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(54) **Package structure for thin display apparatus and method of packing thin display apparatus**

(57) A thin display apparatus is packed in a package box. A reinforced plate is attached to the display apparatus. The reinforced plate has a first end portion, a second end portion, a middle bent portion and a buffer member fixed to the first end portion. The first and second portions face each other with the bent portion located therebetween and connected thereto. The reinforced plate is attached to the display apparatus so that the bent portion is set on a top portion of the display apparatus at a top side, the buffer member is positioned at a front side of the display apparatus as facing a display screen and the second portion is positioned at a rear side of the display apparatus. A cushion member is attached to the reinforced plate so that the cushion member is set on the bent portion set on the top portion.

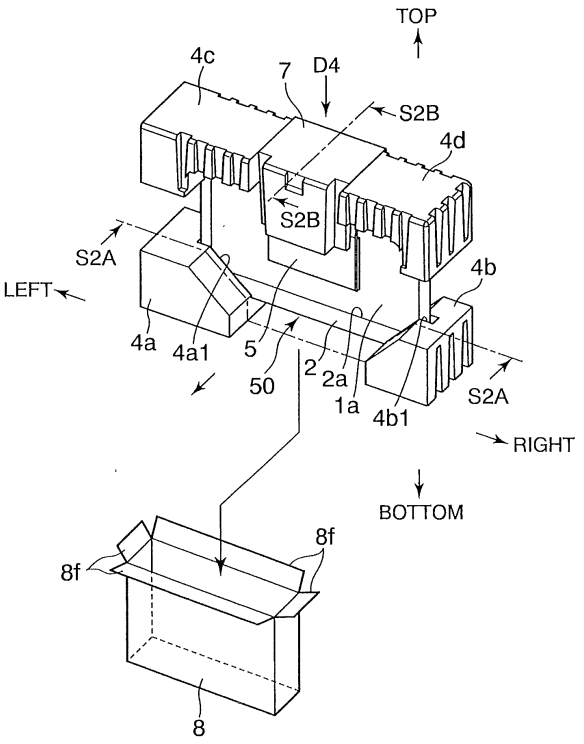

FIG. 5

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a package structure for a thin display apparatus and a method of packing a thin display apparatus.

[0002] There are known package structures for use in shipping thin display panels such as liquid crystal panels and organic EL panels, and also thin display apparatuses equipped with such a thin display panel. Examples of known package structures are a common package structure with buffer members provided at four corners of an article to be packed for supporting the article and an improved package structure for a thin display apparatus disclosed in Japanese Un-Examined Patent Application Publication No. 2006 - 232360 (referred to as Document 1, hereinafter).

[0003] Document 1 discloses a package structure for use in packing a liquid crystal television in a corrugated cardboard box with holding members to be in contact with both ends of the television at the bottom and top sides thereof. The package structure features a reinforced plate that is turned around the television in the vertical direction to wrap the television, with a sponge plate attached to the reinforced plate to precompress the center region of a display panel in the lateral direction.

[0004] According to the package structure in Document 1, the sponge plate minimizes jolts of the center region of the display panel that are generated by shocks, vibration, etc., applied to the television while being shipped. Thus, a thin display apparatus, such as a liquid crystal television, can withstand shocks, vibration, etc., generated during shipping even if a display panel is relatively large.

[0005] However, there is a strong demand for lighter-weight and thinner display panels and apparatuses with a larger screen, for a variety of installation types such as hung on wall and ceiling.

[0006] Light weight display panels and apparatuses are achieved with light metals such as aluminum, in place of metals such as iron, for display panel frames that support a thin display panel and cabinets in which a thin display panel is installed. Such a light metal offers a light weight of around 6 kg which used to be 10 kg or so for thin display panels and apparatuses.

[0007] Such light weight display panels and apparatuses, however, have a tendency of low stiffness compared to heavy display panels and apparatuses of the same screen size.

[0008] Thin liquid crystal display panels are achieved with a thin cell panel, optical sheet, diffusion plate, and other thin components with a small distance between these components. The thinness of 10 mm or less has been achieved for the thinnest part of display panels, which used to be 30 mm or more.

[0009] Such light-weight and thin display panels and apparatuses, however, suffer several problems when packed in a corrugated cardboard box and shipped.

[0010] A first problem is that a cell panel is damaged at the rear side due to rubbing or hitting each other between the cell panel and an optical sheet provided behind the panel when vibration is externally applied.

[0011] This problem is caused by a thinner structure with a smaller distance between the cell panel and the optical sheet, in addition to that a thinner cell panel is more vibrated at the center region in back and forth when an external force is applied.

[0012] A second problem is that a package box is also made thinner. Thus, when the package box falls down a packed cell panel or display apparatus could suffer flexure deformation as protruding in the direction of falling down, at the center region of the top section of the cell panel or display apparatus.

[0013] FIG. 1 illustrates the second problem. An article 101 to be packed is a thin display panel, for example. Attached to the four corners of the article 101 are buffer members 102. The article, or the thin display panel 101 is packed in a package box 103 (indicated by a dash-dot line for brevity) with the buffer members 102.

[0014] Shown in (a) of FIG. 1 is that the package box 103 is placed upright on a floor, etc. Shown in (b) of FIG. 1 is that the package box 103 falls down in a direction indicated by an arrow.

[0015] When the package box 103 falls down in the direction indicated by the arrow, a flexurally-deformed portion K is created at the center region of the top side as protruding in the direction of falling down due to the shock of falling down, as shown in (b) of FIG. 1.

[0016] This problem is caused by that, although the display panel 101 is supported by the buffer members 102 at the four corners, the center region between the opposing corners is not protected by the buffer members 102. The center region of the top side of the display panel 101 thus cannot withstand the shock of falling down, in addition to lower stiffness of the panel 101 that is made larger and thinner.

[0017] The first problem may be solved by the package structure disclosed in Document 1, with the sponge plate that precompress the center region of a display panel in the lateral direction to minimize vibration in back and forth.

[0018] Nevertheless, since the sponge plate is not provided at the center region of the top side of the display panel in Document 1, the second problem may not be solved by the package structure disclosed in Document 1.

[0019] Moreover, the package structure disclosed in Document 1 should be improved in the following points concerning a packing operation.

[0020] One point to be improved lies in the reinforced plate when an article to be packed is a thin display panel or apparatus of 10 mm or less in thickness. In detail, it seems that, if the reinforced plate is weakly turned around such a thin article, it cannot minimize vibration whereas, if it is strongly turned around, the sponge plate precom-

presses the display panel too much, which results in adverse effects to the thin display panel or apparatus with lowered stiffness.

[0021] Another point to be improved is that it takes time to turn the reinforced plate around an article to be packed and connect both ends of the reinforced plate, with several steps.

[0022] Still another point to be improved is that, when an article to be packed is mistakenly packed in a package box without the reinforced plate, the article has to be picked up from the package box for turning the reinforced plate around the article and then again packed in the package box, which leads to lower efficiency in packing operations.

SUMMARY OF THE INVENTION

[0023] A purpose of the present invention is to provide a package structure for a thin display apparatus and a method of packing a thin display apparatus, that offer easier packing operations and protect the packed display apparatus from being deformed when a package box falls down.

[0024] The present invention provides a package structure for packing a thin display apparatus having a display screen comprising: a reinforced plate to be attached to the display apparatus when the display apparatus is packed, the reinforced plate having an first end portion, a second end portion and a middle portion, the first end portion being positioned at a front side of the display apparatus, the second end portion being positioned at a rear side of the display apparatus and the middle portion being positioned at a top side of the display apparatus when the reinforced plate is attached to the display apparatus; a cushion member to be attached to a top portion of the display apparatus when the display apparatus is packed, the top portion being positioned at the top side; and a buffer member fixed to the first end portion of the reinforced plate, wherein, when the display apparatus is packed, the cushion member supports the top portion of the display apparatus from a front direction at the front side and from a rear direction at the rear side through the reinforced plate with the buffer member being in contact with the display screen or being positioned in the vicinity of the display screen at the front side.

