordance with each category by pouring post-retorting distilled water into a cup.

TABLE 2

Ultraviolet Absorbance			
CONTAINER	**CATEGORY**		
	Absorbance (-logT)		
	195nm	225nm	330nm
Present Invention	0.08	0.02	0.00

TABLE 2 (continued)

Ultraviolet Absorbance			
CONTAINER	**CATEGORY**		
	Absorbance (-logT)		
	195nm	225nm	330nm
Conventional Metal Can	0.72	0.23	0.03

Post-retorting distilled water assayed in 1 cm-length cells

TABLE 3

Evaporation Residues in Distilled Water	
CONTAINER	**CATEGORY**
	Evaporation Residues
Present Invention	12.0 mg/m^2
Conventional Metal Can	41.5 mg/m^2

[0032] Evaporation residues converted to mg/m^2 units from container surface accumulation obtained after evaporative dry-hardening post-retorting distilled water in a rotary evaporator, and further by a 105 °C, 4-hour drying.

TABLE 4

Identification of Distilled Water Evaporation Residues	
CONTAINER	**CATEGORY**
	Identification of Distilled Water Evaporation Residues
Present Invention	antioxidants, others
Conventional Metal Can	bisphenol A, bisphenol A derivatives, plasticizers, others

[0033] From Table 1, it is evident that there is a high degree of significant difference in each of the categories at both 1% critical probability and 5% critical probability; and that against scarce transmission of off-taste/off-smell to the distilled water with the article by the present invention, transmission of any manner of off-flavors occurred with the conventional metal can.

[0034] From Table 2, with the magnitude of the absorbance being the criterion for the extent to which organic matter in the distilled water has dissolved out, it is evident that however much eluent matter dissolved out with the conventional metal can.

[0035] From Table 3, the quantity as actual residues that dissolved out is verified, which data evidence that much eluent matter dissolved out with the conventional metal can.

[0036] Data wherein what sort of substance the eluent matter is was summarily examined is had from Table 4. Eluent matter from the conventional metal can centered on bisphenol A, said to be an environmental hormone, which is undesirable for food item health and safety.

Embodiment 2

[0037] As the lid, a metal lid referred to as a #211-gauge was manufactured using a sheet metal laminate comprising, from the internal-face side, PET (30μ)/modified PP (2μ)/sheet iron (200μ)/PET (30μ). The flange width was made the form of metal lids for ordinary roll-crimping, and the lid was notched with a score line and fastened with a pull-tab to make it half-opening. As the body, a two-roll-mill, single-layer PET bottle of 80mm diameter and 120mm height, was manufactured. The mouth was shaped to fit the form of the metal lid for roll-crimping. The bottom was molded into a reverse-dome type pressure resistant construction.

[0038] After filling the body with water, fitting on the above-mentioned lid and performing light roll-crimping with a metal-can seamer, a sample having a joint as shown in Fig. 3 was manufactured by welding the lid to the body with a high-frequency heat-welder. The joint strength of the body was examined by opening a hole in the lid of the sample and pressure-entering water with a water-pressure pump, but even at 10kg/cm^2 water pressure the joint did not peel apart.

[0039] Meanwhile a sealed-in beer sample was manufactured by cooling a commercially available beer to 0 - 5 °C, pouring it gently into the foregoing body, fitting on the above-noted lid and welding the lid to the body with a high-frequency heat-welder. The sample was left standing one month at room temperature, yet neither peeling apart of the joint nor any abnormalities were recognized. The pressure of the beer herein at room temperature was 2.5 kg/cm^2.

Actions/Effects

[0040] Containers are manufactured wherein a metal lid onto which PP or PET is laminated is heat-welded by high-frequency heating onto a multi-layer body the surface of which is constituted from the same kind of plastic material as that of the lid, or onto a single-layer body made from the same kind of plastic as that of the lid. Herein (1) because no polyepoxyphenol paints are utilized, there is no dissolving-out of bisphenol A, said to be an environmental hormone; (2) because no packing for dual-ply roll-crimping is utilized, there is no problem of dissolving-out of residual organic solvents and low-molecular weight components from packing; and (3) containers desirable for food-item health and safety are provided wherein transmission of off-tastes/off-smells to the contents is scarce, and the original palatability and aroma the food items possess are not spoiled. Carrying out both high-frequency heating and dual-ply roll-crimping together on the joint forms the most stabilized joint portions--that follow deformation of the flange when dropped and in which no pinholes or slow leaks arise. Utilizing a pressure-resistant body such as a two-roll-milled bottle for the body enables containers for carbonated beverages to be provided.

Claims

1. A composite container wherein a metal lid made out of sheet metal the inner face of which is covered with polypropylene or polyester, and a container body the inner face of which is constituted by polypropylene or polyester, are respectively joined by high-frequency welding.

