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(71) Applicant: **Orient Instrument Computer Co., Ltd**
Osaka-shi, Osaka 536-0014 (JP)

(72) Inventors:
• **ITO, Tomoaki,**
ORIENT INSTRUMENT COMPUTER CO., LTD
Joto-ku,
Osaka-shi, Osaka 5360014 (JP)
• **KOMORI, Kazushige,**
ORIENT INSTRUMENT COMPUTER COLTD
Joto-ku,
Osaka-shi,
Osaka 5360014 (JP)

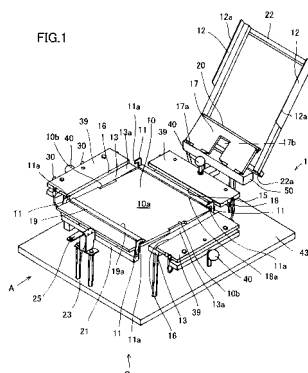
• **SAKANO, Yoshikazu,**
SAKANO ELECTRIC SYSTEM INC.
Naniwa-ku,
Osaka-shi Osaka 5560005 (JP)
• **TAKEHARA, Toshikazu,**
K.K. TAKEHARA RIKEN
Osaka 5998253 (JP)

(74) Representative: **Paul, Dieter-Alfred et al**
Paul & Albrecht,
Patentanwaltssozietät,
Hellersbergstrasse 18
41460 Neuss (DE)

(54) **PACKAGING MACHINE AND PACKAGING METHOD**

(57) A wrapping device 1 for wrapping an object to be wrapped of substantially cuboid shape with predetermined width, length, and thickness facilitates wrapping with a simpler structure.

The wrapping device 1 includes a mounting table 10, an upper side folder 17, a first heater 15, second heaters 16, first projections 11, second projections 12, and interfolding portions 13. A resin film (a wrapping material) is placed on the mounting table 10 and a CD case (an object to be wrapped) is mounted on a receptacle 10a thereon. Then, the resin film is folded back toward the top face of the CD case, to which the folder 17 is moved to fuse it by the first heater 15. Then, the first and the second projections 11 and 12 are moved, and the table 10 is moved downward to interfold and fuse the film by the second heaters 16.



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Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a wrapping device, and more particularly to a device for wrapping an object to be wrapped by wrapping a sheet such as a film therearound. The present invention also relates to a wrapping method, and more particularly to a method of wrapping an object to be wrapped by wrapping a film therearound.

BACKGROUND ART

10 **[0002]** Various kinds of products are packaged by wrapping a sheet-like wrapping material such as a film therearound so as to protect their surface from being tainted or scratched. When an object to be wrapped is a product of cuboid shape, a so-called caramel wrapping is employed, whereby the object is wrapped in a film such that four faces of the cuboid object is wrapped in the film to protrude the film from the rest two faces, whereupon ends of the protruded film are folded back respectively.

15 **[0003]** Such wrapping by only folding back would be fallen off the object, so the film is adhered at the ends or the folded part. - For the bond, adhesive bond is used, or the film itself is fused by heat to directly bond the film.

[0004] Generally, a number of products of same shape are wrapped, so that a dedicated device performs the wrapping. For example, a product is wrapped by a wrapping device in a patent document 1 described below.

20

Patent Document 1: JP 8-276905 A

OBJECT TO BE SOLVED BY THE INVENTION

25 **[0005]** A conventional wrapping device such as the device described above performs a wrapping in large quantities automatically and as fast as possible, while the device is enlarged and complicated.

More specifically, it is necessary to turn an object to be wrapped or to wrap with a part supporting the object hung in the air so as to wrap a film around four faces of the object. That requires a turning mechanism or a mechanism for hanging up the object. Further, to fold back a part protruded from the rest two faces after wrapping the film around the four faces of the object, it is necessary to fold the ends of the film inward along edges of the object, thereby requiring a mechanism for precisely folding back. Still further, in the case that the object is of a thin plate such as a compact disk (CD) case, the protruded part is short, so that the part to be folded back is narrow, resulting in, especially, a precise and complicated structure of the mechanism for folding back.

30 **[0006]** When the film is transformed by folding or the like, it may return to its original shape by force of restitution. Consequently, in the case of wrapping by a wrapping device, maintaining the wrapping state requires bond by a fusion bond or the like, so the device is provided with a means for bond.

[0007] In this way, a wrapping device in the known art is big, complicated, and expensive. That causes a problem of high cost per wrapping quantity in the case of small quantities of wrapping. Further, it is unable to install a big wrapping device to wrap in a small place such as an office not in a large place such as a factory.

40 **[0008]** It is therefore an object of the present invention to provide an improved wrapping device for facilitating to wrap by a simpler structure.

SUMMARY OF THE INVENTION

45 **[0009]** One of aspects of the present invention to solve the problems described above is to provide a wrapping device for wrapping an object to be wrapped of substantially cuboid shape with predetermined width, length, and thickness having top and bottom faces opposed in a thickness direction, front and rear end faces opposed in a longitudinal direction, and right and left side faces opposed in a width direction in a wrapping material being fusible by heating, including a mounting table for mounting the object, a movable folder, and a front face heater adapted to heat the wrapping material to such a temperature as fusible, the mounting table having a front bottom step, the movable folder having a front top step and being movable toward the mounting table, wherein the front top step is adapted to take its position facing to the front bottom step in the thickness direction when the movable folder is moved to the mounting table, in this state, the front face heater is movable between the front bottom step and the front top step, so as to fuse the wrapping material of the front end face.

50 **[0010]** By the invention, it is easy to wrap the material around the four faces (the top and bottom faces, the front and rear end faces) of the object, and in this state, the ends of the material are mutually fused. More specifically, the material is wrapped to almost make a circuit around the top and bottom faces and the front and rear end faces with the opposite ends of the material at the front end face, whereupon a part protruded from the front end face is folded by the front top

step and the front bottom step, and in this state, the front face heater is moved between the front top step and the front bottom step so as to fuse the material, thereby wrapping around the four faces of the object.

[0011] Further, the device may include a side face interfolding member, and a side face heater adapted to heat the wrapping material to such a temperature as fusible, wherein the object on the mounting table is slidable in a sliding direction passing through the side face interfolding member, and wherein the wrapping material is interfoldable on at least one of the right and left side faces of the object when the object passes through the interfolding member, the side face heater being provided ahead of the interfolding member in the sliding direction.

[0012] In such a structure, sliding the object to pass through the side face interfolding member interfolds the right and left side faces of the object, and further, the side face heater is provided ahead of the interfolding member in the sliding direction, so that keeping to slide the object enables to fuse the material interfolded at the right and left side faces.

[0013] Still further, the wrapping device may have a structure wherein the mounting table includes a mounting face for mounting the object thereon, the mounting face being slanted relative to the horizontal, the object being slidable downward along the mounting face.

[0014] In such a structure, the mounting face of the mounting table is provided as slanted relative to the horizontal so as to allow the object to slide downward along the mounting face, thereby enabling the object readily to slide.

[0015] The wrapping device may also employ a lower movable portion adapted to support the object from the lower side, the lower movable portion being movable in the sliding direction of the object and urged upward.

[0016] In such a structure, there is provided the lower movable portion adapted to support the object from the lower side and movable in the sliding direction of the object, so as to stabilize the sliding direction.

[0017] Further, the lower movable portion may have a projection, wherein the projection is adapted to interfold the wrapping material protruded from the rear end face to at least one of the right and left side faces.

[0018] In such a structure, the lower movable portion is provided with the projection, so as to support the object as interfolding the material protruded to the right and left side faces.

[0019] Still further, the wrapping device may include an upper movable portion with a projection, wherein the projection is adapted to interfold the wrapping material protruded from the front end face to at least one of the right and left side faces.

[0020] In such a structure, the upper movable portion is provided with the projection, so as to interfold the material protruded from the front end face to the right and left side faces.

[0021] Further, the front face heater may be attached to the upper movable portion.

[0022] In such a structure, the front face heater is attached to the upper movable portion, so as to provide a simplification of members.

[0023] The side face interfolding member may also have rollers each with a conical surface, so that the wrapping material protruded from the top and bottom faces to at least one of the right and left side faces of the object is interfolded by the conical surfaces when the object is slid.

[0024] In such a structure, the side face interfolding member is provided with the rollers each with the conical surface, by which surface the material protruded to the right and left side faces is interfolded and achieves a smooth interfolding.

[0025] The side face interfolding member may have slots, which are slanted relative to the sliding direction of the object so that the wrapping material protruded from the top and bottom faces to at least one of the right and left side faces of the object is interfolded by being guided into the slots when the object is slid.

[0026] In such a structure, the side face interfolding member is provided with the slots slanted relative to the sliding direction so that interfolding the material protruded from the top and bottom faces to the right and left side faces of the object by being guided into the slots achieves a smooth interfolding.

[0027] The wrapping device may further include a side face heater adapted to heat the wrapping material to such a temperature as fusible below the side face interfolding member.

[0028] In such a structure, there is provided the side face heater below the side face interfolding member, thereby enabling the object to be fused in sliding.

[0029] The mounting table may also have a rear bottom step, so that a receptacle is formed between the front and the rear bottom steps of the table, a distance between the front and the rear bottom steps being substantially the same as the length of the object.

[0030] In such a structure, there is provided the front bottom step and the rear bottom step, between which the receptacle is formed, so that mounting the material and the object on the receptacle folds the material protruded from the bottom face along the front and rear end faces.

[0031] Another aspect of the present invention is to provide a wrapping device for wrapping an object to be wrapped of substantially cuboid shape with predetermined width, length, and thickness having top and bottom faces opposed in a thickness direction, front and rear end faces opposed in a longitudinal direction, and right and left side faces opposed in a width direction, in a wrapping material being fusible by heating, including a mounting table, first movable projections, a second movable projection, an interfolding portion arranged outside of the width direction of the mounting table, and a side face heater adapted to heat the wrapping material to such a temperature as fusible, wherein the mounting table has a mounting portion for mounting the object thereon, a width of which portion is substantially the same as that of the

object, wherein the mounting table is movable up and down, so that the mounting portion is located upper than the top face of the interfolding portion at the upper position where the table is located upward, and so that the mounting portion is located lower than the top face of the interfolding portion at the lower position where the table is located downward, wherein the first projections are movable in the longitudinal direction along at least one of the right and left side faces of the object, so as to move to interfold the material protruded from the front and rear end faces toward the at least one of the side faces, wherein the second projection is movable in the thickness direction along the at least one of the side faces of the object, so as to move to interfold the material protruded from the top face toward the at least one of the side faces, and wherein the side face heater is movable toward the at least one of the side faces of the object mounted on the mounting table at the lower position.

[0032] In this arrangement, after the material is wrapped around the four faces (the top and bottom faces and the front and rear end faces) of the object, interfolding the material protruded from the rest two faces (the right and left side faces) achieves an easy wrapping.

More specifically, the first projections are moved so as to interfold the material protruded from the front and rear end faces to the right and left side faces, and the second projection is moved so as to interfold the material protruded from the top face to the right and left side faces, and then the mounting table is moved from the upper position to the lower position so as to interfold the material protruded from the bottom face to the right and left side faces. Then the material is fused by the side face heater as the material interfolded.

[0033] The present aspect may further include a support, wherein the support is adapted to support the mounting table, thereby maintaining the upper position, the support having a knob, operation of the knob releasing supporting by the support, thereby allowing the mounting table to move to the lower position.

[0034] In this arrangement, the mounting table is supported by the support, which has the knob to be operated to make the table move from the upper position to the lower position, and as a result of an easy operation for moving the table to the lower position.

[0035] In the aspect, in the case of making the mounting table move downward to be at the lower position from the upper position so that the wrapping material protruded from the bottom face and located above the interfolding portion is interfolded by passing through the top face of the interfolding portion with the bottom face of the material mounted on the mounting portion slanted relative to the top face of the interfolding portion.

[0036] In this arrangement, in the case of making the table move downward, since the material passes through the top face of the interfolding portion with the bottom face of the material mounted on the mounting portion slanted relative to the top face of the interfolding portion, the bottom of the material is gradually folded back from one side to the other, thereby enabling to be interfolded finely without fail.

[0037] In the aspect, the second projection may have a flat end, so that in the case of making the second projection move to the mounting table, the end is slanted relative to the top edge of the side face of the object mounted on the mounting table when the end passes through the top edge.

[0038] In this arrangement, since the second projection has the flat end, which is slanted relative to the top edge of the side face of the object mounted on the table when the end passes through the top edges, the top of the material is gradually folded back from one side to the other, thereby enabling to be interfolded finely without fail.

[0039] In the aspect, the first projections may be formed at four places adjacent to opposite ends in the longitudinal direction of the right side face and the left side face of the object mounted on the mounting table and may have operating portions adapted to operate the first projections.

[0040] In this arrangement, since the operating portion adapted to operate the first projections at four places is provided, the first projections are operated by operating the operating portion.

[0041] Still further, the aspect may include a movable folder and a front face heater adapted to heat the wrapping material to such a temperature as fusible, wherein the mounting table has a front bottom step and a rear bottom step and forms a receptacle with substantially the same length as the object between the front and the rear bottom steps, and wherein the folder is provided with a front top step and movable toward the mounting table, so that the front top step is adapted to take its position facing to the front bottom step in the thickness direction when the movable folder is moved toward the mounting table, so that the front face heater is adapted to be displaced between the front bottom step and the front top step, thereby fusing the wrapping material of the front end face.

[0042] In this arrangement, it is easy to wrap the material around the four faces (the top and bottom faces and the front and rear end faces) of the object, and in this state, the ends of the material are mutually fused. More specifically, the material is wrapped to almost make a circuit around the top and bottom faces and the front and rear end faces with the opposite ends of the material at the front end face, whereupon the front end face is folded by the front top step and the front bottom step, and in this state, the front face heater is moved between the front top step and the front bottom step so as to fuse the material, thereby wrapping around the four faces of the object.

[0043] The aspect may also include a frame holding the second movable projection, the frame and the movable folder being pivotable, the mounting table being of rectangular shape, pivot axes of the frame and the folder being arranged out of one of the sides of the rectangular table and in parallel with the side.

[0044] In this arrangement, the frame with the second projection and the movable folder are provided pivotable and have pivot axes at the same side relative to the table, so as to be easy to operate.

[0045] Further, at least one of the front face heater and the side face heater may be constituted by an elastic material of cylindrical shape and a heating element embedded in the elastic material.

[0046] In this arrangement, since the heaters are constituted by the elastic materials and the heating elements incorporated in the elastic materials, it enables entirely a firm attachment and a uniform heating when the wrapping material is heated.

[0047] The present invention provides a wrapping method using the wrapping device described above, and may employ the method wherein the wrapping material has a width wider than that of the object to be wrapped, and a length more than twice the total amount of the length and thickness of the object, and including the steps of wrapping the material around the object to cover the top face, the rear end face, and the bottom face therewith, fusing the material by the front face heater with the front end face sealed with the front bottom step and the front top step, and fusing the material as interfolded at the right and left side faces.

[0048] Such method enables a definite wrapping.

[0049] Further, the present invention provides a wrapping method using the wrapping device described above, and may employ the method wherein the wrapping material has a width wider than that of the object to be wrapped, and a length more than twice the total amount of the length and thickness of the object, and including the steps of mounting the material on the mounting table to cover the receptacle therewith, with a first longitudinal end of the material on the front bottom step, folding the material under the bottom face of the object by the front bottom step and the rear bottom step after mounting the object on the material on the table so as to engage with the receptacle of the table, folding back the material to cover the top face of the object with a second longitudinal end of the material moved to the front bottom step, whereupon folding the second end by the front top step with the movable folder moved, and wrapping the top and bottom faces and the front and rear end faces of the object with the material by bonding the first end and the second end of the material by means of the front side heater.

[0050] Such method enables a definite wrapping.

[0051] The present invention provides a wrapping method using the wrapping device described above, and may employ the method wherein the wrapping material has a width wider than that of the object to be wrapped, and a length more than twice the total amount of the length and thickness of the object, and including the steps of bonding one longitudinal end and the other longitudinal end of the material so as to cover the top and bottom faces and the front and rear end faces of the object with the material, interfolding the edges in the longitudinal direction of the right and left side faces of the material inward by the first movable projections, interfolding a top in the thickness direction of the right and left side faces of the material inward by the second movable projection, interfolding a bottom in the thickness direction of the right and left side faces inward by moving the mounting table to the lower position, and bonding by the side face heaters.

[0052] Such method enables a definite wrapping.