[0025] Moreover, the present invention provides a method of packing a thin display apparatus having a display screen comprising the steps of: a first step of attaching a reinforced plate to the display apparatus, the reinforced plate having a first end portion, a second end portion, a middle bent portion and a buffer member that is fixed to the first end portion, the first and second end portions facing each other with the middle bent portion located between and connected to the first and second end portions, the reinforced plate being attached to the display apparatus so that the middle bent portion is set on a top portion of the display apparatus at a top side thereof, the buffer member is positioned at a front side of the display apparatus as facing the display screen and the second end portion is positioned at a rear side of the display apparatus; and a second step of attaching a cushion member to the reinforced plate so that the cushion member is set on the middle bent portion set, in the first step, on the top portion of the display apparatus.

BRIEF DESCRIPTION OF DRAWINGS

[0026]

FIG. 1 shows a view illustrating a problem of a known package structure;

FIG. 2 shows orthographic views of an exemplary article to be packed by a packing method according to an embodiment of the present invention;

FIG. 3 shows a first view illustrating the packing method according to the embodiment of the present invention;

FIG. 4 shows a second view illustrating the packing method according to the embodiment of the present invention;

FIG. 5 shows a third view illustrating the packing method according to the embodiment of the present invention;

FIG. 6 shows a development view of a main component of a package structure according to an embodiment of the present invention;

FIG. 7 shows a view of a folded state of the main component of the package structure according to the embodiment of the present invention, before used in the packing method according to the embodiment of the present invention;

FIG. 8 shows a transverse sectional view illustrating the package structure according to the embodiment of the present invention;

FIG. 9 shows a vertical sectional view illustrating the package structure according to the embodiment of the present invention;

FIG. 10 shows a partially enlarged view of FIG. 9;

FIG. 11 shows an enlarged view of an area DT shown in FIG. 10;

FIG. 12 shows a schematic view illustrating the dimension of the components of the package structure according to the embodiment of the present invention; and

FIG. 13 shows a perspective view of a modification to the package structure according to the embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0027] Preferred embodiments of the present invention will be described with respect to FIGS. 2 to 13.

[0028] FIG. 2 shows orthographic views of an exemplary article to be packed by a packing method of the present invention. The exemplary article shown in FIG.

2 is a thin display apparatus 50, for example, a liquid crystal monitor. The signs "top", "bottom", "front", "rear", "left" and "right" are given to the drawings when necessary to indicate the direction with respect to the thin display apparatus 50.

[0029] The thin display apparatus 50 includes a thin liquid crystal display panel 1 and a cabinet 2 for the display panel 1 to be installed, having an opening 2a through which a display screen 1a provided on a cell panel 1s of the display panel 1 is exposed. The cabinet 2 has a protruding portion 3 for installing a circuit board, etc., at the rear side.

[0030] The thin display apparatus 50 is a 32-inch liquid crystal monitor having 773 mm in width W, 496 mm in height H, 7 mm in thickness T1 (except for the protruding portion 3), and 23 mm in thickness T2 for the protruding portion 3.

[0031] The thin display apparatus 50 (the liquid crystal monitor) has a mass of 5. 7 Kg with the cabinet 2 made of aluminum (including the protruding portion 3).

[0032] FIGS. 3 to 5 show perspective views illustrating how to pack the thin display apparatus 50 in a package box, according to a packing method of the present invention.

[0033] Firstly, the thin display apparatus 50 is wrapped with a polyethylene film package (not shown).

[0034] Next, as shown in FIG. 3, corner cushions 4a, 4b, 4c and 4d are attached to the four corners of the cabinet 2, as buffer members, so that the corner cushions 4a and 4b, and 4c and 4d support the cabinet 2 at the bottom and top sides, respectively.

[0035] The polyethylene film package will not be referred to in the following description because it is much thinner than the other components and does not contribute to the advantages obtained by the present invention.

[0036] The corner cushions 4a, 4b, 4c and 4d are provided with slits 4a1, 4b1, 4c1 and 4d1, respectively, having a specific shape and width so that the four corners of the cabinet 2 can be tightly inserted into the slits. Shown in FIG. 3 are the slits 4a1, 4b1, and 4c1. The corner cushions 4a, 4b, 4c and 4d are made of styrene form.

[0037] Next, as shown in FIG. 4, a reinforced plate 5 bent into an almost J-shape is installed between the corner cushions 4c and 4d from the top side in a direction D3 so that cabinet 2 is fit between the opposing inner surfaces of the J-shaped reinforced plate 5.

[0038] The reinforced plate 5 is made of a corrugated cardboard, for example. When a corrugated cardboard is used, as shown in FIG. 6, a corrugated cardboard material is cut into a rectangular shape. Crease lines 5a, 5b and 5c are then made between one end portion 5t1 and another end portion 5t2 of the rectangular corrugated cardboard so that a valley fold is formed in a direction of the front side of a drawing paper of FIG. 6. The crease lines 5a, 5b and 5c are preferably made in a direction orthogonal to the direction of the flute.

[0039] Any flute type of corrugated cardboard can be used in the embodiment. Moreover, perforation may be made instead of the crease lines 5a, 5b and 5c.

[0040] When the direction of the flute is set as indicated by an arrow in FIG. 6, a buffer plate 6 is fixed at the end portion 5t1 (in the direction of the flute) of the reinforced plate 5 (the upper side in FIG. 6).

[0041] The buffer plate 6 is made of EPS (Expanded Polystyene), a type of styrene foam, sponge material, etc., and formed into a cuboid. The buffer plate 6 is fixed on the reinforced plate 5 by a fixing means, such as glue or an adhesive tape. The reinforced plate 5 has a width W2 for an inner surface 5e that is the inner side when used, equal to or a little bit smaller than a width W3 shown in FIG. 3.

[0042] FIG. 7 shows the reinforced plate 5 folded along the crease lines 5a, 5b and 5c when used in packing.

[0043] As shown in FIG. 7, the reinforced plate 5 is folded along the crease lines 5a and 5b at almost right angle whereas folded slightly along the crease line 5c. Accordingly, the reinforced plate 5 is formed into an almost J-shape in cross section, having a bent portion kk.

[0044] The term "an almost J-shape" in this description includes not only a letter "J"-shape but also a Π-shape with the end portion 5t2 located lower than that shown in FIG. 7.

[0045] The positions of the crease lines 5a and 5b of the reinforced plate 5 when folded are defined as follows:

A distance Dm1 shown in FIG. 7 is almost equal to H/2 shown in FIG. 2 in which the reference sign H indicates the height of the thin display apparatus 50. The distance Dm1 is, as shown in FIG. 7, a distance between the position of the inner surface 5e between the crease lines 5a and 5b in a top-to-bottom direction and the center position of the buffer member 6 in the top-to-bottom direction.

A width T3 of the inner surface 5e in a lateral direction (orthogonal to the top-to-bottom direction) shown in FIG. 7 is equal to or little bit larger than thickness T1 of the thin display apparatus 50 (except for the protruding portion 3) shown in FIG. 2.

[0046] The position of the crease line 5c will be discussed later.

[0047] In addition to the inner surface 5e, the reinforced plate 5 has an inner surface 5d between the crease line 5a and the end portion 5t2, an inner surface 5f between the crease lines 5b and 5c, and an inner surface 5g between the crease line 5c and the end portion 5t1, as shown in FIGS. 6 and 7. It is noted that the positions of the end portions 5t1 and 5t2 are upside down in FIGS. 6 and 7.

[0048] Referring again to FIG. 4, concerning the packing method of the present invention, the reinforced plate 5 formed into a specific shape shown in FIG. 7 is installed in the direction D3 in such a manner that the buffer plate 6 is in contact with the display screen 1a (FIG. 2) and the top side of the thin display apparatus 50 is inserted be-

tween the inner surfaces 5d and 5f.