2. The composite container set forth in claim 1, wherein

   said inner faces of the metal lid and container body are coated with polypropylene film; and
   the coating layer of said polypropylene film is obtained by heat-welding a coextrusion film made from PP and modified PP onto sheet metal.

3. The composite container set forth in claim 1, wherein

   said inner faces of the metal lid and container body are coated with polyester film; and
   the coating layer of said polyester film is obtained by heating the metal faces and heat-welding a PET laminating film thereon.

4. The composite container set forth in claim 1, wherein

   said inner faces of the metal lid and container body are coated with polyester film; and
   the coating layer of said polyester film is obtained by applying to one face of a polyethylene terephthalate film an adhesive polymer having metal as well as polyester affinity, and coating on with the adhesive polymer layer intervening.

5. The composite container set forth in claim 1, wherein said metal lid is formed from sheet metal of sheet thickness from 0.10mm to 0.40mm for securing requisite pressure resistance as a long-term storage food can or beverage can.

6. The composite container set forth in claim 5, wherein said metal lid is formed from sheet metal of sheet thickness from 0.15mm to 0.30mm for securing requisite pressure resistance as a long-term storage food can or beverage can.

7. The composite container set forth in claim 1, wherein a plastic film made from the same kind of material as said container body is laminated on the internal face wherein said metal lid contacts said container body.

8. The composite container set forth in claim 1, wherein the coating layer thickness on the inner surface of said metal lid is from 10μm to 200μm.

9. The composite container set forth in claim 1, wherein the coating layer thickness on the inner surface of said metal lid is from 20μm to 70μm.

10. The composite container set forth in claim 1, wherein a flange portion for joining said container body is formed circumferentially on the outer peripheral portion of said metal lid, and wherein the width of said flange portion is 1mm - 10mm.

11. The composite container set forth in claim 10, wherein the flange portion being for joining said container body and formed encircling the outer peripheral portion of said metal lid, the width of said flange portion is 2mm - 7mm.

12. The composite container set forth in claim 10 or 11, wherein the outer peripheral circumference on the opening end-face of said container body is wound into and roll-crimped to said metal lid flange portion, after which the outer peripheral circumference of said container body and the metal lid flange portion are fastened by high-frequency welding.

13. The composite container set forth in claim 10 or 11, wherein a flange portion that joins to the flange portion of said metal lid is formed on the outer peripheral circumference of said container body, and the container body flange portion is formed 1mm narrower than the flange width of said metal lid.

14. The composite container set forth in claim 1, wherein the joint with said metal lid in the inner face of said container body is composed from plastic material of the same kind as the film coated on the inner face of said metal lid.

15. The composite container set forth in claim 1, wherein said container body is constituted by a molded article made from a single-layer plastic material.

16. The composite container set forth in claim 1, wherein said container body includes a barrier base material and a polypropylene or polyester coating layer provided on the barrier base material.

17. The composite container set forth in claim 16, wherein the coating layer on said container body is formed from the same kind of material as the coating layer on said metal lid inner face.