[0053] The wrapping device of the present invention facilitates wrapping with a simpler structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0054] Fig. 1 is a perspective view of a wrapping device provided in a first embodiment of the present invention;

Fig. 2A is a side elevation of the device seen in the direction of arrow 'A' in Fig. 1;

Fig. 2B is another side elevation of the device seen in the direction of arrow 'B'. in Fig. 1;

Fig. 3 is a cross-sectional view of a front face heater provided in the device;

Fig. 4 is a cross-sectional view of a side face heater provided in the device;

Fig. 5 is a front view showing a state in which a resin film is placed on the device in the embodiment;

Fig. 6 is a side view showing a state in which a CD case is mounted on a resin film placed on the device in the embodiment;

Fig. 7 is a side view showing a state in which the resin film is folded back toward a top face of the CD case from the state shown Fig. 6;

Fig. 8 is an enlarged side view showing a state in which the resin film is folded back at its end from the state shown in Fig. 7;

Fig. 9A is a front view showing a state in which a resin film is placed on the device in the embodiment and folded back at its end;

Fig. 9B is an enlarged side view of the end in the state shown in Fig. 9A;

Fig. 10 is a perspective view of a resin film fused at its ends mutually;

Fig. 11 is a perspective view showing a state of the resin film folded at two places by first movable projections from the state shown in Fig. 10;

Fig. 12 is a front view showing a state in which a resin film is fused at its ends mutually from the state shown in Fig. 9A;
 Fig. 13 is a perspective view of the resin film on the way in which the film is folded at a top face by a second movable
 projection from the state shown in Fig. 11;
 Fig. 14 is a perspective view of the resin film folded at the top face by the second projection from the state shown
 in Fig. 11;
 Fig. 15 is a front view showing a state in which a frame is moved toward a mounting table from the state shown in
 Fig. 12;
 Fig. 16 is a side view showing the state on the way from the state shown in Fig. 12 to the state shown in Fig. 15;
 Fig. 17 is a side view of the state shown in Fig. 15;
 Fig. 18 is a perspective view of the resin film on the way in which a mounting table in the state shown in Fig. 14 is
 moved from the upper position to the lower position;
 Fig. 19 is a perspective view of the resin film in a state in which the mounting table is moved to the lower position
 from the state shown in Fig. 14;
 Fig. 20 is a side view of the state shown in Fig. 19;
 Fig. 21 is a front view showing a state in which the frame and the first projections are moved back from the state
 shown in Fig. 15;
 Figs. 22A and 22B show a wrapping device provided in a second embodiment of the present invention, Fig. 22A
 being a front view thereof, Fig. 22B being a side view thereof;
 Fig. 23 is an enlarged side view of the upper part of Fig. 22;
 Fig. 24 is an enlarged side view of the upper part of Fig. 22;
 Fig. 25 is an enlarged side view of the upper part of Fig. 22;
 Fig. 26 is an enlarged side view of the upper part of Fig. 22;
 Fig. 27 is a perspective view of a CD case to be wrapped and a resin film;
 Figs. 28A and 28B show a diagram on the way of wrapping, Fig. 28A being a side view thereof, Fig. 28B being a
 perspective view thereof;
 Figs. 29A and 29B show a diagram on the way of wrapping, Fig. 29A being a side view thereof, Fig. 29B being a
 perspective view thereof;
 Figs. 30A and 30B show a diagram on the way of wrapping, Fig. 30A being a side view thereof, Fig. 30B being a
 perspective view thereof;
 Figs. 31A and 31B show a diagram on the way of wrapping, Fig. 31A being a side view thereof, Fig. 31B being a
 perspective view thereof;
 Figs. 32A and 32B show a diagram on the way of wrapping, Fig. 32A being a side view thereof, Fig. 32B being a
 perspective view thereof;
 Figs. 33A and 33B show a wrapping device provided in a third embodiment of the present invention, Fig. 33A being
 a front view thereof, Fig. 33B being a side view thereof;
 Fig. 34 is a perspective view of one of right and left side face interfolding members;
 Fig. 35 is a perspective view on the way of wrapping;
 Figs. 36A and 36B show a diagram on the way of wrapping, Fig. 36A being a perspective view thereof, Fig. 36B
 being a side view thereof;
 Figs. 37A and 37B show a diagram on the way of wrapping, Fig. 37A being a perspective view thereof, Fig. 37B
 being a side view thereof;
 Figs. 38A and 38B show a diagram on the way of wrapping, Fig. 38A being a perspective view thereof, Fig. 38B
 being a side view thereof; and
 Fig. 39 is a perspective view on the way of wrapping.

DESCRIPTION OF THE NUMERALS

[0055]

1, 2, and 3: wrapping device
 10: mounting table
 10a: receptacle (mounting portion)
 11: first movable projection
 12: second movable projection
 13: interfolding portion
 15: front face heater
 16: side face heater
 17: movable folder

17a:	pivot
18a:	front bottom step
19a:	rear bottom step
20:	front top step
5 22:	frame
22a:	pivot
23:	support
25:	knob
30:	operating portion
10 37:	tubular member
38:	electrically-heated wire
80:	CD case (object to be wrapped)
81:	front end face
82:	rear end face
15 83:	top face
84:	bottom face
85:	left side face
86:	right side face
90:	resin film (wrapping material)
20 110:	mounting table
111:	projection
117:	movable folder
118a:	front bottom step
120:	front top step
25 128:	upper movable portion
129:	lower movable portion
130, 160:	right and left side face interfolding members (side face interfolding member)
131, 132:	roller
131a, 132a:	conical surface
30 133:	heating roller (side face heater)
143:	heating portion (front heater)
161, 162:	slot

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0056] Now, preferred embodiments of the present invention will be described below, making reference to the accompanying drawings.

Herein, wrapping devices 1, 2, and 3 described below are powered mostly manually to wrap without a driving system such as a motor involving an external energy such as electricity.

[0057] Fig. 1 shows the wrapping device 1 provided in the first embodiment of the present invention. The wrapping device 1 uses a resin film 90 as a wrapping material to wrap a rectangular compact disk case (viz. CD case) 80 as an object to be wrapped. Herein, the CD case 80 and the resin film 90 are shown in Fig. 10 and the like. Specifically, wrapping is done in such a way as placing the resin film 90 on a mounting table 10, mounting the CD case 80 thereon, folding the film 90, bonding one end of the film 90 and the other so as to cover the four faces of the CD case 80, interfolding the film 90 protruded from the rest two faces, and bonding the film 90.

Herein, in the description below, a thickness direction denotes a direction vertical to a surface of the mounting table 10, a width direction denotes a direction parallel to the surface of the table 10 and vertical to faces where the film 90 is interfolded, and a longitudinal direction denotes a direction vertical to both the thickness and the width directions. Further, as to faces of the object, a top face and a bottom face denote faces opposed to each other in the thickness direction, a front end face and a rear end face denote faces between two sides of the top and the bottom faces and opposed to each other in the longitudinal direction, and a right side face and a left side face denote faces between two sides of the top and the bottom faces and opposed to each other in the width direction.

[0058] The wrapping device 1 includes the mounting table 10, first movable projections 11, second movable projections 12, a movable folder 17, interfolding portions 13, a front face heater 15, side face heaters 16, and a fixing plate 43.

[0059] The mounting table 10, as shown in Fig. 1, is of rectangular shape. The table 10 is provided with a first rib 18 and a second rib 19 projecting from the upper surface of the table 10. The first and the second ribs 18 and 19 are substantially the same shape, with a cross section of rectangular shape, and extending in the width direction in parallel. A front bottom step 18a is formed on the face nearer the second rib 19 of the first rib 18, and a rear bottom step 19a is

formed on the face nearer the first rib 18 of the second rib 19. The first and the second ribs 18 and 19 defines a receptacle 10a therebetween, which functions as a mounting portion for mounting a CD case described below.

Herein, the mounting table 10 has a width in conformity with that of the CD case 80, and a distance between the front bottom step 18a of the first rib 18 and the rear bottom step 19a of the second rib 19 is in conformity with the length of the CD case 80. The receptacle 10a seen from above is substantially the same shape as the bottom face 84 of the CD case 80. Further, the mounting table 10 has recessed areas 10b, which are located at opposite edges in the width direction of the table 10 to form a cavity between the table 10 and the interfolding portions 13 described below so that a user can insert his or her fingers into the recessed areas to hang up the table 10.

[0060] The mounting table 10, as shown in Fig. 1, is supported by a pivot not shown and a support 23. The pivot is connected with a connecting portion 50, which is secured to the fixing plate 43 provided under the wrapping device 1. The table 10 is pivotably supported around the pivot not shown, which direction is parallel to the width direction.

[0061] The support 23 supports the table 10 to be at an upper position and at a lower position, that is, supports the table 10 with its position changed. The support 23 has a knob 25, operation of which makes the table 10 supported at the upper position move to the lower position readily. Herein, a power of the operation uses a gravitational force of the table 10, whereas the table 10 is hung up by hands from the lower position to the upper position.

[0062] The table 10 pivots as described above, so that its slanted state changes, as being slanted such that the rear bottom step 19a is higher than the front bottom step 18a at the upper position, and as being the near-horizontal at the lower position.

[0063] The first movable projections 11, as shown in Fig. 1, 10, and 11, are of reverse L-shaped plate. The first projections 11 are provided at four places, adjacent to the opposite ends of the table 10 in the width direction, adjacent to the first and the second ribs 18 and 19 in the longitudinal direction. The first projections 11 in four places are situated little above the table 10 at almost the same position in the thickness direction (the vertical direction).

[0064] Distal ends 11a of the first projections 11 project in the longitudinal direction. The distal ends 11a of a pair of the first projections on the same side in the width direction project in a different direction, facing to each other and inwardly.

The first projections 11 are movable within almost the same length as the projecting length of the distal ends 11a.

[0065] Fig. 2B shows the mounting table 10 seen from underneath. Referring to Fig. 2B, each pair of the first projections 11 on the same side in the longitudinal direction (the cross direction) are mutually connected via a coupling rod 21. The wrapping device 1 has two coupling rods 21, with each of the first projections 11 in four places connected to one of the rods 21. The coupling rods 21 each have a sliding portion 33 that engages with a rail 31 at the bottom of the table 10 so as to be movable in the longitudinal direction. Consequently, movement of the coupling rods 21 makes the first projections 11 move in the longitudinal direction.

Further, the sliding portions 33, as shown in Fig. 2B, are hung on the rail 31 not to fall downward, and the members such as the coupling rods 21 and the first projections 11 fixed on the rods 21 are hung on the mounting table 10 via the rails 31.

[0066] Further, the wrapping device 1 has operating portions 30 connected with the coupling rods 21. Sliding the operating portions 30 in the longitudinal direction makes the first projections 11 move. The operating portions 30 each have a rib 35 with the ribs 35 of the two operating portions 30 arranged facing to each other, between which a spring 34 is loaded. The spring 34 is a compression spring and has urging force acting in a direction keeping away the two operating portions 30 mutually, thereby keeping each other's operating portions 30 away.

The two operating portions 30 are arranged on the same left side of the table 10, so as to be operated in one hand.

[0067] Referring to Fig. 1, there is provided two pieces of the second movable projections 12, which are of thin plate-like shape.

Further, the wrapping device 1 has a frame 22, to which two pieces of the second projections 12 are attached. The frame 22 is journaled by a pivot 22a attached to a connecting portion 50 and extending in the width direction. The frame 22 is pivotable around the pivot 22a so as to be pivotally moved toward the table 10. The second projections 12 are attached so that their distal ends 12a points toward the table 10. The distal ends 12a have substantially the same length as that of the CD case 80 in the longitudinal direction and are of substantially flat shape. Moving the frame 22 toward the table 10 makes the second projections 12 move from top down, thereby being outside of the table 10 in the width direction.

[0068] The movable folder 17, as shown in Fig. 1, is a plate-like member and journaled by a pivot 17a attached to the connecting portion 50 and extending in the width direction. The folder 17 is pivotable around the pivot 22a so as to be pivotally moved toward the table 10. The pivot point of the folder 17 and the pivot point of the frame 22 with the second projections 12 are provided at the same side relative to the table 10. The pivot axes are situated outside of the side of the table 10 adjacent to the rib 18 (i.e., adjacent to the front end face 84 of the mounted CD case 80) and parallel to the side. Further, the pivot 17a is connected to the folder 17 adjacent to its one edge, whereas a front top step 20 is formed adjacent to the other edge on the side opposite to the pivot 17a.

The folder 17 is pivotally moved toward the table 10 around the pivot 22a. Pivotally moving the folder 17 toward the table 10 displaces the front top step 20 to a point above the front bottom step 18a on the table 10, so as to be opposed to the front bottom step 18a in the thickness direction.

[0069] The folder 17 has a slot 17b. It is constituted in such a manner that a handle 40 described below attached to a retainer plate 39 of the front face heater 15 passes through the slot 17b when the folder 17 is moved toward the table 10. Consequently, such structure prevents the handle 40 from contacting with the folder 17 in the case of moving the folder 17.

[0070] The interfolding portions 13 are of elongated plate-like members and provided outside of the right and left sides of the table 10 in the width direction. The interfolding portions 13 in two places, as described below, are respectively located outside of a left side face 85 and a right side face 86 of the CD case 80 mounted on the table 10. The interfolding portions 13 each have substantially the same length as that of the receptacle 10a in the longitudinal direction.

The interfolding portions 13 each have a top face 13a, which is located at a lower level than the receptacle 10a of the table 10 when the table 10 is at the upper position, and at a higher level than the table 10 at the lower position. The interfolding portions 13 are secured to the fixing plate 43.

[0071] In the process that the table 10 moves from the upper position to the lower position, the vertical position of the receptacle 10a approximately corresponds to that of the interfolding portions 13, and that is when the bottom surface of the receptacle 10a of the table 10 is slanted relative to the top faces 13a of the interfolding portions 13. More specifically, the rear bottom step 19a is slanted higher relative to the front bottom step 18a.

[0072] The front face heater 15 is arranged at the side where the folder 17 is provided relative to the table 10. In other words, the front face heater 15 is located outside of the front end face 81 of the CD case 80 mounted on the table 10. The front face heater 15 is constituted, as a cross section of that is shown in Fig. 3, by a tubular member 37 made of resin, rubber or the like of tubular shape having elasticity and an electrically-heated wire 38 which is a heating element embedded in the tubular member 37. Electrifying to the electrically-heated wire 38 generates heat in the wire 38, and the heat is conducted to the tubular member 37, thereby heating the resin film 90 contacting with the tubular member 37 to fuse the film 90 mutually, as described below. Herein, an adhesive being fusible by heating may be applied in advance on the film 90 that is a wrapping material to heat the adhesive for fusing.

[0073] The front face heater 15 is retained by the retainer plate 39, which is of plate-like member. The front face heater 15 is attached to the edge of the retainer plate 39 to cover the entire area of the edge adjacent to the table 10 of the retainer plate 39.

The retainer plate 39 is made of resin with heat resistance, so that the heat generated by the electrically-heated wire 38 is not easily conducted to the retainer plate 39.

[0074] Further, the retainer plate 39 is movable in the width direction toward the table 10, and is urged in a direction away from the table 10 by an urging member not shown. The retainer plate 39 has a handle 40 secured thereto. Only when the handle 40 is pushed toward the table 10, the heater 15 is moved toward the table 10, and when pushing is stopped, the handle 40 moves back in a direction away from the table 10 by the urging member.

When the handle 40 is pushed, the front face heater 15 is located above the front bottom step 18a and adjacent to the front end face 81 of the CD case 80 mounted on the table 10. Then, the front face heater 15 is moved toward the table 10 to press the front end face 81 of the CD case 80.

In the state that the folder 17 is moved toward the table 10, the front face heater 15 is also movable toward the table 10. In this case, the front face heater 15 is moved between the front bottom step 18a and the front top step 20.

[0075] The side face heaters 16 are arranged on either outside in the width direction of the table 10. Each of the side face heaters 16 is constituted, as a cross section of that is shown in Fig. 4, similar to the front face heater 15.

Retainer plates 39 of the side face heaters 16 are located at a higher level than the interfolding portions 13 and movable in the longitudinal direction toward the table 10. When being moved toward the table 10 at the lower position, the side face heaters 16 are moved toward the edges of either side of the table 10, and to a position above and adjacent to outside of the width direction of the receptacle 10a.

[0076] Further, as well as the front face heater 15, the side face heaters 16 are urged in a direction away from the table 10 by an urging member not shown. The retainer plates 39 of the side face heaters 16 each are provided with a handle 40. Only when the handles 40 are pushed toward the table 10, the side face heaters 16 are moved toward the table 10.

In this way, the side face heaters 16 have the same movements to the front face heater 15.

[0077] Now, a method for wrapping a CD case 80 in a resin film 90 by using the wrapping device 1 will be described.

[0078] The resin film 90 for use in wrapping has a width a little wider than that of the CD case 80 and a length more than twice the total amount of the length and thickness of the CD case 80. Herein, in the case of using a long film, it is to be cut in advance to the length described above.

A material of the resin film 90 is not limited, though a resin made of ethylene or polypropylene, a drawn film, or the like may be employed.

[0079] At first, as shown in Fig. 1, the mounting table 10 is located at the upper position and the frame 22 and the front face folder 17 are located away from the table 10.

[0080] Referring to the Fig. 5, the resin film 90 is placed on the table 10. More specifically, an end of the film 90 in the longitudinal direction is to be adjacent to the front bottom step 18a so as to cover the entire area of the receptacle 10a

therewith. The film 90 is placed in this way, thereby covering the front bottom step 18a and the rear bottom step 19a. A distance between the end of the film 90 in the longitudinal direction and the front bottom step 18a is to be shorter than the thickness of the CD case 80.

[0081] Further, the CD case is mounted on the film 90 to conform to the receptacle 10a.

That ensures, as shown in Fig. 6, that the film 90 is placed between the CD case 80 and the front bottom step 18a, so that the film 90 is folded along the front bottom step 18a and toward the front end face 81 of the CD case 80. Similarly, the film 90 is placed between the CD case 80 and the rear bottom step 19a, so that the film 90 is folded along the rear bottom step 19a and toward the rear end face 82 of the CD case 80. The bottom face 84 of the CD case 80 is covered with the film 90.

[0082] Next, the resin film 90 is folded back to cover the top face 83 of the CD case 80. Referring to Fig. 7, since the length of the film 90 is a little more than twice the total amount of the length and thickness of the CD case 80, its end covers the top face 83 of the CD case 80. Thus, the film 90 covers the rear end face 82, the top face 83, and the bottom face 84, and the opposite ends of the film 90 in the longitudinal direction come to the front end face 81.