[0049] Next, as shown in FIG. 5, a cushion 7 (which will be described later in detail) is installed between the corner cushions 4a and 4d in a direction D4 from the top side.

[0050] Then, the thin display apparatus 50 is packed in a package box 8, with the corner cushions 4a to 4d, the reinforced plate 5 and the cushion 7 attached thereto. The package box 8 is then closed by folding flaps 8f, thus completing a packing operation.

[0051] The cushion 7 is described in detail.

[0052] The cushion 7 is made of a buffer material such as styrene form. The cushion 7 supports the center region of the thin display apparatus 50 at the top side with the reinforced plate 5, which will be described with reference to FIGS. 8 to 12.

[0053] FIG. 8 is a sectional view taken on line S2A - S2A of FIG. 5. FIG. 9 is a sectional view taken on line S2B - S2B of FIG. 5. FIG. 10 is a partially enlarged view of FIG. 9 at the top side. FIG. 11 is an enlarged view of an area DT shown in FIG. 10. FIG. 12 is a schematic view illustrating the dimension of the components.

[0054] As shown in FIG. 8, the cushion 7 has a width W4 in the lateral direction, equal to or little bit smaller than a width W3 that is a gap between the corner cushions 4c and 4d. The width adjustment allows that the three cushions 4c, 7 and 4d are tightly aligned in the lateral direction at the top side of the thin display apparatus 50.

[0055] The cushion 7 is provided with a slit 7a at the center region in cross section, as shown in FIGS. 9 and 10. The slit 7a is formed by an inner surface 7a1 at the front side and an opposing inner surface 7a2 at the rear side. The inner surfaces 7a1 and 7a2 are slopes to shape the slit 7a open wide gradually in the bottom direction in FIG. 9. The inner surface 7a2 at the rear side is provided with several ribs 7a3 aligned in the lateral direction, each having an end surface almost orthogonal to the top-to-bottom direction, as shown in FIG. 8.

[0056] The slit 7a has a width T5 at the bottom thereof as shown in FIG. 10, which corresponds to the width obtained by adding the width T1 (FIG. 2) of the thin display apparatus 50 and a width twice that of the reinforced plate 5. The cushion 7 thus can be attached to the thin display apparatus 50 tightly in a front-to-rear direction of the apparatus 50 in a manner that the top side of the apparatus 50 is inserted into the slit 7a with the reinforced plate 5 between the cushion 7 and the apparatus 50.

[0057] Moreover, the cushion 7 has a specific outer width in the front-to-rear direction of the thin display apparatus 50, that is equal to or little bit smaller than an inner width of the package box 8 in the front-to-rear direction. The width adjustment allows that the cushion 7 is tightly installed in the package box 8 in the front-to-rear direction. The same goes for the corner cushions 4a to 4d.

[0058] Accordingly, the thin display apparatus 50 is packed in the package box 8 tightly in the front-to-rear and lateral directions, with the corner cushions 4a to 4d, the reinforced plate 5 and the cushion 7.

[0059] As shown in FIG. 10, the slit 7a of the cushion 7 is formed with a tilt angle $\theta 7$ of, for example, about 4 degrees for the slope of the inner surface 7a1 with respect to the vertical line that goes through the cushion 7 in a direction orthogonal to the front-to-rear direction of the thin display apparatus 50.

[0060] The tilt angle $\theta 7$ is decided in accordance with the relationship between a distance Dm2 in the top-to-bottom direction and a width T4 of the buffer plate 6 in the front-to-rear direction, in FIG. 7. The distance Dm2 is defined as a distance between the crease lines 5c and the inner surface 5e between the crease lines 5a and 5b.

[0061] The tilt angle $\theta 7$ is discussed in detail. In FIG. 11, an enlarged view of the area DT in FIG. 10, the display screen 1a is positioned far back (in the right direction in FIG. 11) by Δd from the front side 2b of the cabinet 2.

[0062] It is preferable that the buffer member 6 is in almost surface contact with the display screen 1a or they face with each other with an extremely small gap when the thin display apparatus 50 is packed in the package box 8.

[0063] In order to satisfy the positional relationship between the buffer member 6 and the display screen 1a, the following expression (1) is given when the buffer member 6 has a thickness T4, according to FIG. 12: $\tan\theta 7 = (T4 - \Delta d) / Dm2$ ... (1)

wherein T4 = 10 mm, Δd = 1. 5 mm, and Dm2 = 120 mm, in this embodiment.

[0064] Under the requirements discussed above, an outer surface 5fr (FIG. 7), the opposite surface of the inner surface 5f of the reinforced plate 5, is in almost surface contact with the front-side inner surface 7a1 (FIG. 10) of the slit 7 of the cushion 7 when the thin display apparatus 50 is packed in the package box 8.

[0065] Referring to FIG. 8 again, the ribs 7a3 are provided in order for the inner surface 5d (FIG. 7) of the reinforced plate 5 to be in surface contact with the rear surface of the cabinet 2. The ribs 7a3 are aligned at a specific interval in the lateral direction in FIG. 8, with a specific width and height.

[0066] The ribs 7a3 provided as described above are deformed when an external force is applied from the front to rear of the thin display apparatus 50 or the package box 8 falls down in the rear direction, in FIG. 5, after the thin display apparatus 50 has been packed in the package box 8. The deformed ribs 7a3 effectively absorb the kinetic energy of the thin display apparatus 50 in accordance with the motion of the display apparatus 50 in the rear direction, thus exhibiting preferable buffer effects.

[0067] According to the packing method and package structure of the embodiment described above, the thin display apparatus 50, an article to be packed, is tightly supported by the corner cushions 4a to 4d at the four corners at the top and bottom sides and also the cushion 7 interposed between the corner cushions 4c and 4d at the top side, in the package box 8.

[0068] The thin display apparatus 50, an article to be

packed, is therefore protected from being deformed at the top side even if the display apparatus 50 falls down in the front or rear side because it is supported by the corner cushions 4c and 4d, and also the cushion 7 at the top side.

[0069] Moreover, when the thin display apparatus 50 is packed in the package box 8, with the reinforced plate 5, the corner cushions 4c and 4d, and the cushion 7, the buffer plate 6 is put in almost surface contact with an specific area of the display screen 1a including the center region thereof or put in a position to face the specific area with a very small gap. The reinforced plate 5 having the buffer plate 6 is restricted from being deformed in the front direction by the cushion 7 at the inner surface 7a1 thereof at the front side. Therefore, when the cell panel 1s (FIGS.2 and 11) of the thin liquid crystal display panel 1 is vibrated in the front-to-rear direction, the vibration is diminished by the buffer plate 6 installed as described above.

[0070] Furthermore, the crease lines 5a, 5b and 5c made in the direction orthogonal to the direction of the flute, as shown in FIG. 6, give higher stiffness to the reinforced plate 5 having the buffer plate 6 against the deformation in the front-to-rear direction, which further restricts the cell panel 1s from being vibrated.

[0071] When the reinforced plate 5 is made of a corrugated cardboard, the type of flute, the material type of corrugated cardboard core, etc., and the direction of flute can be appropriately selected so that the cell panel 1s can be effectively restricted from vibration.

[0072] With the reinforced plate 5 described above, the cell panel 1s is protected from being damaged, especially, at the back thereof because of no contact (rubbing, hitting, etc.) with an optical panel (not shown) provided just behind the cell panel 1s.

[0073] Moreover, the reinforced plate 5 can be attached to an article to be packed, such as the thin display apparatus 50, after the article is packed in the package box 8, thus an easier and more efficient packing operation is achieved.

[0074] Furthermore, even if the reinforced plate 5 has to be replaced with a new one after packed due to defectiveness after packed, it can be replaced with no need to pick up a packed article, such as the thin display apparatus 50 from the package box 8, thus higher packing operability is achieved.