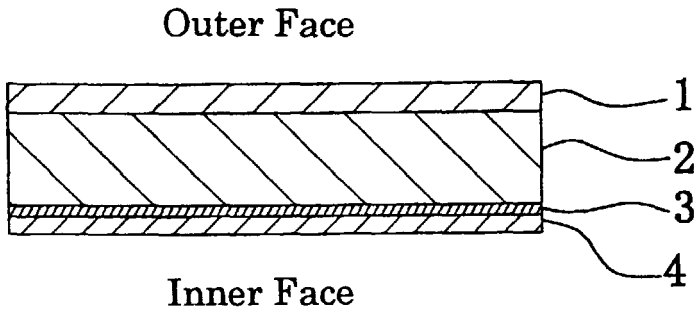

Fig. 1

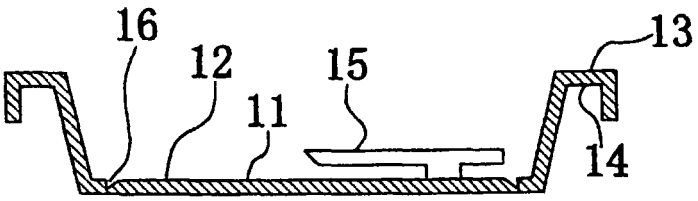

Fig. 2

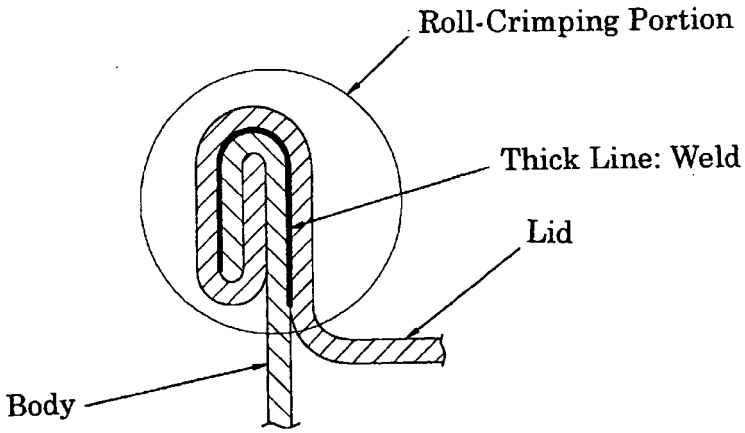

Fig. 3

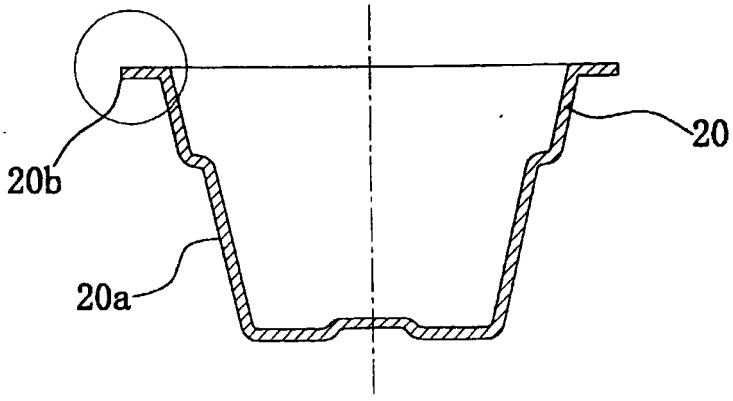

Fig. 4

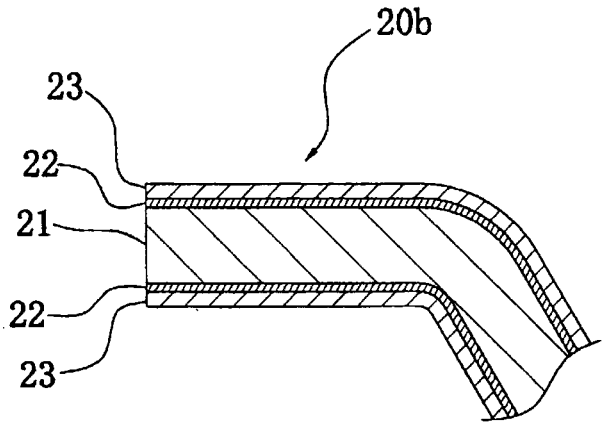

Fig. 5

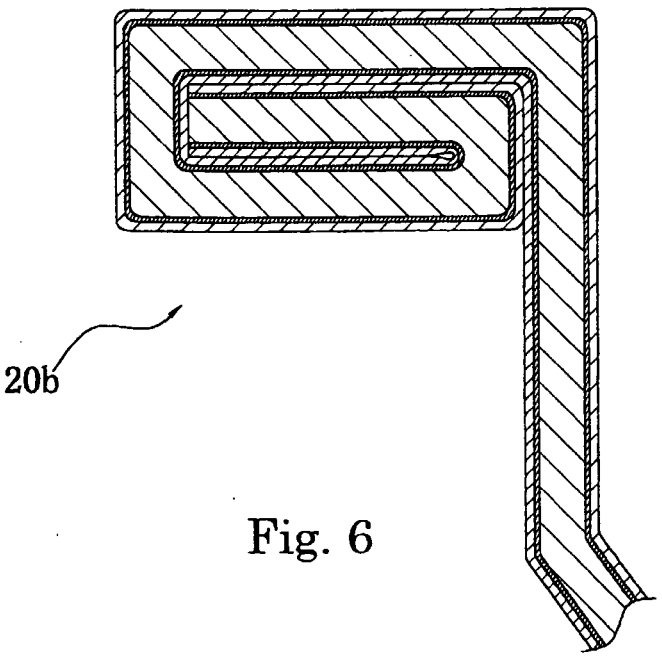

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP99/03312

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] B65D25/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[6] B65D25/14, 6/28-6/32, 8/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-1999
Kokai Jitsuyo Shinan Koho 1971-1999 Jitsuyo Shinan Toroku Koho 1996-1999

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP, 5-132061, A (Fujii Yoki Kogyo K.K.), 28 May, 1993 (28. 05. 93), Claims ; Par. No. [0011] (Family: none)	1-14 16, 17 15
Y	JP, 1-254545, A (Dainippon Printing Co., Ltd.), 11 October, 1989 (11. 10. 89), Claims (Family: none)	15
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[x] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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