Then, as shown in Fig. 7, the movable folder 17 is pivotally moved toward the table 10, thereby making the front top step 20 take its position facing to the front bottom step 18a in the thickness direction.

The front top step 20 of the folder 17 folds the film 90 protruded from the top face 83 toward the front end face 81, so that the film 90 partly overlaps as in the state shown in Figs. 8 and 9B.

At this time, slightly pulling the film 90 toward the front end face 81 enables a more definite wrapping with the film 90 close to the CD case 80 without surface waviness.

[0083] In this state, the overlapped film 90 is fused to be bonded by the front face heater 15. More specifically, the electrically-heated wire 38 of the front face heater 15 is energized for heat generation, whereby the tubular member 37 reaches a high temperature, and then the handle 40 is moved in a direction indicated by arrows in Figs. 9A and 9B to bring the tubular member 37 in contact with the overlapped film 90, which becomes a high temperature and is fused. Once being fused, the film 90 does not return to the original condition by force of restitution even the folder 17 is put back into place.

[0084] Therefore, as shown in Fig. 10, the CD case 80 is covered with the film 90 at its front end face 81, its rear end face 82, its top face 83 and its bottom face 84, whereas the left side face 85 and the right side face 86 have the film 90 protruded therefrom in the width direction.

[0085] Further, as described below, the film 90 protruded from the right and the left side faces 86 and 85 of the CD case 80 is interfolded. Herein, a method of interfolding at the right and the left side faces 86 and 85 will be described only about the case of the right side face 86, and as for the case of the left side face 85, a description is omitted because of the similar case due to a symmetric shape.

[0086] Referring to Fig. 10, the table 10 is at the upper position, that is, the receptacle 10a of the table 10 is located at a higher level than the top face 13a of the interfolding portion 13. Consequently, the film 90 protruded in the width direction is also located at a higher level than the top face 13a of the interfolding portion 13.

The distal ends 11a of the first projections 11 are located in front of and back of the protruded film 90.

[0087] Then, as shown in Fig. 12, when the two operating portions 30 are moved inward, the first projections 11 are moved inward, so that the film 90 protruded to the right side face 86 of the CD case 80 is pressed by the distal ends 11a to be folded inward. That leads to the state shown in Fig. 11. In the embodiment, since the two operating portions 30 are adapted to be moved inward, all the first projections 11 are operated in one hand in such a manner as holding the operating portions 30. Alternatively, only one operating portion 30 may be equipped so as to operate all the first projections 11 by the one operating portion 30.

[0088] When the first projections 11 are moved inward, a front end face protruded part 91 protruded from the front end face 81 and a rear end face protruded part 92 protruded from the rear end face 82 among the protruded film 90 are interfolded inward. Then, as shown in Fig. 11, a top face protruded part 93 protruded from the top face 83 and a bottom face protruded part 94 protruded from the bottom face 84 are slightly transformed in a direction where the thickness direction extends, upon interfolding of the front end face protruded part 91 and the rear end face protruded part 92.

[0089] Further, pivotally moving the frame 22 toward the table 10 leads through the state shown in Figs. 13 and 16 to Figs. 14, 15, and 17, thereby locating the second projection 12 adjacent to the right side face 86 of the CD case 80.

That is when, as shown in Fig. 13, the top face protruded part 93 is interfolded downward by the second projection 12. And when the second projection 12 is moved toward the table 10 and let downward, the distal end 12a of the second projection 12 exceeds an upper side 86a of the right side face 86 of the CD case 80, being slanted. Thus, a point where the top face protruded part 93 is interfolded proceeds from a front side (the right as viewed in Fig. 13) to a rear side (the left as viewed in Fig. 13) gradually, thereby enabling a smooth interfolding with little catch.

[0090] After the top face protruded part 93 is interfolded, the knob 25 of the support 23 is operated so as to move the table 10 from the upper position to the lower position. Referring to Fig. 14, when the table 10 is at the upper position before the knob 25 is operated, the bottom face protruded part 94 is located at higher level than the top face 13a of the interfolding portion 13, and then, when the table 10 is moved to the lower position, the bottom face protruded part 94 is

interfolded upward, so the top face protruded part 93 is within the bottom face protruded part 94. In this manner, as shown in Fig. 20, a state in double chain line changes to a state in solid line.

[0091] When the table 10 is moved downward so as to be from the upper position to the lower position, faces of the table 10 in the vertical direction pass through the top face 13a of the interfolding portion 13. At this time, the bottom face 84 of the CD case 80 on the table 10 moves, being slanted relative to the top face 13a of the interfolding portion 13, so a point where the bottom face protruded part 97 is interfolded proceeds gradually from a front side (the right as viewed in Figs. 18 to 20) to a rear side (the left side as viewed in Figs. 18 to 20), thereby enabling a smooth interfolding with little catch.

[0092] Then, releasing the hand holding the operating portions 30 to put the first projections 11 back into place and moving the frame 22 upward lead to a state shown in Fig. 19. In this state, since the interfolding portion 13 holds the lower side of the bottom face protruded part 94, within which the front end face protruded part 91, the rear end face protruded part 92, and the top face protruded part 93 are, the film 90 does not restitute to return to the original condition before being interfolded.

[0093] Further, the interfolded part described above is fused by the side face heater 16. More specifically, the electrically-heated wire 38 of the side face heater 16 is energized for heat generation, whereby the tubular member 37 reaches a high temperature, and then the handle 40 is moved to make the heater 16 contact with the bottom face protruded part 94, which is fused with the top face protruded part 93.

Once fusing the bottom face protruded part 94 with the top face protruded part 93 by the side face heater 16, the interfolded part of the film 90 of the right side face 86 does not return to the original condition by force of restitution.

The wrapping is completed in this way.

[0094] The method in the embodiment simplifies the structure of the device because no necessity to hang up the CD case 80 to be wrapped after the CD case 80 is mounted on the mounting table 10. Further, the steps 18a, 19a, and 20 and the movable projections 11 and 12 fold and interfold the resin film 90 that is a wrapping material at its ends and at the parts corresponding to the sides of the CD case 80, so as to wrap precisely without failure with simple operation.

[0095] Now, another wrapping device 2 provided in a second embodiment of the present invention will be described. Figs. 22A and 22B are a front view and a side view of the wrapping device provided in the second embodiment of the present invention. Figs. 23 to 26 are enlarged side views of the upper part of Figs. 22A and 22B. Fig. 27 is a perspective view of a CD case to be wrapped and a resin film. Figs. 28 to 32 are perspective views and side views showing a diagram on the way of wrapping.

[0096] The wrapping device 2, as shown in Fig. 22, includes a mounting table 110, a movable folder 117, right and left side face interfolding members (viz. side face interfolding members) 130, and heating rollers (viz. side face heaters) 133.

[0097] The mounting table has a slope 137 with a mounting surface 137a slanted relative to the horizontal, and an upper movable portion 128 and a lower movable portion 129 both being movable along the mounting surface 137a of the slope 137.

[0098] The slope 137 is of rectangular plate-like shape and substantially vertical to the horizontal. The slope 137 is supported by a support 138 provided underneath. There is provided a front bottom step 118a at an upper part and on the mounting surface 137a of the slope 137. Referring to Fig. 22B, the front bottom step 118a extends horizontally.

[0099] The upper and the lower movable portion 128 and 129 each have a main body 142 in the shape of a rod extending horizontally and projections 111 arranged to the opposite ends of the main body 142. The projections 111 project in a direction along the mounting surface 137a of the slope 137 and inward so that the projections 111 of the upper movable portion 128 and the projections 111 of the lower movable portion 129 face to each other. More specifically, the projections 111 of the upper movable portion 128 project downward and the projections 111 of the lower movable portion 129 project upward.

Herein, the main body 142 has substantially the same length as the width of the CD case 80. A distance between the lower movable portion 129 at a first stage and the front bottom step 118a is substantially the same as the length of the CD case 80.

[0100] The upper and the lower movable portions 128 and 129 are movable along the mounting surface 137a of the slope 137. That is because the slope 137 has grooves 141 on the mounting surface 137a thereof so that projections 135 formed on the upper and the lower movable portions 128 and 129 engage with the grooves 141, whereby preventing the upper and the lower movable portions 128 and 129 from disengaging from the slope 137 and being movable along the mounting surface 137a. Further, the grooves 141 are arranged in a direction extending vertically, so that the upper and the lower movable portions 128 and 129 are movable vertically.

Herein, the upper and the lower movable portions 128 and 129 are urged upward by means of urging members not shown such as springs. Such a structure allows the upper and the lower movable portions 128 and 129 to move downward only when needed. The lower movable portion 129 also has a stopper not shown so as to be located at the first stage.

[0101] The upper movable portion 128 has a handle 140, operation of which makes the upper movable portion 128 move vertically by hand. There is also provided a heating portion (a front face heater) 143 on the lower part of the upper

movable portion 128 so as to fuse the film 90 of the front end face 81 of the CD case 80, as will be described below.

[0102] The CD case 80 is mounted on the top of the lower movable portion 129 of the mounting table 110 and on the mounting surface 137a of the slope 137.

[0103] The right and left side face interfolding members 130, as shown in Fig. 22 and 31, are located in two places at both sides slightly below midline of the slope 137. Each of the interfolding members 130 in two places have conical rollers 131 and 132, which are rotatably secured by means of shafts 131a and 132a secured to the slope 137. Herein, the shafts 131b and 132b are arranged horizontally and substantially parallel to the mounting surface 137a of the slope 137.

The rollers 131 and 132, as shown in Fig. 22A, are conical and taper towards the slope 137.

[0104] The heating rollers 133 are positioned below the interfolding members 130 in two places respectively and heated by heat generated by such as an electrical heater.

The heating rollers 133 are rotatably secured by means of shafts 133b secured to the slope 137. Herein, the shafts 133b are vertical to the mounting surface 137a of the slope 137 and also vertical to a moving direction of the upper and the lower movable portions 128 and 129. The CD case 80 is contactable with outer peripheries 133a of the heating rollers 133 at its right and left side faces 86 and 85.

[0105] Referring to Figs. 23, 24, and the like, the movable folder 117 is of L-shaped plate and provided adjacent to the upper edge of the slope 137. The folder 117 is journaled by a pivot 117a on the slope 137, so as to pivotally move toward the table 110. The folder 117 is provided with a front top step 120.

Herein, the folder 117, as shown in Fig. 22A, has a slot 147 so that the handle 140 of the upper movable portion 128 is movable.

[0106] Pivotaly moving the folder 117 toward the table 110 makes the front top step 120 take its place facing to the front bottom step 118a in the thickness direction, and it is possible to adjust a distance between the front top step 120 and the front bottom step 118a at this state to be substantially the same as the thickness of the CD case 80.

[0107] Now, a method for wrapping a CD case 80 in a resin film 90 by using the wrapping device 2 will be described.

At first, as shown in Fig. 27, the resin film 90 is placed to cover the top face 83, the rear end face 82, and the bottom face 84 therewith. Herein, the resin film 90 is of the same material and size as the case of the wrapping device 1 provided in the first embodiment, that is, has a width a little wider than that of the CD case 80 and a length more than twice the total amount of the length and thickness of the CD case 80. More specifically, the film 90 has a width adding a length for folding back at the opposite ends to the width of the CD case 80 and the length adding an overlap space to the length twice the total amount of the length and thickness of the CD case 80.

[0108] In this state, the CD case 80 with the film 90 is mounted on the top of the lower movable portion 129 of the mounting table 110 and on the mounting surface 137a of the slope 137 of the device 2. Herein, at this time, the movable folder 117 is open, as shown in Fig. 23.

[0109] Fig. 28 shows the film 90 in this state. In such a manner, the rear end face 82 of the CD case 80 contacts with the lower movable portion 129, and the rear end face protruded part 92 of the film 90 is interfolded since the projections 111 of the lower movable portion 129 project upward.

[0110] Further, the film 90 at the bottom face 84 is sandwiched between the mounting surface 137a of the slope 137 and the CD case 80. The upper edge of the resin film at the bottom face 84 is folded toward the front end face 81 by the front bottom step 118a.

[0111] Next, the folder 117 is pivotally moved toward the table 110, and this state is shown in Figs 24 and 29. The front top step 120 takes its place facing to the front bottom step 118a in the thickness direction, thereby folding the film 90 at the top face 83 toward the front end face 81.

In such a manner, portions of the film 90 under the bottom face 84 and on the top face 83 are folded to be along the front end face 81, thereby covering the front end face 81 of the CD case 80. The film 90 at the front end face 81 is partly overlapped.

[0112] Further, moving the handle 140 downward makes the upper movable portion 128 move downward. Therefore, as shown in Fig. 25, the bottom side of the main body 142 of the upper movable portion 128 contacts with the front end face 81 of the CD case 80, and then, the heating portion 143 of the upper movable portion 128 heats to fuse the overlapping film 90 interfolded toward the front end face 81.

[0113] Then, as shown in Fig. 30, the film 90 covers the top face 83, the rear end face 82, the bottom face 84, and the front end face 81 therewith. Each of the right and the left side faces 86 and 85 have a top face protruded part 93 and a bottom face protruded part 94 where the film 90 is protruded. The front end face protruded part 91 and the rear end face protruded part 92 are folded back by the projections 111 on the upper and the lower movable portions 128 and 129.

[0114] If and when the handle 140 is moved further downward by a stronger force than the upward urging force acting on the upper and the lower movable portions 128 and 129, as shown in Fig. 26, the upper movable portion 128, the CD case 80, and the lower movable portion 129 are also moved downward. Therefore, the right and the left side faces 86 and 85 of the CD case 80 is led adjacent to the right and left side interfolding members 130 situated at both sides slightly

below the midline of the slope 137.

In such a manner, the CD case 80 slides in the same direction as the moving direction of the upper and the lower movable portions 128 and 129 and in a direction along the mounting surface 137a.

[0115] Referring to Fig. 31, one of the bottom face protruded parts 94 is interfolded inward by a conical surface 131 a of the roller 131 of the interfolding member 130, and one of the top face protruded parts 93 is interfolded inward by a conical surface 132a of the roller 132.

Consequently, when the CD case 80 pass through the interfolding member 130, the top face protruded part 93 and the bottom face protruded part 94 are interfolded with overlapped so that the top face protruded part 93 comes outside. Further, such interfolding is done from downside to upside.

[0116] Referring to Fig. 32, it follows with the heating roller 133 passing through the overlapped part, so that the outer periphery 133a of the heating roller 133 contact with the top face protruded part 93. The top face protruded part 93 and the bottom face protruded part 94 are heated to be fused. Herein, the heating roller 133 is arranged just below the interfolding member 130, thereby fusing the film 90 before the film 90 is put back into place by a rebound.

[0117] The front end face 81 of the CD case 80 passes through the heating roller 133, the CD case 80 is moved to a lower level than the heating roller 133, and then the wrapping of the CD case 80 is completed.

Herein, Figs. 28 to 32 illustrate only the left side face 85, though the wrapping of the right side face 86 is also done likewise simultaneously.

[0118] Now, still another wrapping device 3 provided in a third embodiment of the present invention will be described. Fig. 33 is a front view and a side view of the wrapping device provided in the third embodiment of the present invention.

Fig. 34 is a perspective view of one of right and left side face interfolding members. Figs. 35 and 39 are perspective view on the way of wrapping. Figs. 36 to 38 are perspective views and side views showing diagrams on the way of wrapping.

[0119] The wrapping device 3, as shown in Fig. 33, includes a mounting table 110, a movable folder 117, right and left side face interfolding members (viz. side face interfolding members) 160, and heating rollers 133. The wrapping device 3 is different only in a structure of the right and left side face interfolding members 160 from the wrapping device 2 described above.

[0120] Each of the interfolding members 160 provided in the device 3, as shown in Fig. 34, is a rectangular tube having rectangular inner and outer shapes with two slots 161 and 162. Two interfolding members 160 are respectively arranged at both ends of and slightly below the midline of the slope 137, similarly to the interfolding members 130 provided in the second embodiment. Further, the interfolding members 160 are positioned with their slot faces 163 having the slots 161 and 162 inside.

[0121] As to each of the interfolding members 160, the slots 161 and 162 are formed so as to penetrate through the inside and outside thereof. One slot 161 extends from a first edge 165 to a second edge 166 in a longitudinal direction and the other slot 162 extends from the first edge 165 to about the halfway in the longitudinal direction.

Referring to Fig. 33, the slot 161 is arranged closer to the mounting surface 137a of the table 110 of the slope 137 than the slot 162.

[0122] The slot 161 extends substantially parallel to the sliding direction of the CD case 80 that is the longitudinal direction from the first edge 165 to about the halfway, and is slanted relative to the sliding direction so as to keep away from the slope 137 from about the halfway to the second edge 166. The slot 162 is slanted relative to the sliding direction so as to come close to the slope 137 from the first edge 165 to about the halfway.

The position of the slot 161 at the first edge 165 in a thickness direction is adjacent to the mounting surface 137a, whereas the position of the slot 162 at the first edge 165 is at the thickness of the CD case 80 away from about the surface 137 of the slope 137 in the thickness direction.

[0123] Now, a method for wrapping a CD case 80 in a resin film 90 by using the wrapping device 3 will be described. Similar to the case of the second embodiment, as shown in Fig. 27, the resin film 90 is placed to cover the top face 83, the rear end face 82, and the bottom face 84 therewith. Then the CD case 80 is wrapped by the method described in the second embodiment, until the film 90 at the side of the front end face 81 is fused to cover the top face 83, the rear end face 82, the bottom face 84, and the front end face 81 therewith.