[0075] It is further understood by those skilled in the art that the foregoing description is a preferred embodiment of the described structure and method and that various changes and modifications may be made in the invention without departing from the sprit and scope thereof.

[0076] For example, the reinforced plate 5 may be made of other materials than a corrugated cardboard, such as resin, like polypropylene (PP).

[0077] An article to be packed may be the thin liquid crystal display panel 1 without being installed in the thin display apparatus 50, or other thin plate-like materials such as glass and resin.

[0078] Regarding the buffer plate 6 to be put in contact with the display screen 1a on the cell panel 1s of the display panel 1, its position of contact, area and shape are not limited to those described above. Nevertheless, it is preferable that the buffer plate 6 covers the center region of the display screen 1a, the center region being to be vibrated most when the package box 8 falls down.

[0079] Shown in FIG. 13 is a modification to the package structure described above, with a cushion 71 having an integral structure of the corner cushions 4c and 4d, and the cushion 7.

[0080] Also in this modification, the thin display apparatus 50 (an article to be packed) is tightly supported by the cushion 71 at the top side from left to right corners.

[0081] The cushion 71 has a larger exterior dimension than each of the separate corner cushions 4c and 4d, and cushion 7. However, the use of the cushion 71 reduces the cushion installation steps of 1 /3 fewer than those separated cushions.

[0082] Also in this modification, a packed article is protected from being damaged at the top side when a package box falls down in front or rear because it is supported or protected at the top side.

[0083] As described in detail, the present invention achieves that a packed article, such as a thin liquid crystal display panel and a thin display apparatus and so on, is packed in a package box by an easier operation and is protected from being deformed even if a package box falls down.

Claims

1. A package structure for packing a thin display apparatus having a display screen comprising:

   a reinforced plate to be attached to the display apparatus when the display apparatus is packed, the reinforced plate having an first end portion, a second end portion and a middle portion, the first end portion being positioned at a front side of the display apparatus, the second end portion being positioned at a rear side of the display apparatus and the middle portion being positioned at a top side of the display apparatus when the reinforced plate is attached to the display apparatus;

   a cushion member to be attached to a top portion of the display apparatus when the display apparatus is packed, the top portion being positioned at the top side; and

   a buffer member fixed to the first end portion of the reinforced plate,

   wherein, when the display apparatus is packed, the cushion member supports the top portion of the display apparatus from a front direction at the front side and from a rear direction at the

rear side through the reinforced plate with the buffer member being in contact with the display screen or being positioned in the vicinity of the display screen at the front side.

2. The package structure according to claim 1 further comprising a package box, a left corner cushion and a right corner cushion, the left corner cushion and the right corner cushion being to be attached to a left end portion and a right end portion, respectively, of the display apparatus at the top side, wherein, when the display apparatus is packed in the package box, a position of the cushion member in a left direction and a right direction is determined by the left and right corner cushions, the left and right directions being orthogonal to the front and rear directions.

3. The package structure according to claim 1, wherein, when the display apparatus is packed, the cushion member supports the display apparatus from a left end portion to a right end portion of the display apparatus at the top side, the left and right portions being included in the top portion of the display apparatus.

4. The package structure according to claim 1, wherein the buffer member is contact with a specific area of the display screen or positioned in the vicinity of the specific area at the front side, the specific area including a center of the display screen.

5. The package structure according to claim 1, wherein the middle portion of the reinforced plate is a bent middle portion so that the first and second end portions face each other with the bent middle portion located between and connected to the first and second end portions, for the top portion of the display apparatus to be fit in the bent middle portion when the display apparatus is packed.

6. The package structure according to claim 5, wherein the bent middle portion of the reinforced plate has a first crease at which the bent middle portion is connected to the first end portion and a second crease at which the bent middle portion is connected to the second end portion, each crease having a specific angle so that the top portion of the display apparatus is fit in the bent middle portion.

7. The package structure according to claim 6, wherein the reinforced plate has an inner surface connected to the first end portion to which the buffer member is fixed, the inner surface having a third crease at which the inner surface is bent at an angle smaller than the specific angle in the rear direction and connected to the middle portion, the buffer member being interposed between the first end portion and the third crease.

8. The package structure according to claim 7, wherein the cushion member has a slit into which the bent middle portion of the reinforced plate is inserted when the cushion member supports the top portion of the display apparatus through the reinforced plate.

9. The package structure according to claim 8 further comprising a cabinet having the display screen installed therein, wherein the slit of the cushion member has inner surfaces facing each other and having slopes to form the slit, each slope having an angle θ with respect to a vertical line that goes through the cushion member in a direction orthogonal to the front and rear directions, the angle θ being defined as $\tan\theta = (T - \Delta d) / Dm$ in which T is a thickness of the buffer member in the front and rear directions, Δd is a distance between the display screen and a front side of the cabinet in the front and rear directions and Dm is a distance between the third crease and an inner surface of the bent middle portion between the first and second creases of the reinforced plate.

10. A method of packing a thin display apparatus having a display screen comprising the steps of:

a first step of attaching a reinforced plate to the display apparatus, the reinforced plate having a first end portion, a second end portion, a middle bent portion and a buffer member that is fixed to the first end portion, the first and second end portions facing each other with the middle bent portion located between and connected to the first and second end portions, the reinforced plate being attached to the display apparatus so that the middle bent portion is set on a top portion of the display apparatus at a top side thereof, the buffer member is positioned at a front side of the display apparatus as facing the display screen and the second end portion is positioned at a rear side of the display apparatus; and
a second step of attaching a cushion member to the reinforced plate so that the cushion member is set on the middle bent portion set, in the first step, on the top portion of the display apparatus.

11. The method according to claim 10 further comprising the steps of:

a third step of packing the display apparatus in a package box;
and
a fourth step of attaching a left corner cushion and a right corner cushion to a left end portion and a right end portion, respectively, of the dis-

play apparatus at the top side so that a position of the cushion member in a left direction and a right direction on the display screen is determined by the left and right corner cushions in the package box.

12. The method according to claim 10, wherein the second step includes the step of supporting the display apparatus with the cushion member from a left end portion to a right end portion of the display apparatus, the left and right portions being included in the top portion of the display apparatus.

13. The method according to claim 10, wherein the first step includes the step of setting the buffer member at the front side so that buffer member is contact with a specific area of the display screen or positioned in the vicinity of the specific area at the front side, the specific area including a center of the display screen.

14. A method according to claim 10 further comprising the steps of:

a third step of bending the reinforced plate at a first crease and a second crease each at a specific angle to form the middle bent portion so that the first and second end portions face each other with the middle bent portion located between and connected to the first and second end portions; and

a fourth step of bending the reinforced plate at a third crease at an angle smaller than the specific angle in the rear direction, the third crease being located at an inner surface of the reinforced plate, the inner surface being connected to the first end portion to which the buffer member is fixed, the buffer member being interposed between the first end portion and the third crease.

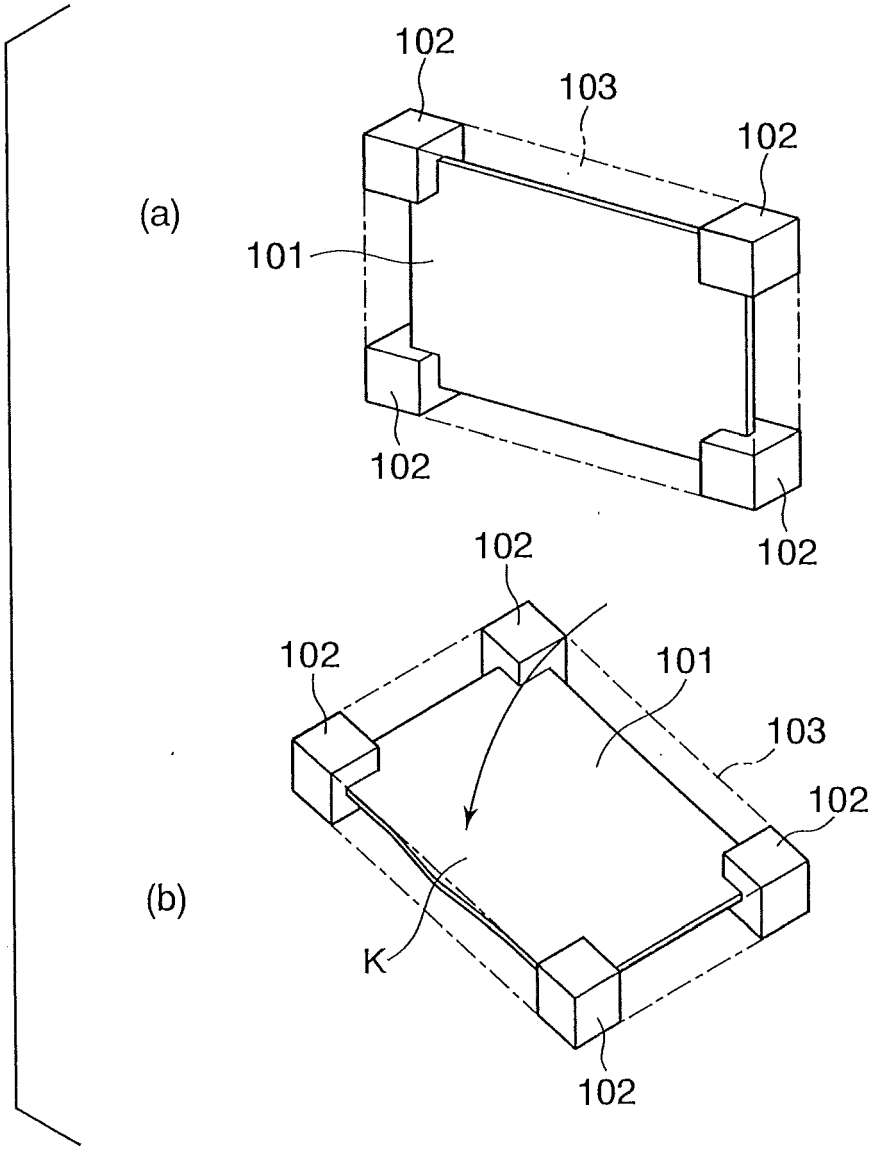

FIG. 1
(PRIOR ART)

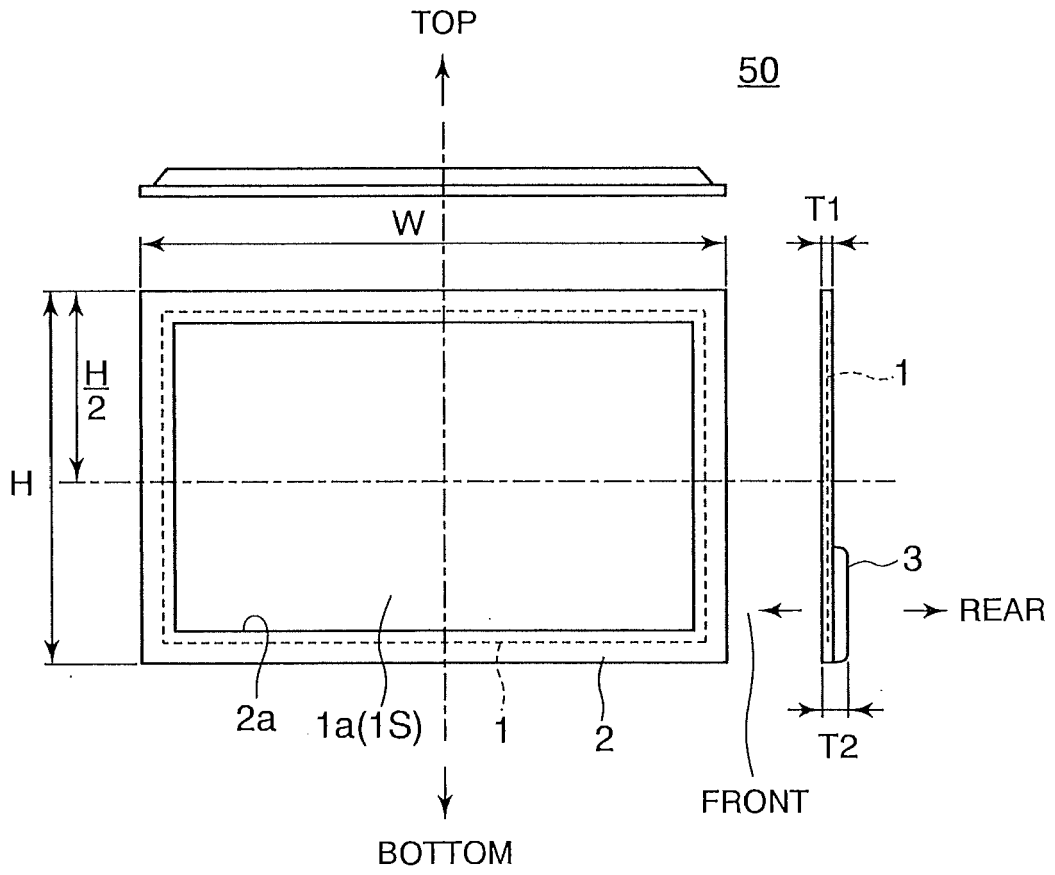

FIG. 2

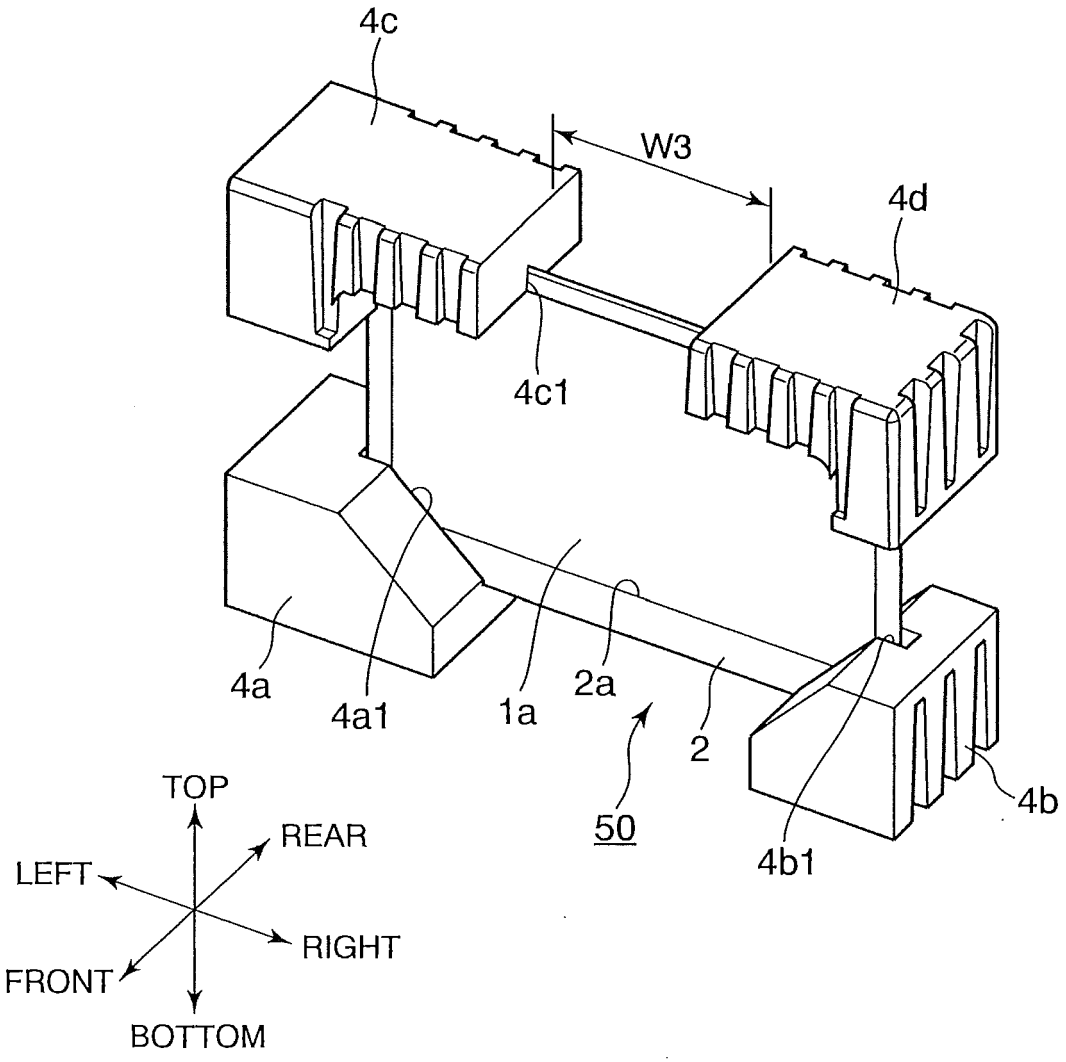
4c
W3
4d
4c1
4a
4a1
1a
2a
2
50
4b
4b1
TOP
REAR
LEFT
RIGHT
FRONT
BOTTOM