A method of interfolding the film 90 protruded toward the right and left side faces 86 and 85 is as follows. It is different from the method described in the second embodiment.

[0124] Specifically, the upper movable portion 128 is moved downward by means of the handle 40, and the CD case 80 and the lower movable portion 129 are moved downward. Therefore, the top face protruded parts 93 and the bottom face protruded parts 94, each of which are the film 90 protruded from the right and the left side faces 86 and 85, come adjacent to the right and left side face interfolding members 160 respectively.

[0125] Further downward movement of the CD case 80 changes a state shown in Fig. 35 into a state shown in Fig. 36, that is, the bottom face protruded part 94 is guided into the slot 161 of the interfolding member 160 and the top face protruded part 93 is guided into the slot 162.

[0126] Referring to Fig. 36B that shows a cross section adjacent to the lower edge of the CD case 80, the bottom face and the top face protruded parts 94 and 93 are not folded yet at the beginning of being put into the slots 161 and 162.

[0127] Moving the CD case 80 still further downward, the bottom face protruded part 94 goes into and along the slot 161, whereas the top face protruded part 93 goes into and along the slot 162. Since the slot 162 is slanted in the direction closer to the slope 137, the top face protruded part 93 is gradually folded toward the slope 137 in accordance with the move of the CD case 80.

Then, when the lower edge of the CD case 80 comes adjacent to the halfway of the interfolding member 160, as shown in Figs 37A and 37B, the top face protruded part 93 is completely interfolded. The bottom face protruded part 94 is not interfolded at about the halfway.

[0128] Moving the CD case 80 successively downward, the bottom face protruded part goes into along the slot 161. Since the slot 161 is slanted away from the slope 137, the bottom face protruded part 94 is gradually folded toward the opposite side of the slope 137 in accordance with the move of the CD case 80.

[0129] When the entire CD case 80 passes through the interfolding member 160, as shown in Fig. 39, the film 90 at the left side face 85 of the CD case 80 is completely interfolded.

[0130] Then, as the device 2 described above, the overlapping part of the top face and the bottom face protruded parts 93 and 94 comes to the heating roller 133, and the outer periphery 133a of the heating roller 133 contacts with the top face protruded part 93. Therefore, the top face and the bottom face protruded parts 93 and 94 are heated to be fused. Herein, the heating roller 133 is arranged just below the interfolding member 160, thereby fusing the film 90 before that the film 90 is put back into place by a rebound.

[0131] Use of the wrapping devices 2 and 3 wraps the CD case 80 to be wrapped in the resin film 90 that is a wrapping material with a simple operation. More specifically, the CD case 80 is wrapped in the film 90 and set in the devices 2 and 3 in this state, the movable folder 117 is pivotally moved, and the handle 140 is moved downward, thereby enabling a completion of wrapping. Consequently, it is available to wrap without a complicated operation and readily by anyone.

[0132] In the embodiments, an object to be wrapped is the CD case 80, but may be any other object to be wrapped. Further, a wrapping material is the resin film 90, but may be any other wrapping material.

Claims

1. A wrapping device for wrapping an object to be wrapped of substantially cuboid shape with predetermined width, length, and thickness having top and bottom faces opposed in a thickness direction, front and rear end faces opposed in a longitudinal direction, and right and left side faces opposed in a width direction in a wrapping material being fusible by heating, comprising:

a mounting table for mounting the object;

a movable folder; and

a front face heater adapted to heat the wrapping material to such a temperature as fusible;

the mounting table having a front bottom step;

the movable folder having a front top step and being movable toward the mounting table;

wherein the front top step is adapted to take its position facing to the front bottom step in the thickness direction when the movable folder is moved to the mounting table;

in this state, the front face heater is movable between the front bottom step and the front top step, so as to fuse the wrapping material of the front end face.

2. The wrapping device as defined in claim 1, further comprising:

a side face interfolding member; and

a side face heater adapted to heat the wrapping material to such a temperature as fusible;

wherein the object on the mounting table is slidable in a sliding direction passing through the side face interfolding member; and

wherein the wrapping material is interfoldable on at least one of the right and left side faces of the object when the object passes through the interfolding member;

the side face heater being provided ahead of the interfolding member in the sliding direction.

3. The wrapping device as defined in claim 2,

wherein the mounting table comprises a mounting face for mounting the object thereon;

the mounting face being slanted relative to the horizontal;

the object being slidable downward along the mounting face.

4. The wrapping device as defined in claim 2 or 3, further comprising a lower movable portion adapted to support the

object from the lower side,
the lower movable portion being movable in the sliding direction of the object and urged upward.

5. The wrapping device as defined in claim 4,
wherein the lower movable portion has a projection;
wherein the projection is adapted to interfold the wrapping material protruded from the rear end face to at least one of the right and left side faces.
6. The wrapping device as defined in one of claims 2 to 5, further comprising an upper movable portion with a projection, wherein the projection is adapted to interfold the wrapping material protruded from the front end face to at least one of the right and left side faces.
7. The wrapping device as defined in claim 6,
wherein the front face heater is attached to the upper movable portion.
8. The wrapping device as defined in one of claims 2 to 7,
wherein the side face interfolding member has rollers each with a conical surface, so that the wrapping material protruded from the top and bottom faces to at least one of the right and left side faces of the object is interfolded by the conical surfaces when the object is slid.
9. The wrapping device as defined in one of claims 2 to 7,
wherein the side face interfolding member has slots;
the slots being slanted relative to the sliding direction of the object so that the wrapping material protruded from the top and bottom faces to at least one of the right and left side faces of the object is interfolded by being guided into the slots when the object is slid.
10. The wrapping device as defined in claim 8 or 9, further comprising a side face heater adapted to heat the wrapping material to such a temperature as fusible below the side face interfolding member.
11. The wrapping device as defined in claim 1,
wherein the mounting table has a rear bottom step;
so that a receptacle is formed between the front and the rear bottom steps of the table,
a distance between the front and the rear bottom steps being substantially the same as the length of the object.
12. A wrapping device for wrapping an object to be wrapped of substantially cuboid shape with predetermined width, length, and thickness having top and bottom faces opposed in a thickness direction, front and rear end faces opposed in a longitudinal direction, and right and left side faces opposed in a width direction, in a wrapping material being fusible by heating, comprising:
a mounting table;
first movable projections;
a second movable projection;
an interfolding portion arranged outside of the width direction of the mounting table; and
a side face heater adapted to heat the wrapping material to such a temperature as fusible;
wherein the mounting table has a mounting portion for mounting the object thereon, a width of which portion is substantially the same as that of the object;
wherein the mounting table is movable up and down, so that the mounting portion is located upper than the top face of the interfolding portion at the upper position where the table is located upward, and so that the mounting portion is located lower than the top face of the interfolding portion at the lower position where the table is located downward;
wherein the first projections are movable in the longitudinal direction along at least one of the right and left side faces of the object, so as to move to interfold the material protruded from the front and rear end faces toward the at least one of the side faces;
wherein the second projection is movable in the thickness direction along the at least one of the side faces of the object, so as to move to interfold the material protruded from the top face toward the at least one of the side faces; and
wherein the side face heater is movable toward the at least one of the side faces of the object mounted on the mounting table at the lower position.

13. The wrapping device as defined in claim 12 further comprising a support,
wherein the support is adapted to support the mounting table, thereby maintaining the upper position;
the support having a knob;
operation of the knob releasing supporting by the support, thereby allowing the mounting table to move to the lower
position.

14. The wrapping device as defined in claim 12 or 13,
wherein in the case of making the mounting table move downward to be at the lower position from the upper position
so that the wrapping material protruded from the bottom face and located above the interfolding portion is interfolded
by passing through the top face of the interfolding portion with the bottom face of the material mounted on the
mounting portion slanted relative to the top face of the interfolding portion.

15. The wrapping device as defined in one of claims 12 to 14,
wherein the second projection has a flat end, so that in the case of making the second projection move to the
mounting table, the end is slanted relative to the top edge of the side face of the object mounted on the mounting
table when the end passes through the top edge.

16. The wrapping device as defined in one of claims 12 to 15,
wherein the first projections are formed at four places adjacent to opposite ends in the longitudinal direction of the
right side face and the left side face of the object mounted on the mounting table and have operating portions adapted
to operate the first projections.

17. The wrapping device as defined in one of claims 12 to 16 further comprising:

a movable folder; and
a front face heater adapted to heat the wrapping material to such a temperature as fusible;
wherein the mounting table has a front bottom step and a rear bottom step and forms a receptacle with sub-
stantially the same length as the object between the front and the rear bottom steps; and
wherein the folder is provided with a front top step and movable toward the mounting table, so that the front top
step is adapted to take its position facing to the front bottom step in the thickness direction when the movable
folder is moved toward the mounting table,
so that the front face heater is adapted to be displaced between the front bottom step and the front top step,
thereby fusing the wrapping material of the front end face.

18. The wrapping device as defined in claim 17 further comprising a frame holding the second movable projection,
the frame and the movable folder being pivotable;
the mounting table being of rectangular shape;
pivot axes of the frame and the folder being arranged out of one of the sides of the rectangular table and in parallel
with the side.

19. The wrapping device as defined in one of claims 1 to 18,
wherein at least one of the front face heater and the side face heater is constituted by an elastic material of cylindrical
shape and a heating element embedded in the elastic material.

20. A wrapping method using the wrapping device as defined in one of claims 1 to 10,
wherein the wrapping material has a width wider than that of the object to be wrapped, and a length more than twice
the total amount of the length and thickness of the object; and comprising the steps of:

wrapping the material around the object to cover the top face, the rear end face, and the bottom face therewith;
fusing the material by the front face heater with the front end face sealed with the front bottom step and the
front top step; and
fusing the material as interfolded at the right and left side faces.

21. A wrapping method using the wrapping device as defined in one of claims 11, 17, 18, and 19,
wherein the wrapping material has a width wider than that of the object, and a length more than twice the total
amount of the length and thickness of the object; and comprising the steps of:

mounting the material on the mounting table to cover the receptacle therewith, with a first longitudinal end of

the material on the front bottom step;

folding the material under the bottom face of the object by the front bottom step and the rear bottom step after mounting the object on the material on the table so as to engage with the receptacle of the table;

folding back the material to cover the top face of the object with a second longitudinal end of the material moved to the front bottom step, whereupon folding the second end by the front top step with the movable folder moved; and

wrapping the top and bottom faces and the front and rear end faces of the object with the material by bonding the first end and the second end of the material by means of the front side heater.

- 22.** A wrapping method using the wrapping device as defined in one of claims 12 to 19, wherein the wrapping material has a width wider than that of the object to be wrapped, and a length more than twice the total amount of the length and thickness of the object; and comprising the steps of:

bonding one longitudinal end and the other longitudinal end of the material so as to cover the top and bottom faces and the front and rear end faces of the object with the material;

interfolding the edges in the longitudinal direction of the right and left side faces of the material inward by the first movable projections;

interfolding a top in the thickness direction of the right and left side faces of the material inward by the second movable projection;

interfolding a bottom in the thickness direction of the right and left side faces inward by moving the mounting table to the lower position; and

bonding by the side face heaters.