FIG. 3

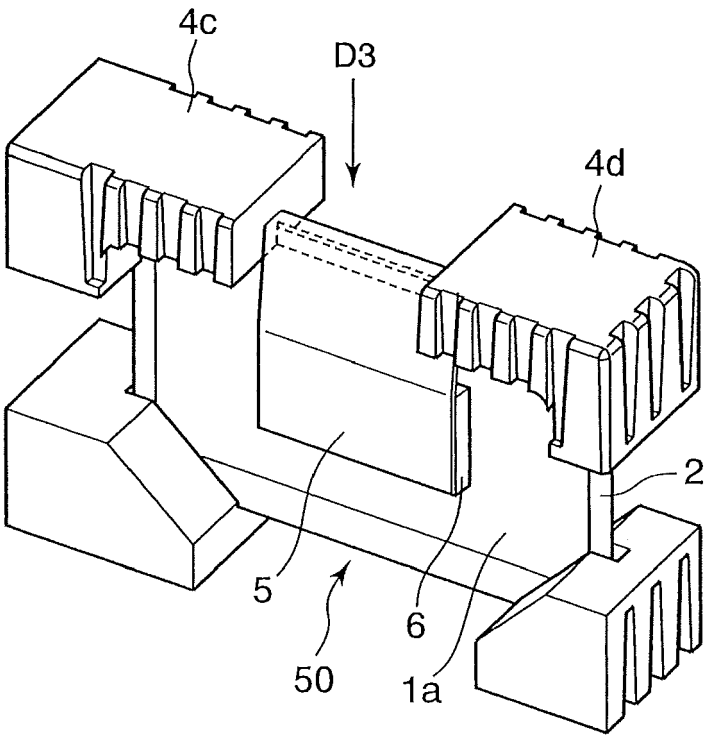

FIG. 4

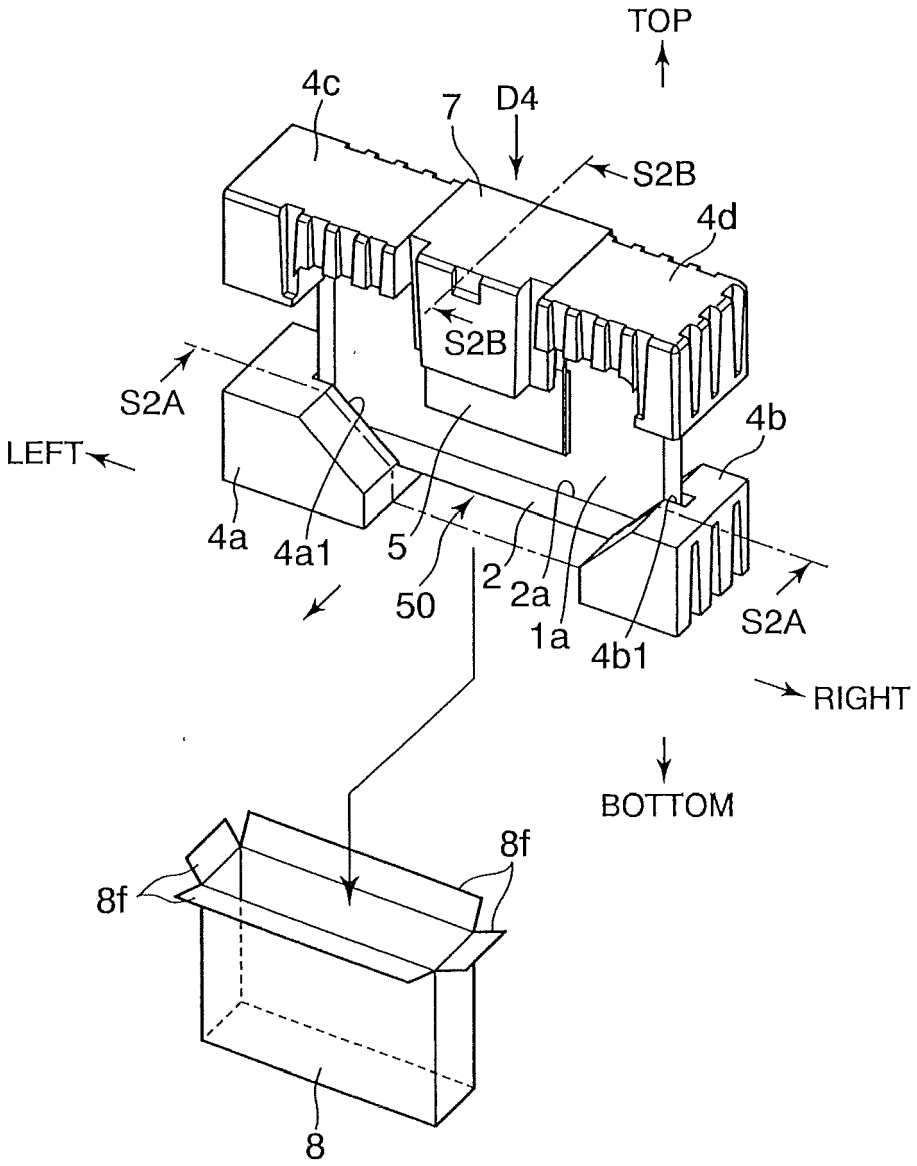
TOP
4c
7
D4
S2B
4d
S2B
S2A
LEFT
4b
4a
4a1
5
50
2
2a
1a
4b1
S2A
RIGHT
BOTTOM
8f
8f
8

FIG. 5

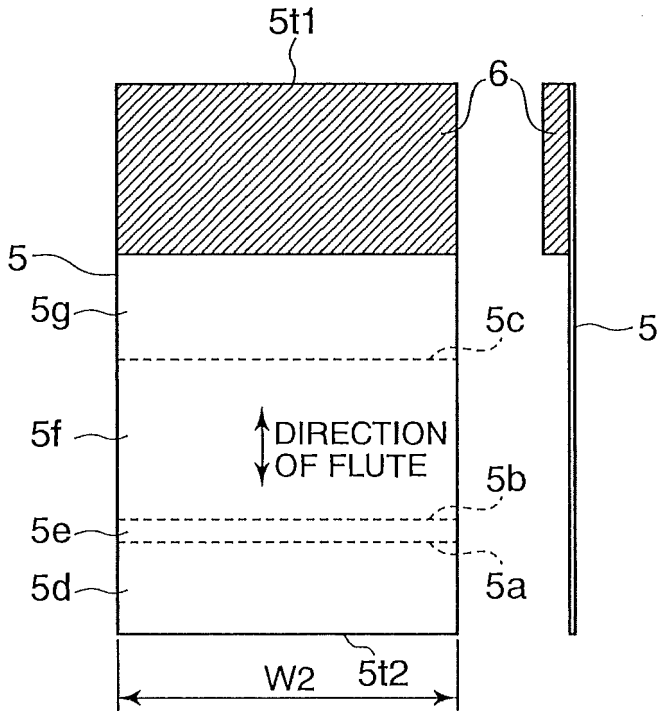

FIG. 6

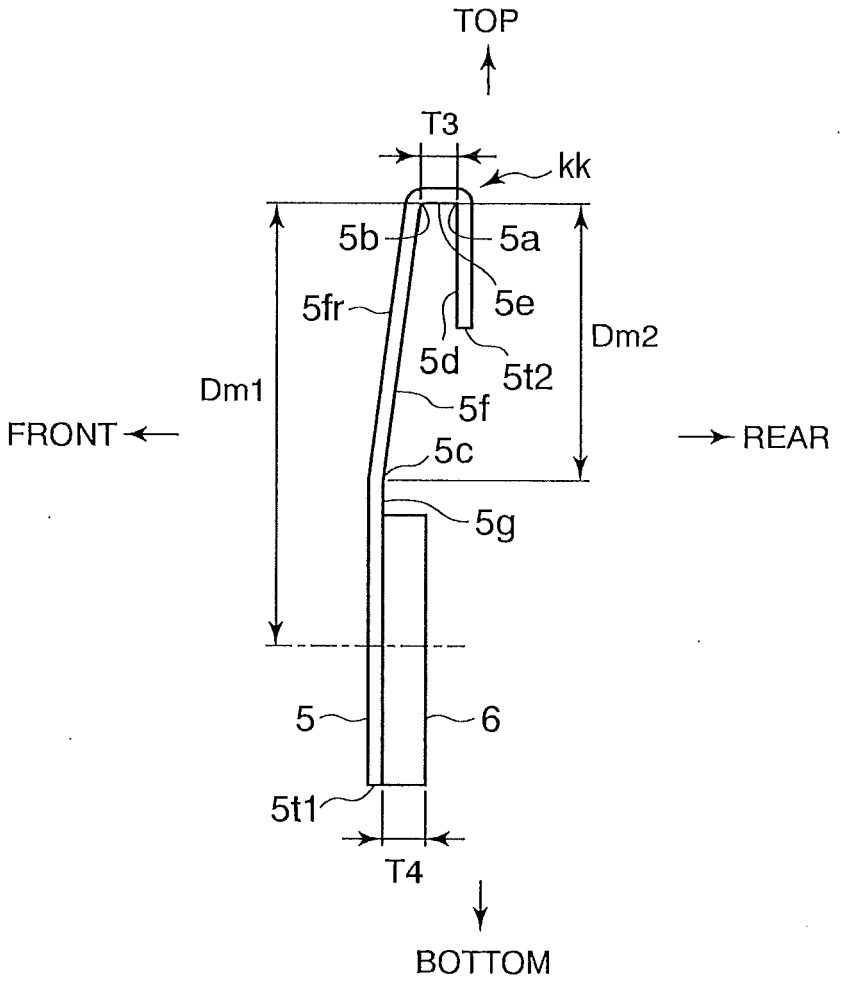
TOP
T3
kk
5b
5a
5fr
5e
Dm2
5d
5t2
Dm1
5f
FRONT
REAR
5c
5g
5
6
5t1
T4
BOTTOM