FIG.1

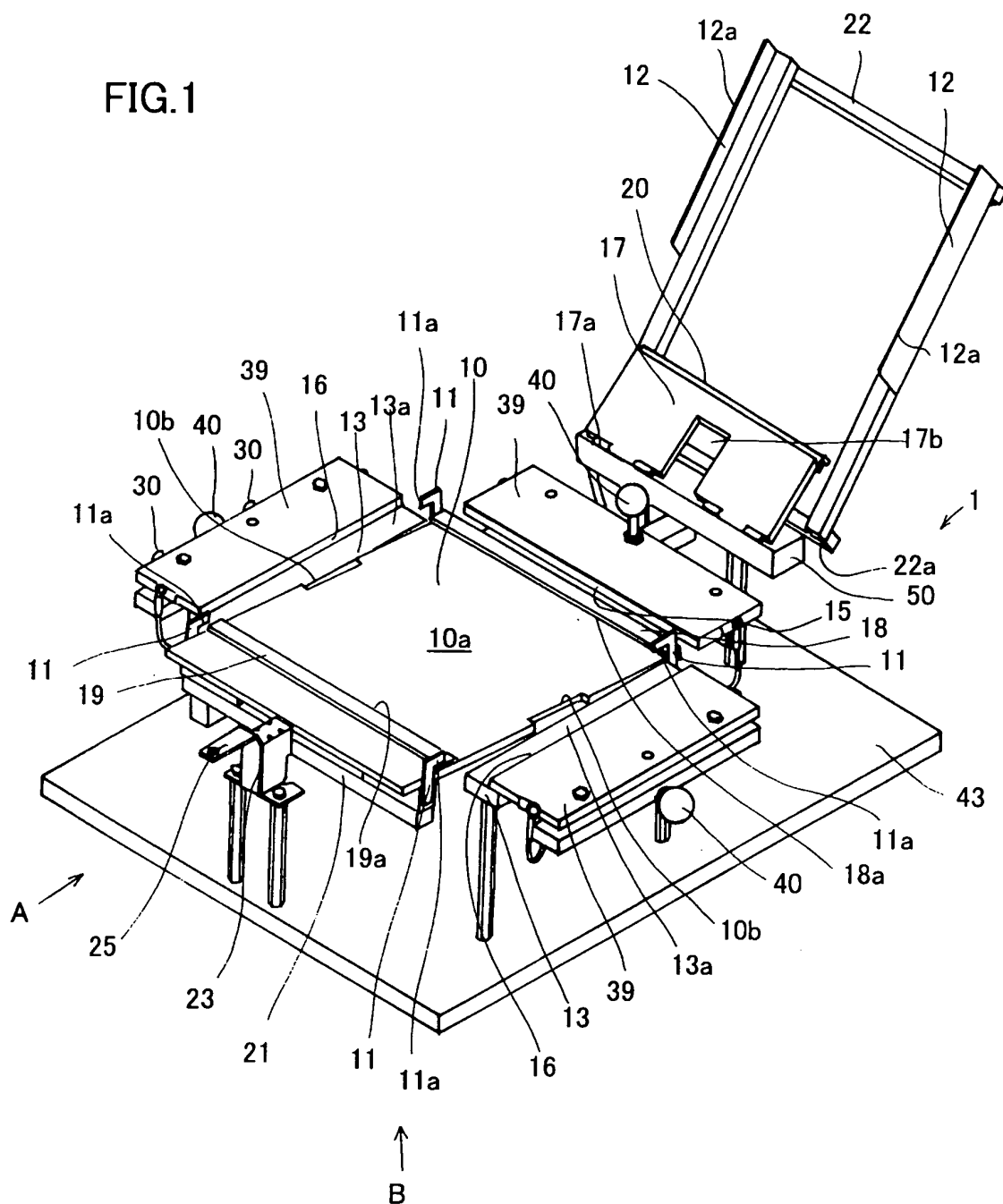


FIG.2A

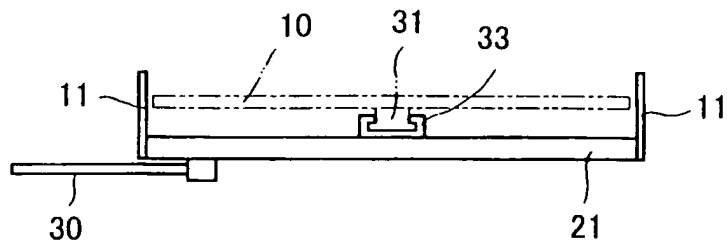


FIG.2B

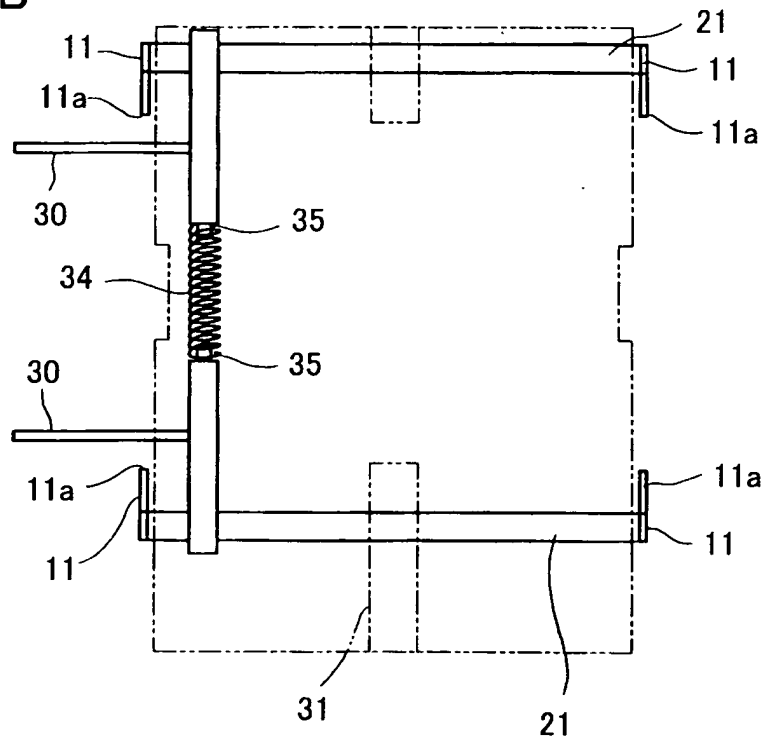


FIG.3

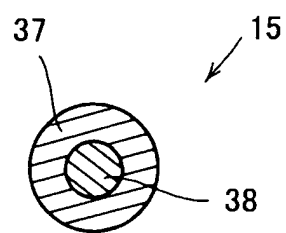


FIG.4

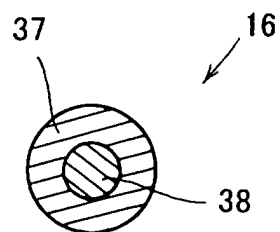


FIG.5

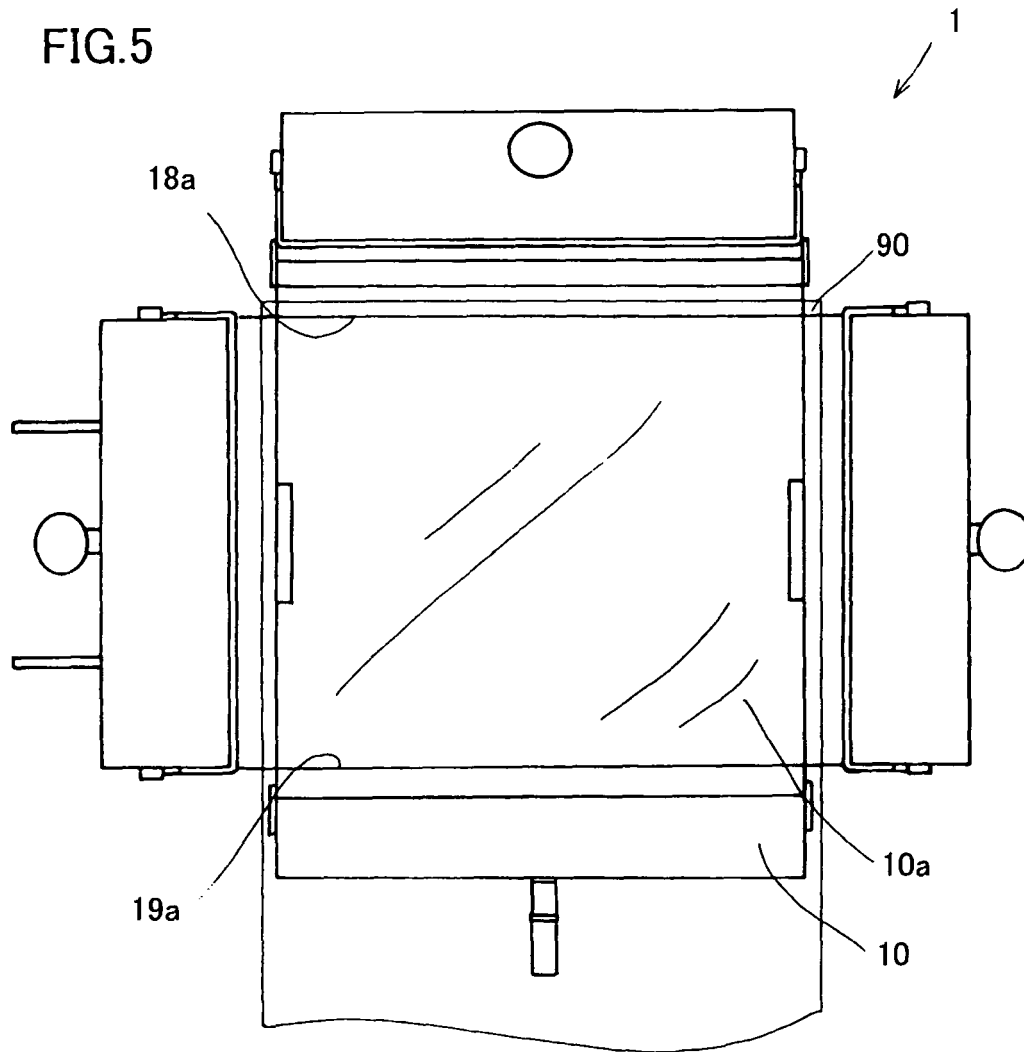


FIG.6

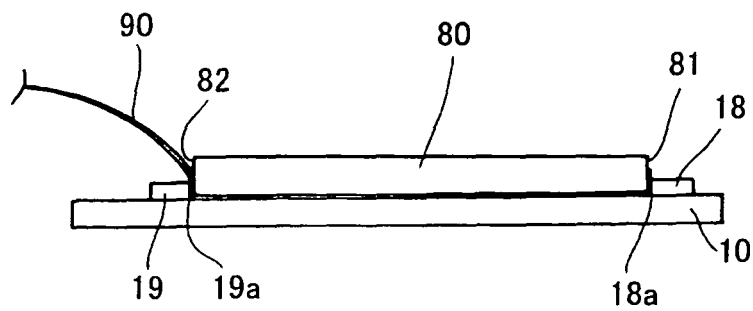


FIG.7

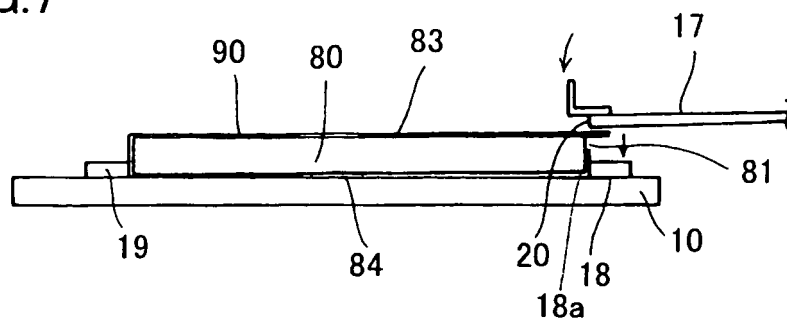


FIG.8

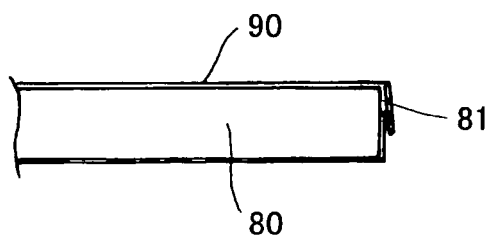


FIG.9A

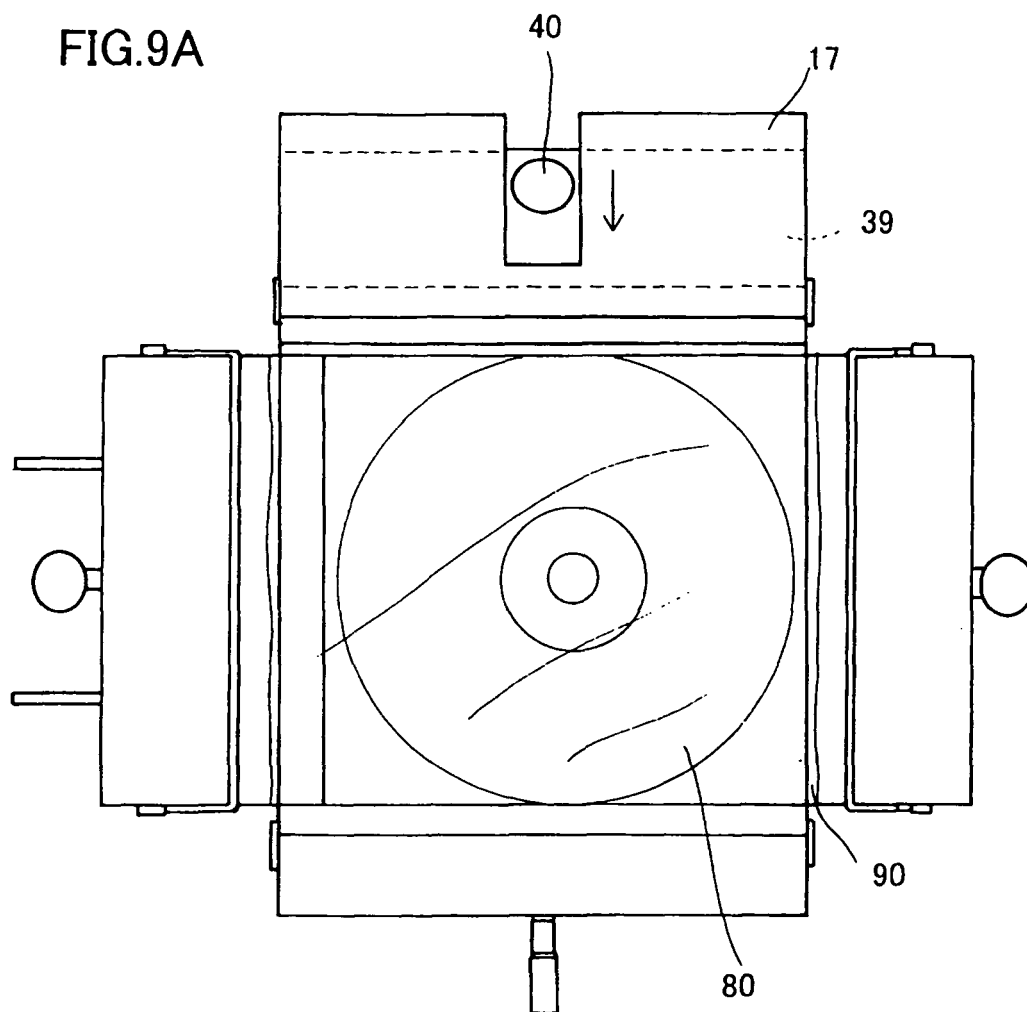


FIG.9B

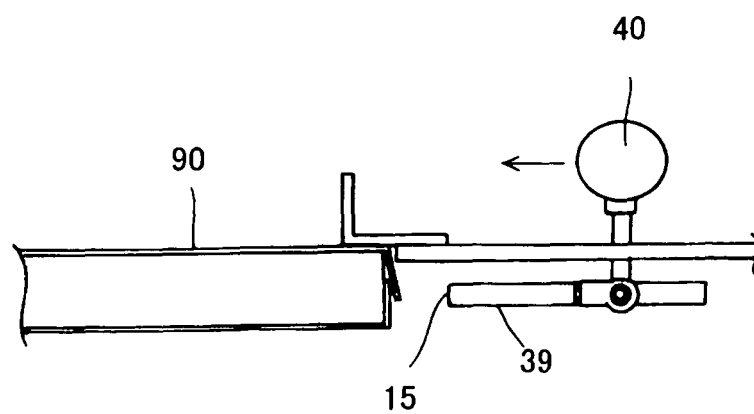


FIG.10

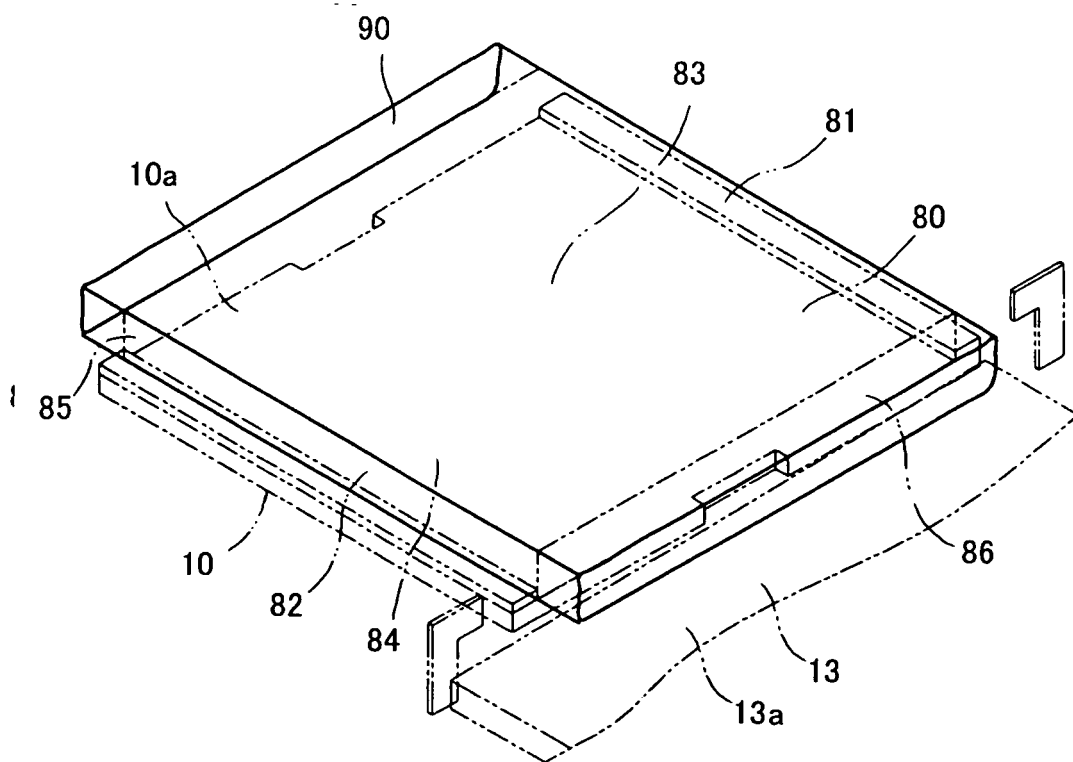


FIG.11

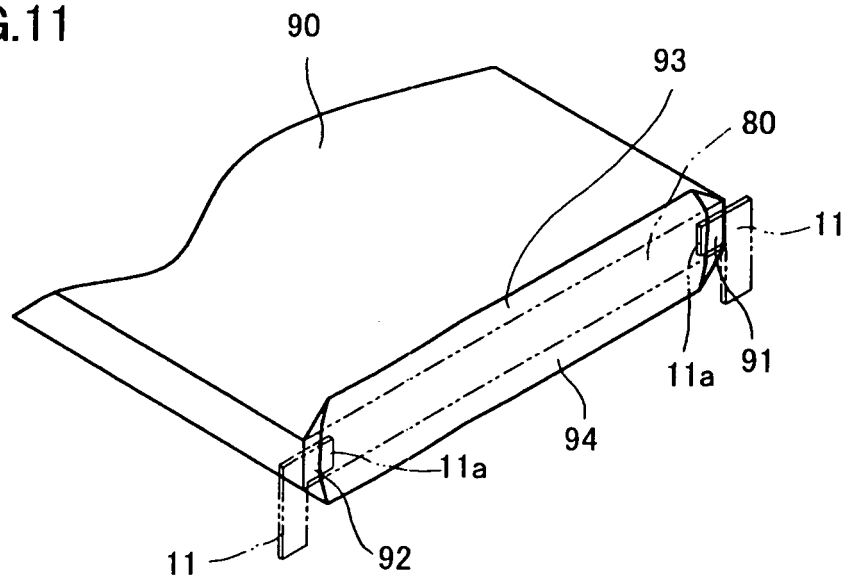


FIG.12

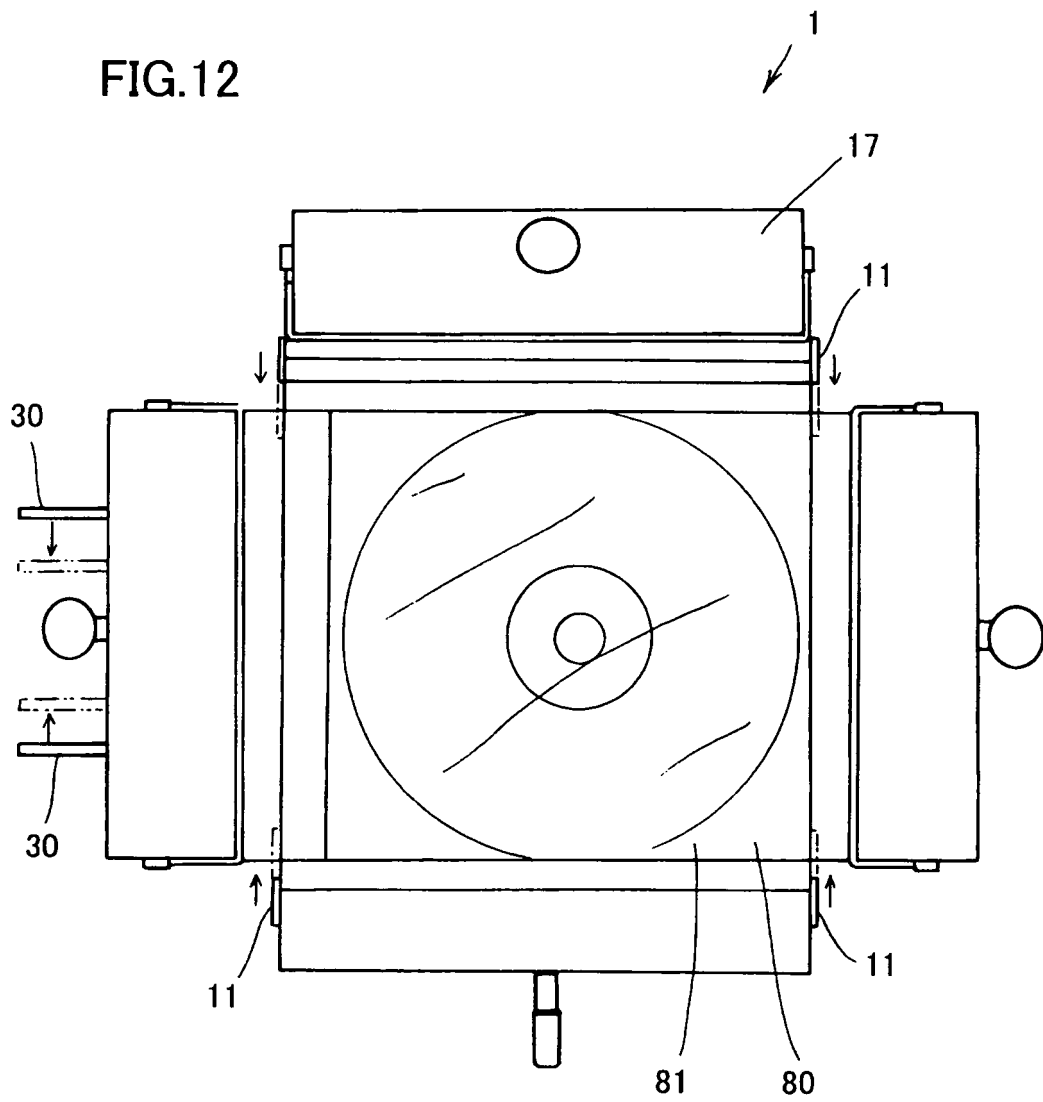


FIG.13

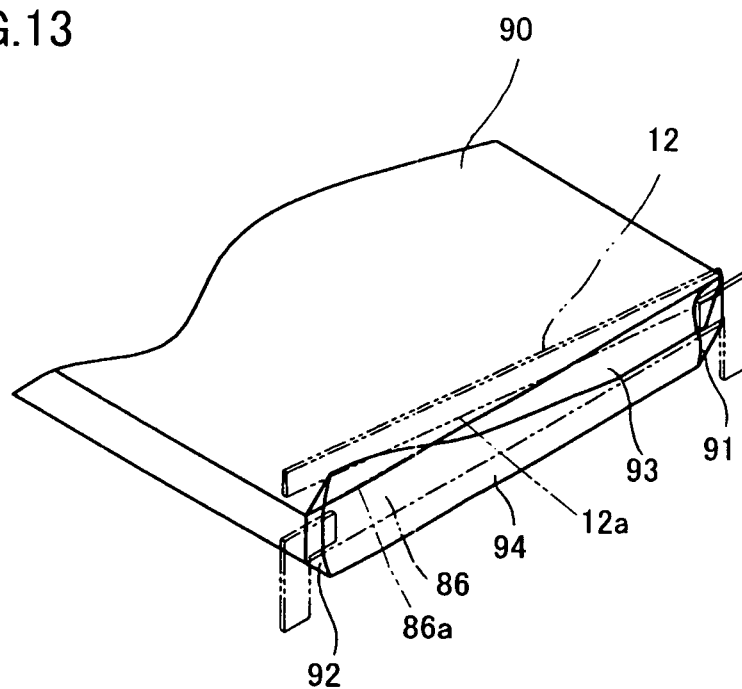


FIG.14

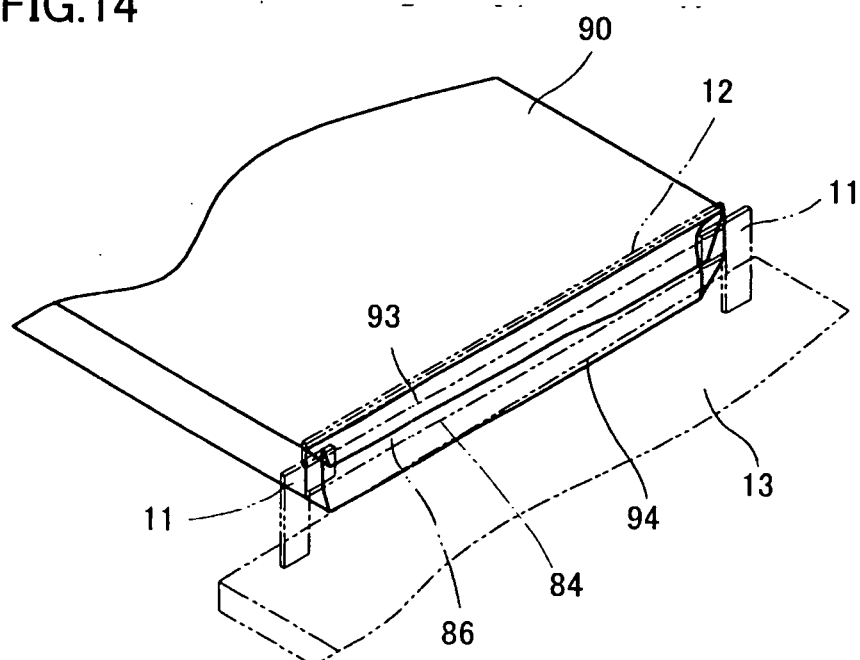


FIG.15

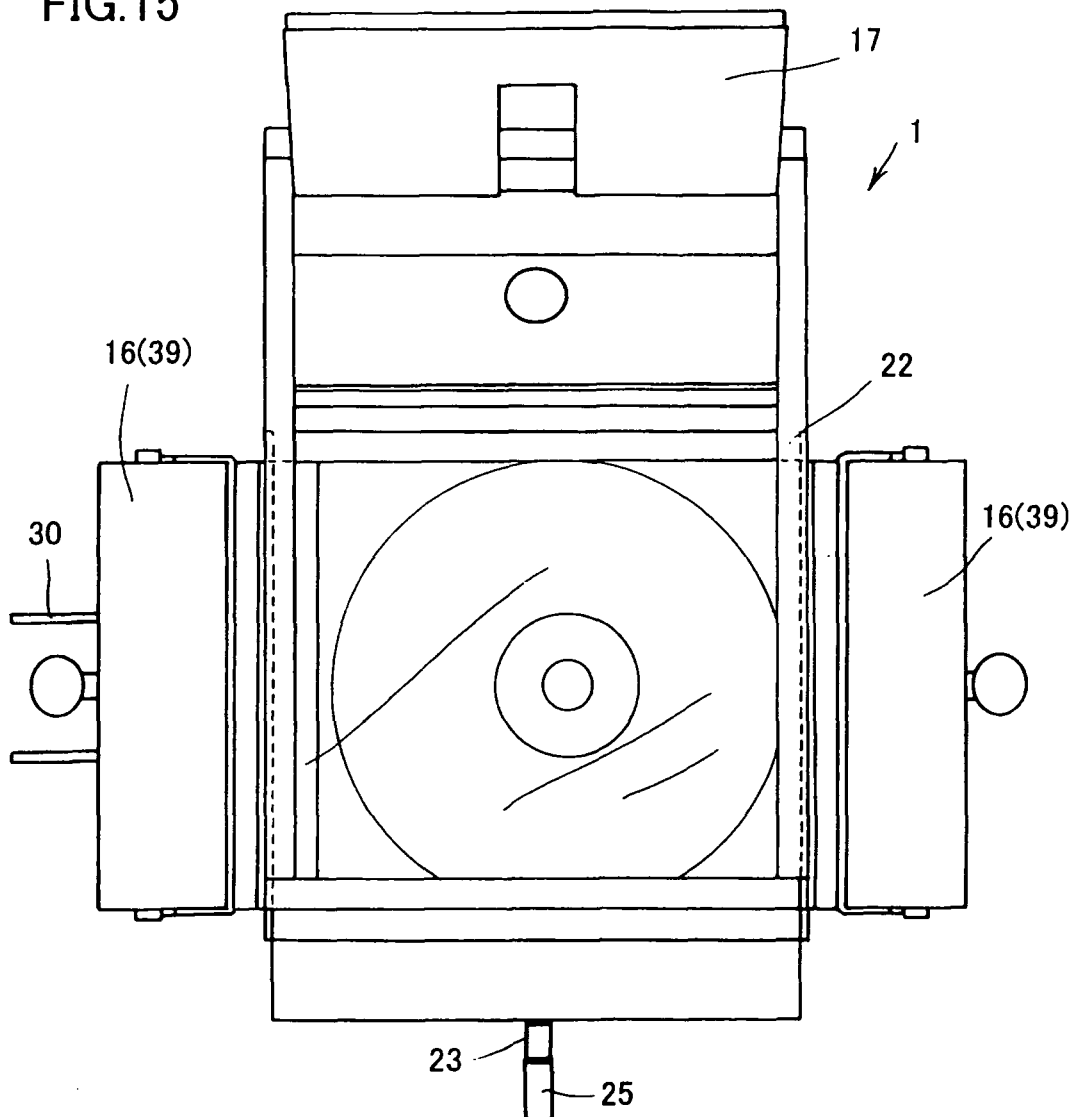


FIG.16

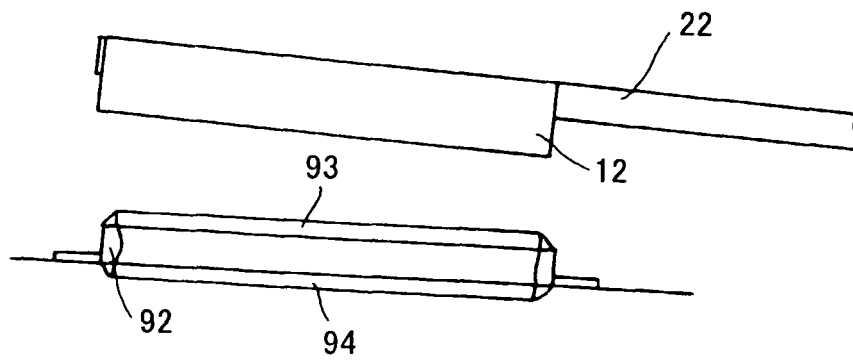


FIG.17

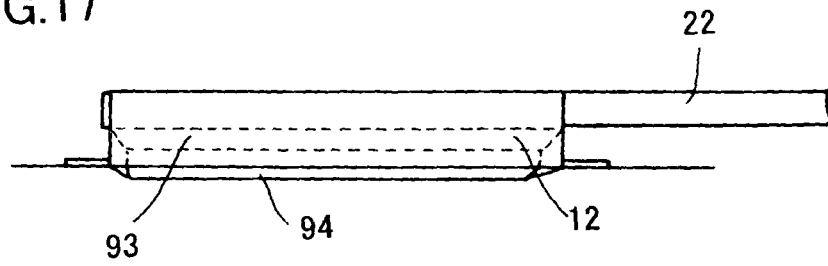


FIG.18

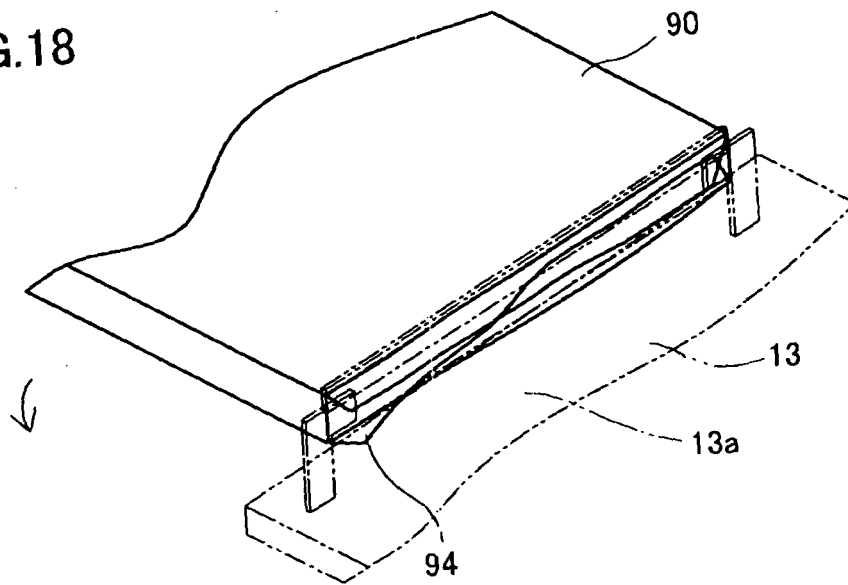


FIG.19

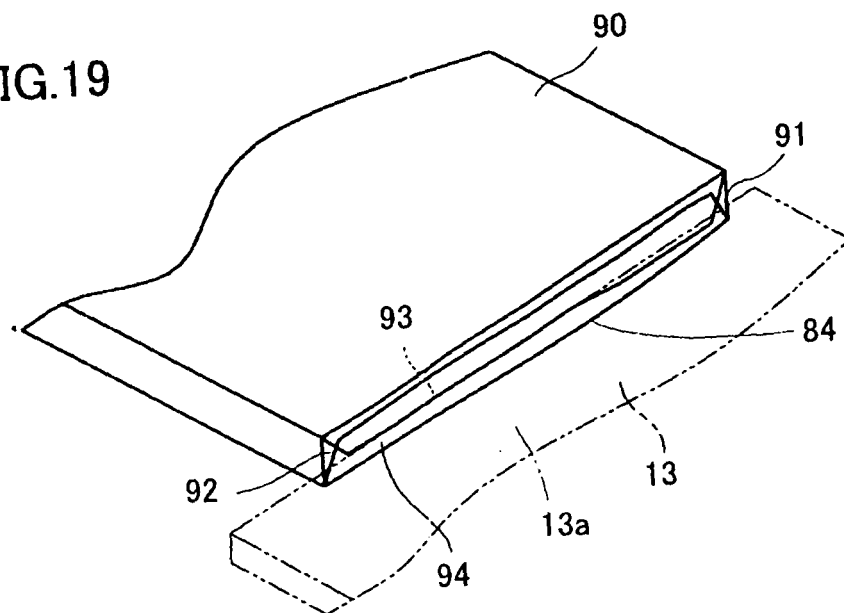


FIG.20

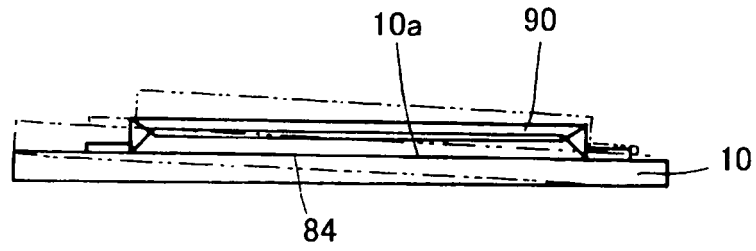


FIG.21

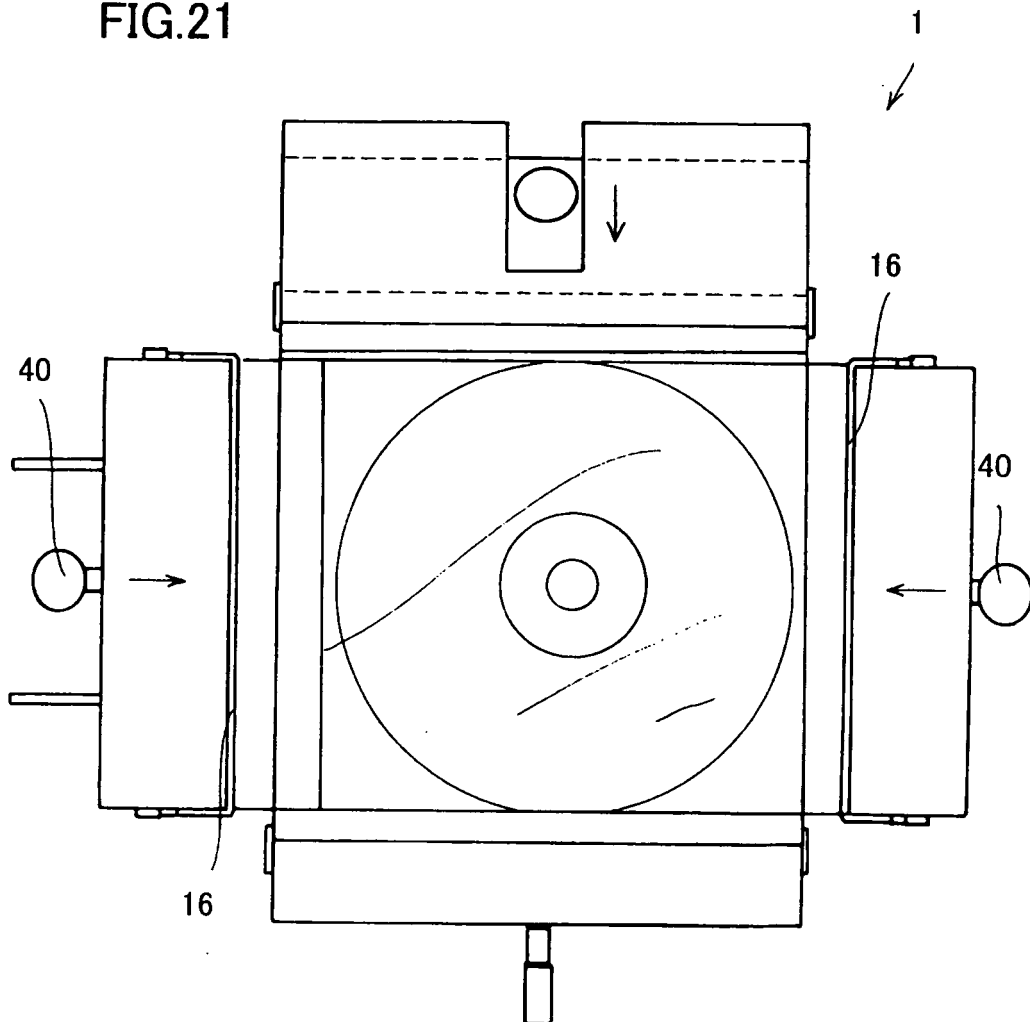


FIG. 22B

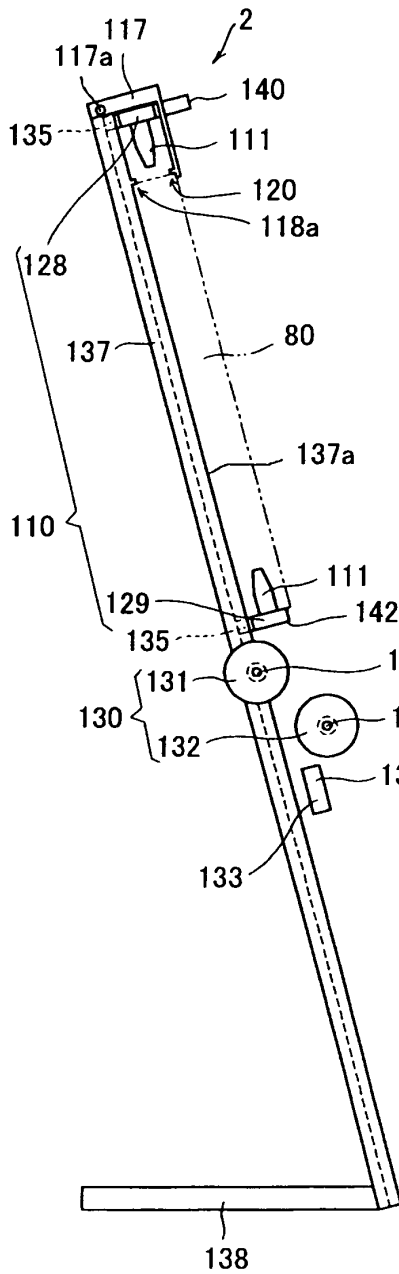


FIG.22A

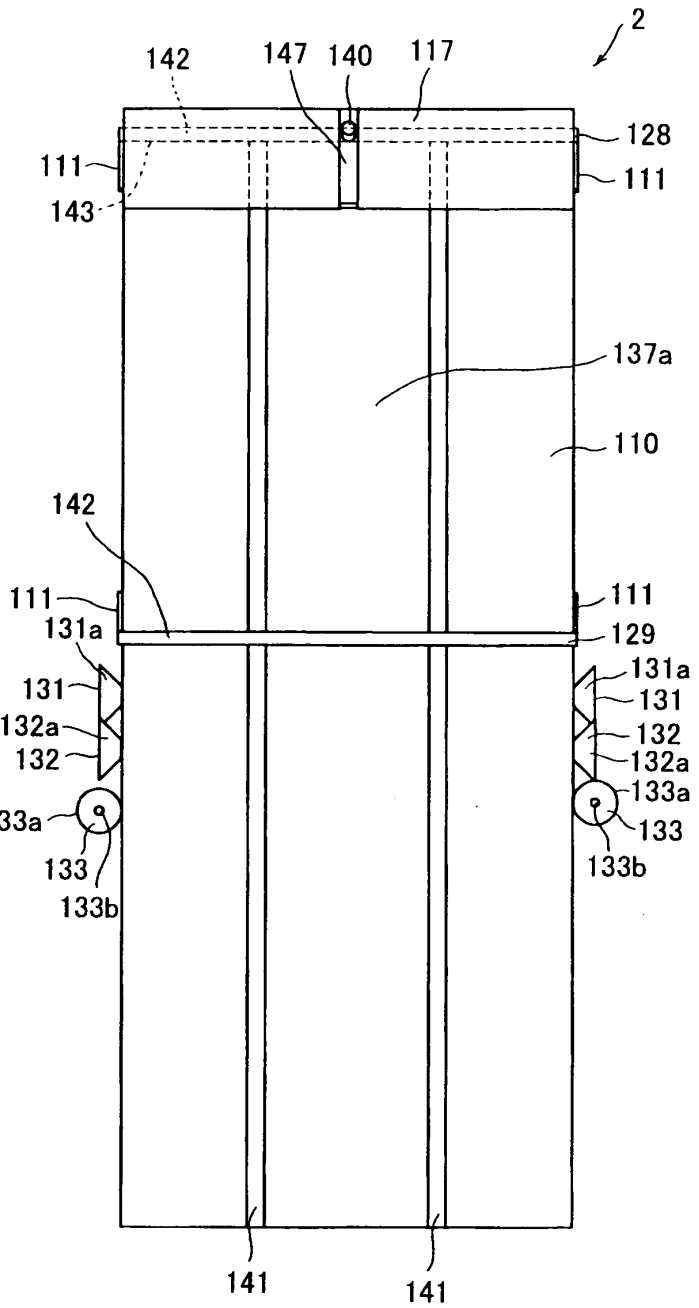


FIG.23

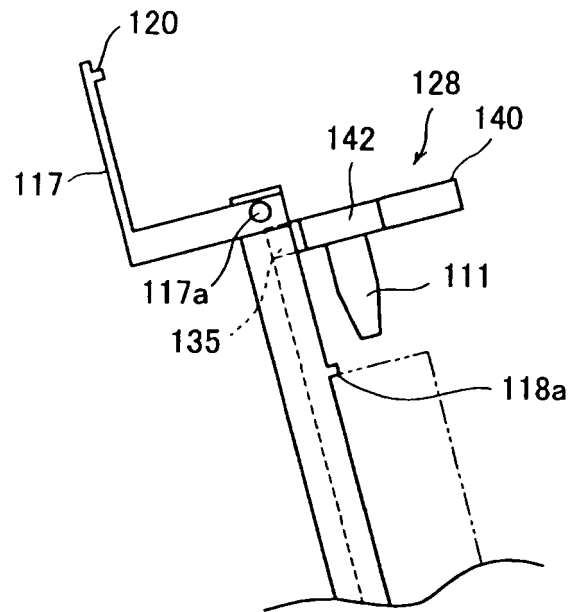


FIG.24

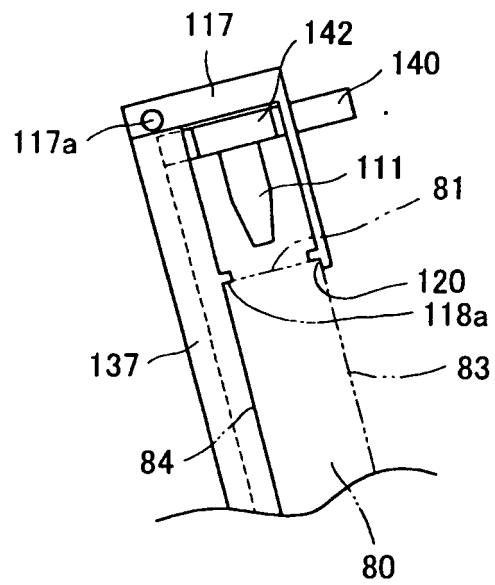


FIG.25

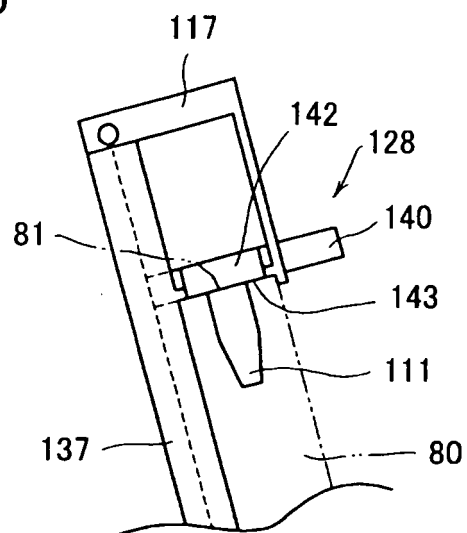


FIG.26

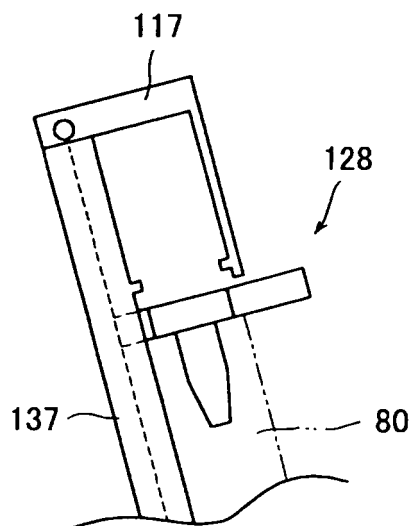


FIG.27

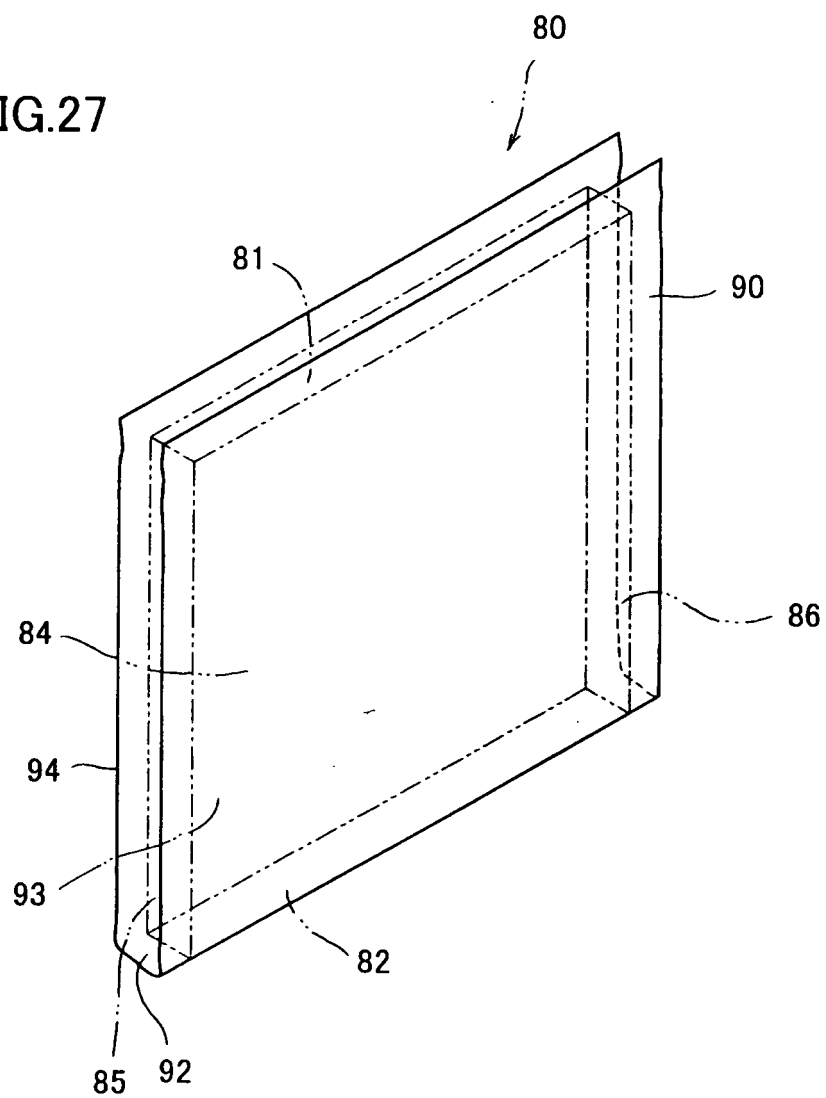


FIG.28A

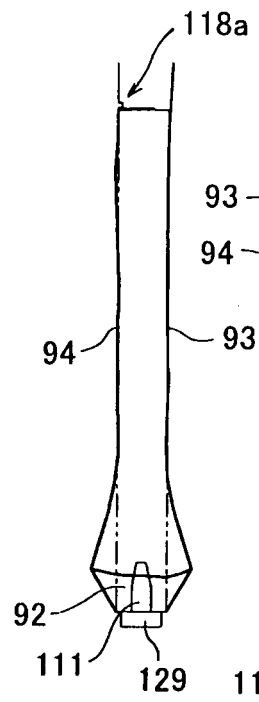


FIG.28B

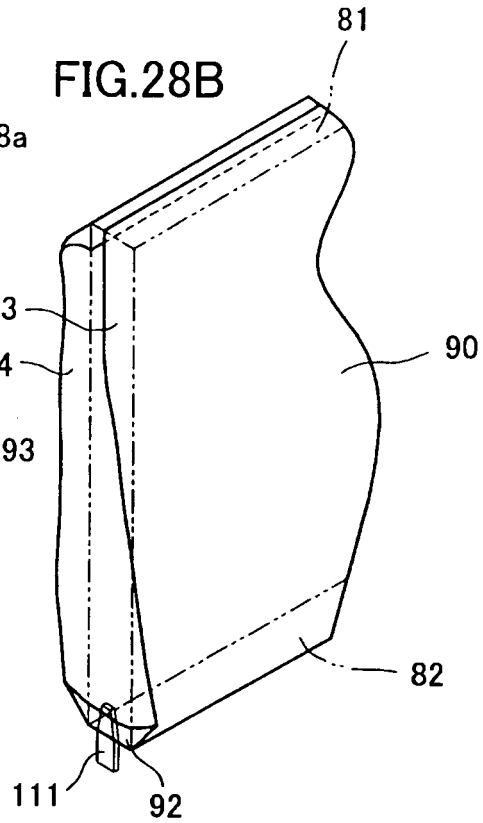


FIG.29A

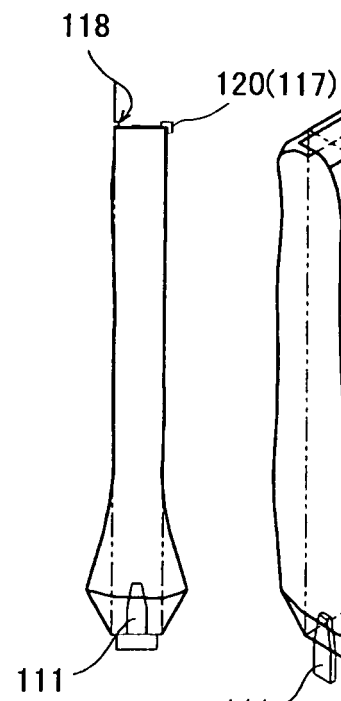


FIG.29B

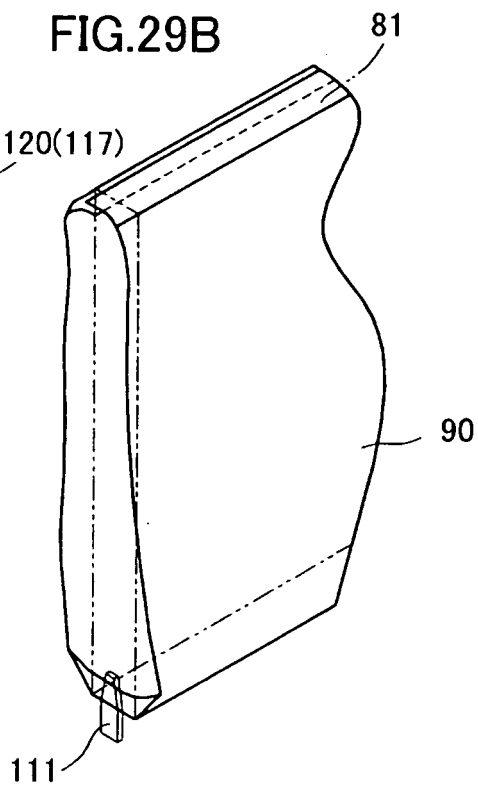


FIG.30A

FIG.30B

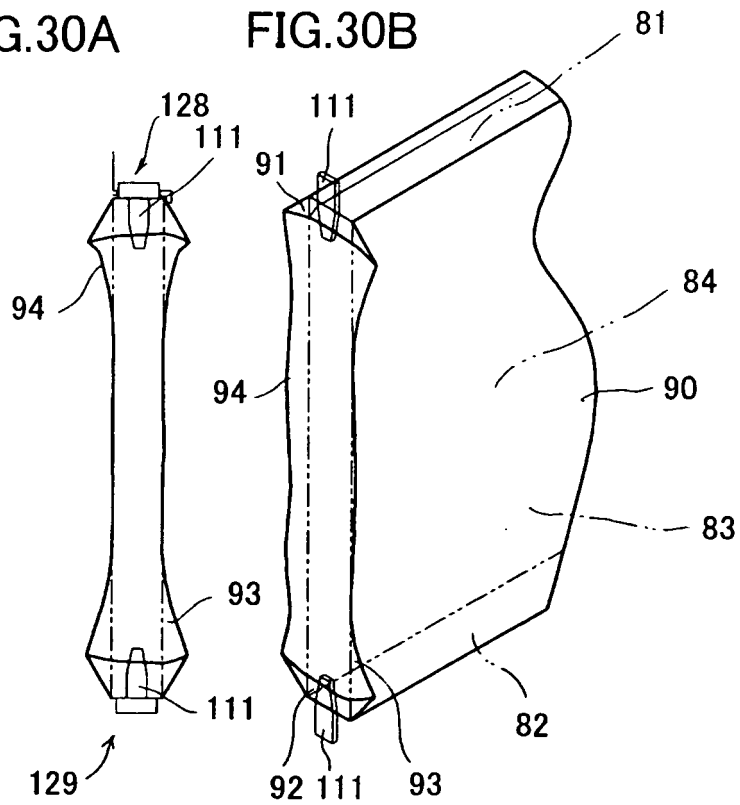


FIG.31A

FIG.31B

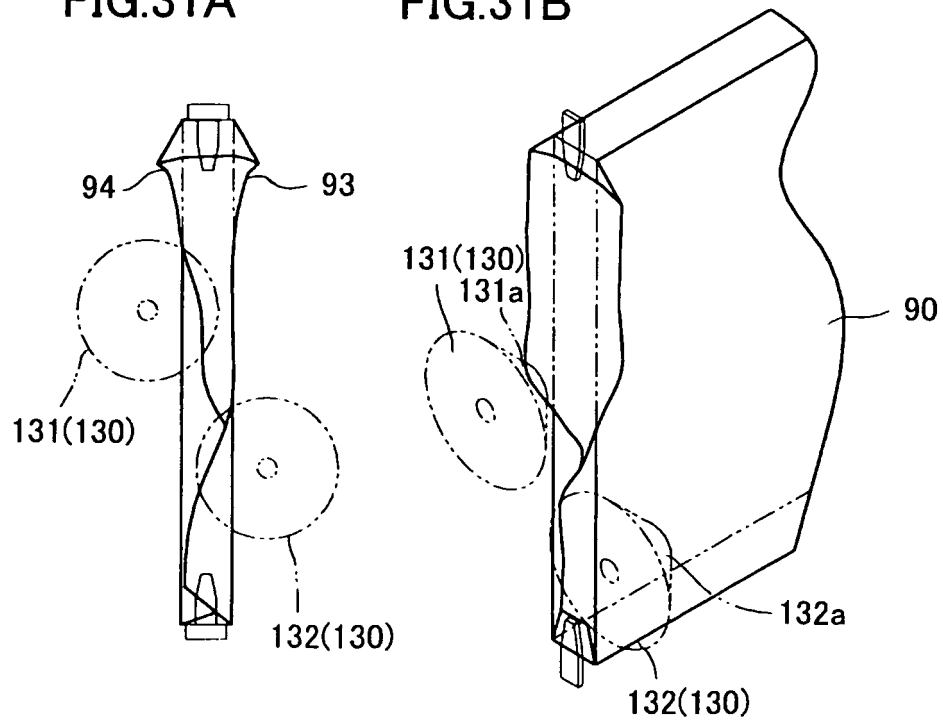


FIG.32A

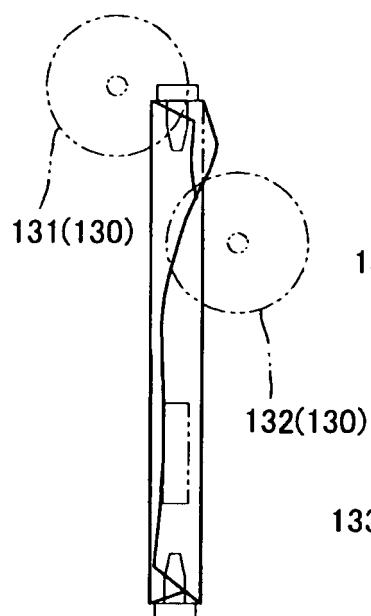


FIG.32B

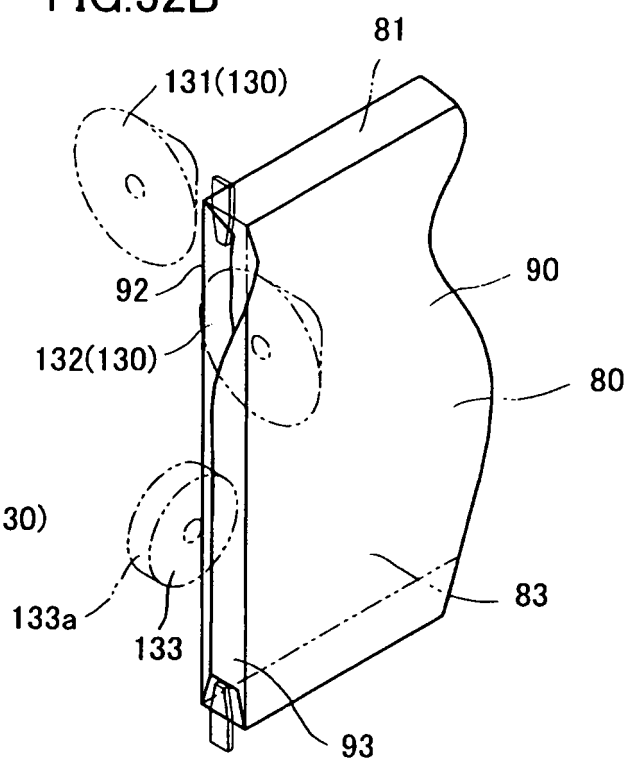


FIG.33B

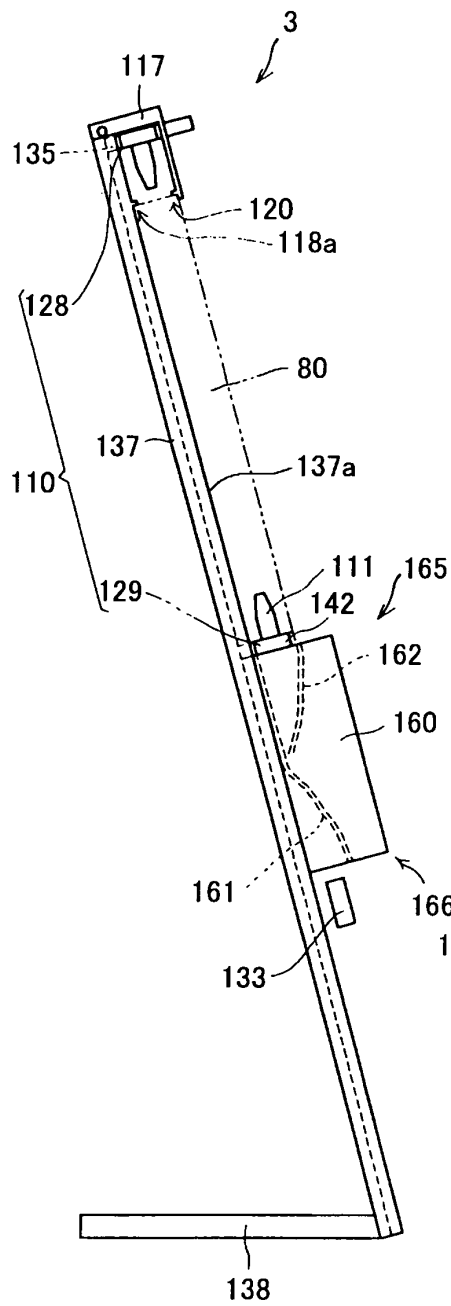


FIG.33A

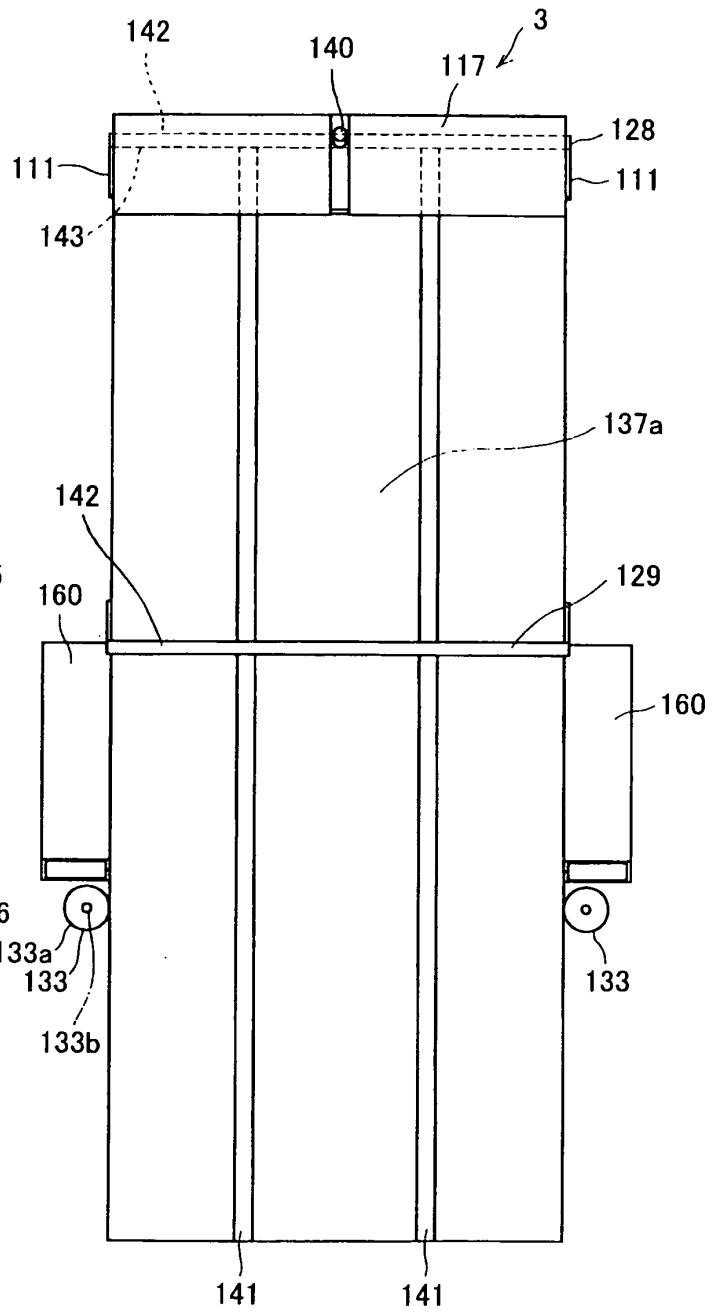


FIG.34

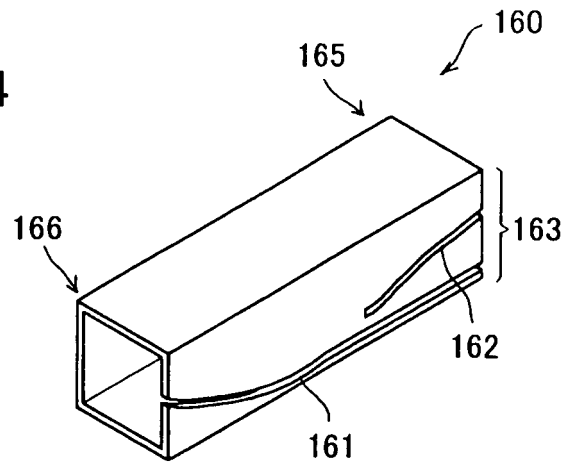


FIG.35

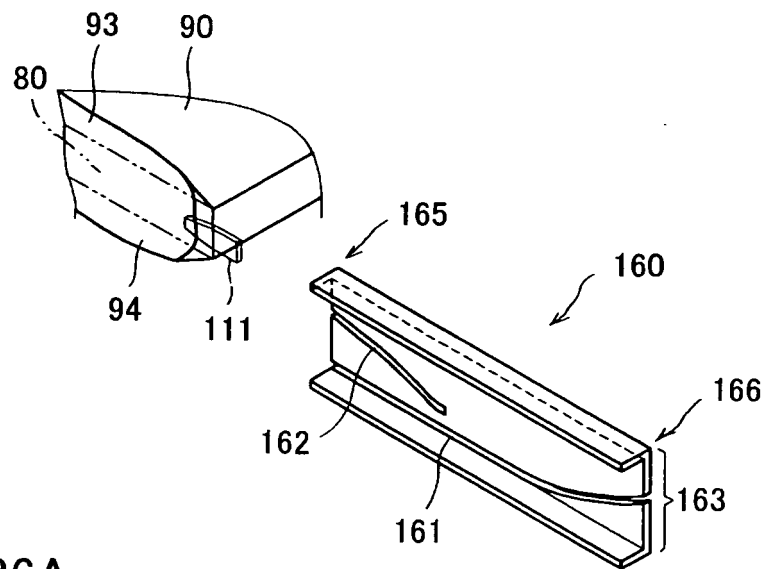


FIG.36A

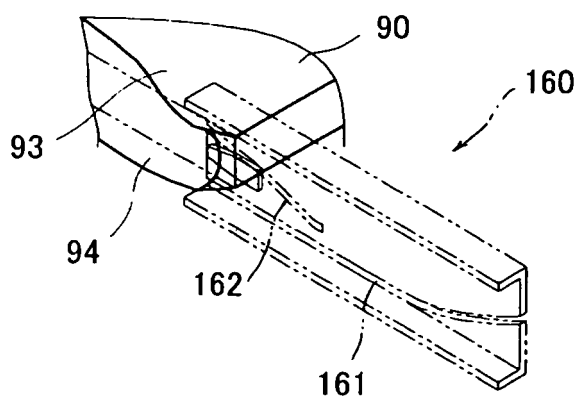