FIG. 7

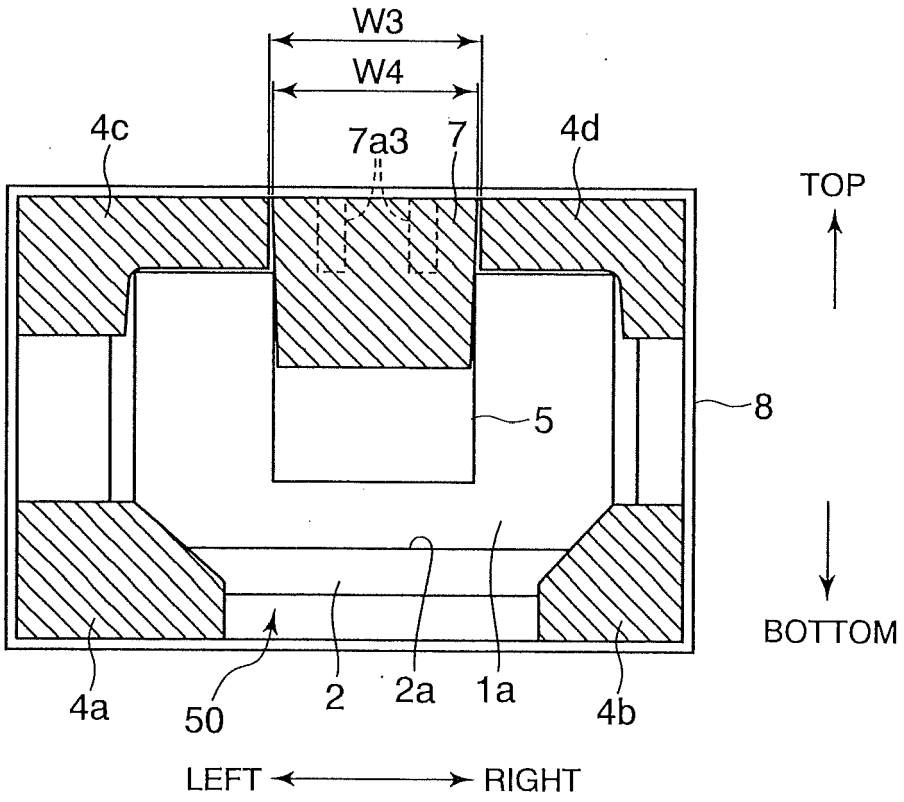

FIG. 8

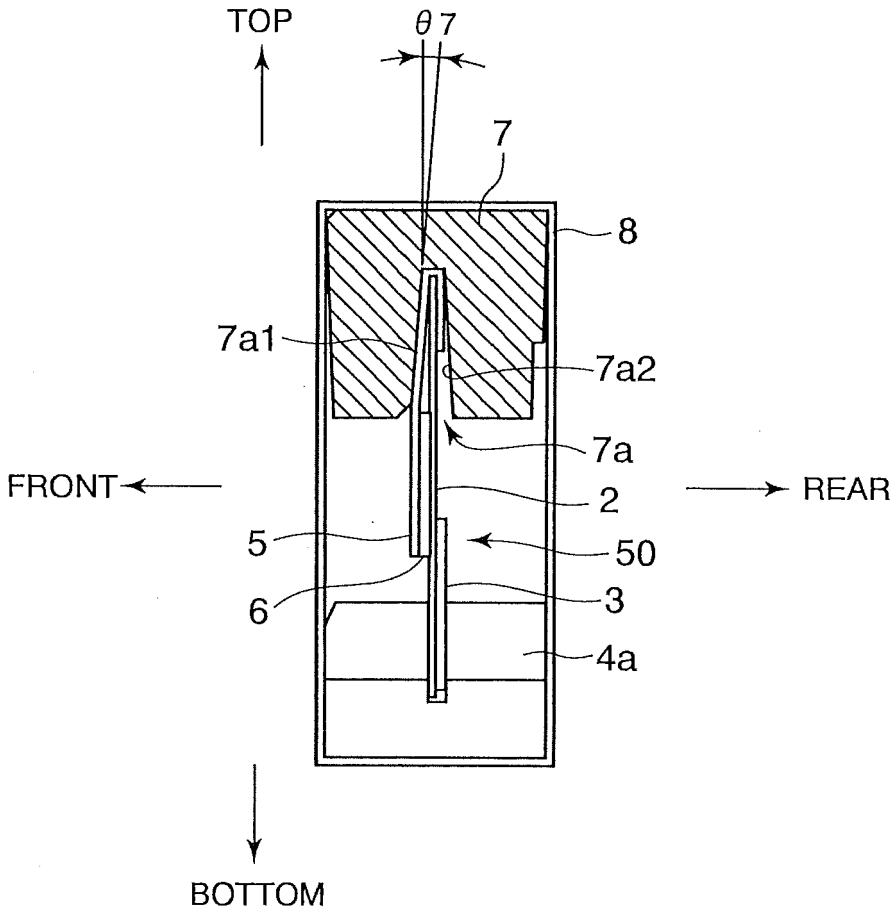

FIG. 9

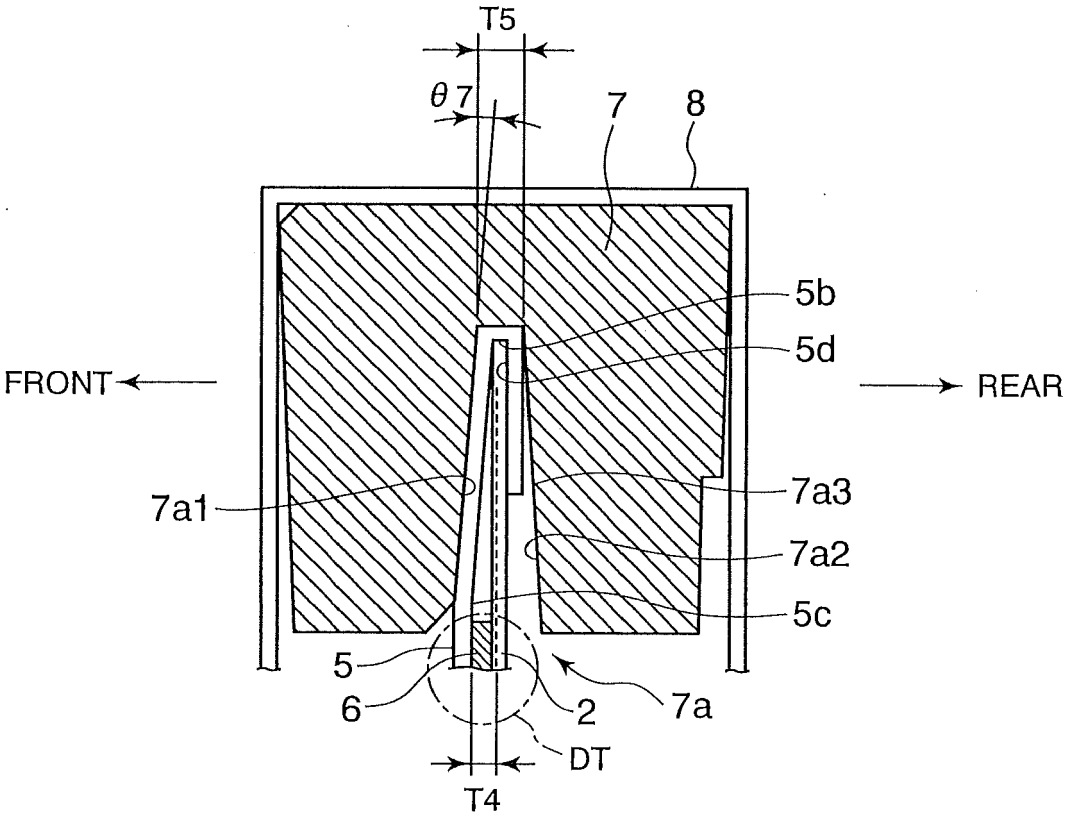

FIG. 10

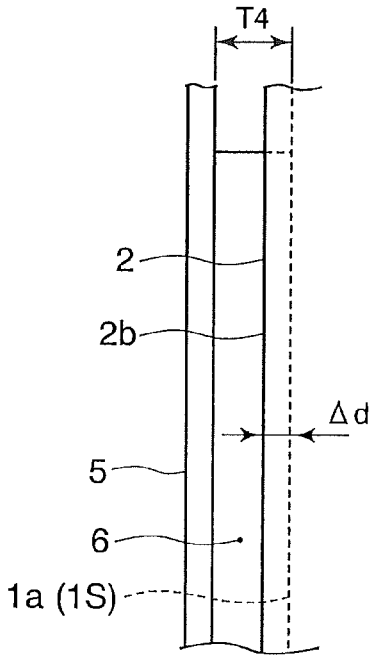

FIG. 11

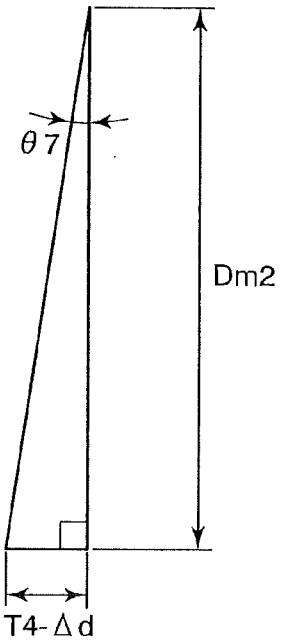

FIG. 12

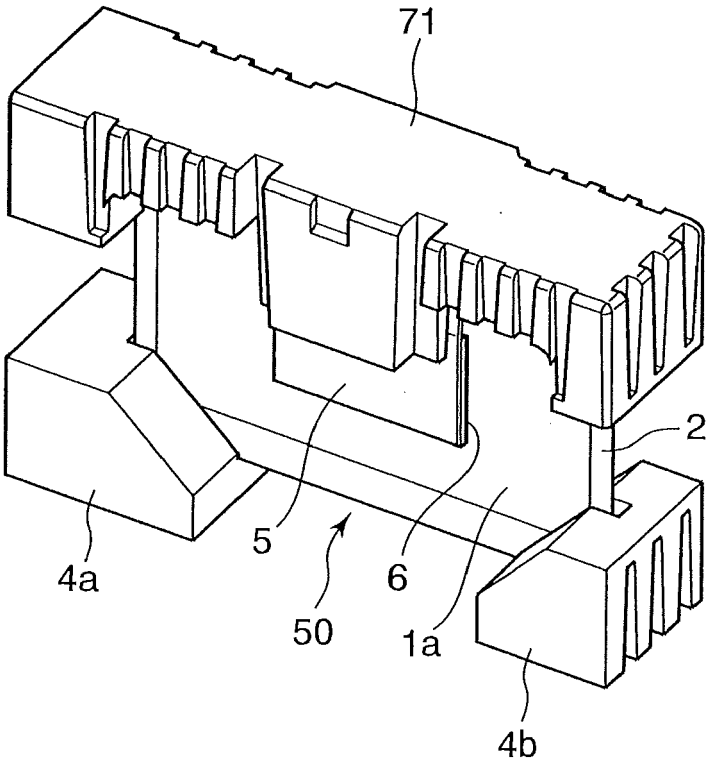

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 4209

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	JP 2006 232360 A (SHARP KK) 7 September 2006 (2006-09-07) * abstract *	1,10	INV. B65D81/05
A	US 5 094 903 A (ELZEY PAUL B [US]) 10 March 1992 (1992-03-10) * column 2, lines 8-42; figures 1-3 *	1,10	
A	WO 2007/013319 A1 (MATSUSHITA ELECTRIC IND CO LTD [JP]; AKEGAWA TAKASHI) 1 February 2007 (2007-02-01) * figure 1 *	1,10	
A	DE 91 14 168 U1 (OVERATH, UDO) 16 January 1992 (1992-01-16) * figures 1-10 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC) B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 December 2010	Jervelund, Niels

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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08-12-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2006232360 A	07-09-2006	NONE	
US 5094903 A	10-03-1992	NONE	
WO 2007013319 A1	01-02-2007	NONE	
DE 9114168 U1	16-01-1992	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- JP 2006232360 A **[0002]**