FIG.36B

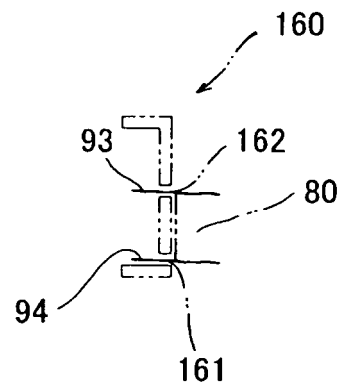


FIG.37A

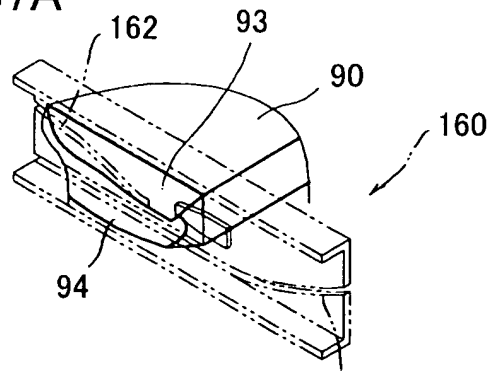


FIG.37B

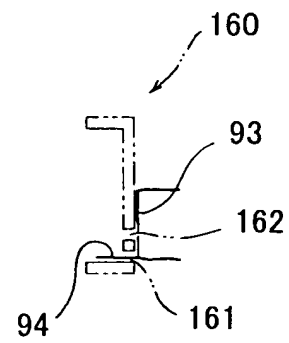


FIG.38A

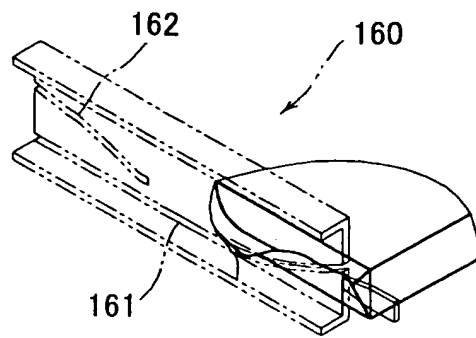


FIG.38B

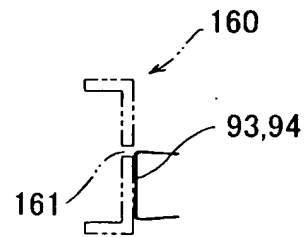
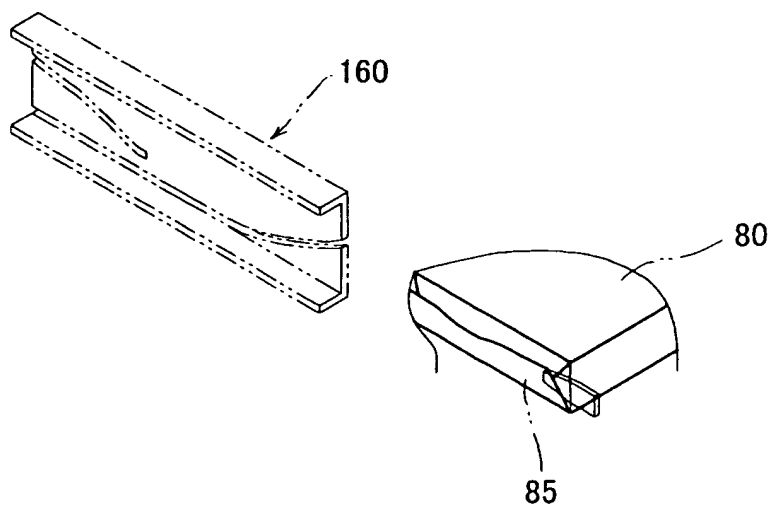


FIG.39



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/014831

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ B65B67/10, 11/02, 49/08, 51/12		
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 ⁷ B65B67/10, 67/08, 11/00-11/58, B65B49/00-49/16, 51/10, 51/14		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004 Kokai Jitsuyo Shinan Koho 1971-2004 Jitsuyo Shinan Toroku Koho 1996-2004		
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	US 2940236 A (John D. CONTI), 14 June, 1960 (14.06.60), Column 4, line 71 to column 7, line 39; Figs. 1, 9, 10 (Family: none)	12-16, 19, 22
A	US 3685253 A (Robert E. HERRELL), 22 August, 1972 (22.08.72), Column 6, lines 19 to 43; Figs. 10, 15 & CA 960955 A	1, 11, 17, 18, 20, 21
A	US 2652669 A (Harry G. HOLTZ), 22 September, 1953 (22.09.53), Column 4, line 28 to column 5, line 28; Fig. 1 (Family: none)	2, 10
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent 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 when the document is taken alone "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 "&" document member of the same patent family		
Date of the actual completion of the international search 15 December, 2004 (15.12.04)		Date of mailing of the international search report 28 December, 2004 (28.12.04)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/014831

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 10-114303 A (Kao Corp.), 06 May, 1998 (06.05.98), Par. Nos. [0007], [0029]; Figs. 2, 6 & EP 845416 A1	8, 9
A	US 3810314 A (Andrew W. ANDERSON), 14 May, 1974 (14.05.74), Column 4, line 38 to column 5, line 13; Fig. 3 (Family: none)	9
A	JP 5-262322 A (Viskase Corp.), 12 October, 1993 (12.10.93), Par. No. [0015]; Fig. 3 & AT 130243 T & AU 2526892 A & CA 2077978 A1 & DE 6920118 T2 & EP 552407 A2 & US 5149943 A1	19

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 8276905 A [0004]