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(54) Flexible container

(57) Containers (10) are produced from a flexible material. The container has a front wall (12), a rear wall (14), a pair of side walls (16, 18) and a bottom wall (20). The bottom wall has an unfolded inner ply reinforced by an outer ply comprised of two folded leg members extending from the front and rear walls.

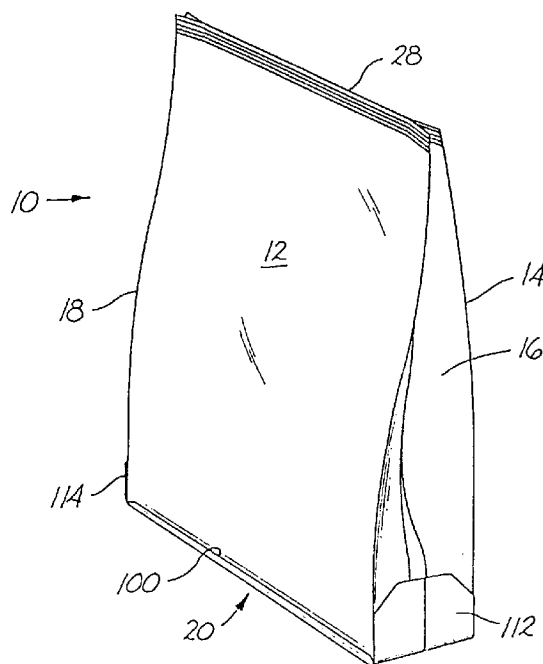


FIG. 1

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Description

TECHNICAL FIELD

The present invention relates to the packaging industry, and more particularly to a flexible container, as well as a method for making same.

Traditional means for packaging products, particularly liquids, have included metal cans and glass and plastic bottles. Cans and bottles have the advantage of being hermetically sealable, are of sturdy construction, and may be stored in a self-supported upright position.

However, a number of problems exist in the use of cans and bottles. For example, their production methods are complicated and expensive. The raw materials used in producing such containers are also expensive.

Furthermore, traditional cans and bottles present environmental problems in that, even in their empty state, they occupy a relatively large amount of space, whether it be at a landfill or in a kitchen garbage can. Finally, cans and bottles are rather heavy and therefore are inconvenient and expensive to transport.

BACKGROUND ART

In an attempt to overcome the reliance upon cans and bottles, packages have recently begun to use flexible, fusible sheet material in forming disposable containers, such as found in U.S. Patent No. 3,380,646 to Doyen et al and U.S. Patent No. 4,287,247 to Reil et al. Such containers are problematic, however, in that they have interior crevices in their bottoms and corners formed from folds or creases which may act as bacterial traps. Furthermore, they must be produced from relatively thick, and therefore expensive, retort material to be capable of standing upright without support. Even if manufactured with such thick material, the packages are typically unstable and must be supported on the shelves of a store by a box or other means. Once purchased and opened, consumers have to empty the contents of the containers into pitchers or other storage means. Also, the flexible containers used to date usually have at least one weld on their interior bottom wall, which is in the location of the most pressure from liquid or other packaged products. As a result, there is a structural weakness at the bottom portions of most currently used containers.

The methods employed in producing the currently used flexible containers are complicated in that they require a relatively large number of welding steps, many of which must be performed while the container material is in a vertical orientation. As a result, the apparatus for forming the container is by necessity complicated and expensive.

There exists a need, therefore, for a container which is hermetically sealable, lightweight, and which is flexible so as not to occupy a large volume of space when emptied.

There exists a further need for a flexible container

which has no interior crevices, which can be produced from relatively thin material, and which is sturdy, particularly along its bottom.

There also exists a need for a method of producing such a container which provides effective seals yet is simple, quick and inexpensive.

DISCLOSURE OF THE INVENTION

The present invention relates to a container having a front wall, a rear wall, a pair of sidewalls, and a reinforced bottom wall. The bottom wall is preferably comprised of a plurality of folded leg members extending from the lower edges of the front and rear walls. The lower portions of the sidewalls are reinforced with the folded-up endmost portions of the folded leg members. The top edges of the container may be welded closed to form a hermetically sealed package.

A method of making a container from flexible material comprises placing a V-fold, or a modified flat V-fold, in a sheet of flexible material to form an intermediate structure having a first subsection, a second subsection underlying the first subsection, a second subsection underlying the first subsection and a V-fold section intermediate the first and lower edge of the second subsections having a first V-fold member attached to the lower edge of the first subsection and a second V-fold member attached to the lower edge of the second subsection. The first and second V-fold members are preferably connected along a longitudinal fold line.

A first side edge weld line is made connecting the upper edges with the lower edges to weld the first subsection to both the second subsection and the first V-fold member and at the same time to weld the second subsection to the second V-fold member. A second side edge weld line is made a distance from the first side edge weld line connecting the upper edges with the lower edges to weld the first subsection to both the second subsection and the first V-fold member and at the same time to weld the second subsection to the second V-fold member. The side edge welds result in the formation of an upper container portions and first and second leg portions, which are connected along the first fold line.

A first oblique weld line is made interconnecting the point of intersection of the first weld line and the first fold line to the lower edge of the first subsection. A second oblique weld line is made interconnecting the point of intersection of the second side edge weld line and the longitudinal fold line to the lower edge of the first subsection. A leg weld line may be made between the first and second side edge weld lines at approximately the middle point of the first leg to weld the first subsection to both the first V-fold member and the second subsection to the second V-fold member.

The bottom wall is formed by folding the first leg inwardly toward the first fold line so that the lower edge of the first subsection is adjacent the first fold line and folding the second leg inwardly towards the first fold line so

that the lower edge of the second subsection is adjacent the longitudinal fold line. Upon separating the first subsection from the second subsection, an interior space is formed between the first and second side edge weld lines and the endmost portions of the legs pivot along the lateral axis of the bottom wall upwardly towards the first and second side edge weld lines. One of the endmost portions is attached to the first side edge weld line and the remaining endmost portion is attached to the second side edge weld line to form reinforced container side edges.

The container of the present invention has a number of significant attributes. For example, the bottom and lower side walls of the container, which are subjected to the most pressure by the contents of the container, are reinforced by multiple plies of container material, yet the container bottom is free from any debilitating internal weld. The present container may also have deeper side walls than those previously known.

Furthermore, the container can be produced from relatively thin material and therefore is lighter and less expensive to manufacture and transport than containers requiring thick material. This is especially useful when the container is made from flexible material, which is expensive. The thinness of the container walls also encourages the use of biodegradable materials, which have traditionally been thin. Still, the container is capable of standing vertically on its own, both during the filling process and when on a grocery or refrigerator shelf without the need of an outer box or other supporting means. The present invention therefore eliminates the need for transferring the contents into a pitcher or other containment means after opening. The fact that there are no crevices in the interior of the container minimizes the worry about bacteria-traps when storing the opened container between uses. This also enables the container to be used as a mixing bowl, such as for foods or other items to which water is added.

Also, once the product is used and the container is empty, the walls of the container will collapse back to its flat state. This will result in the waste container occupying far less volume in the family trash, as well as in a landfill, than the commonly used can or plastic bottle.

The method of producing the present invention is also advantageous. For example, the entire container may, in one embodiment, be produced using a single web of material. Also, the number of welds needed to be made are minimized and the entire production process prior to filing may, if desired, be performed while the web material is traveling in a horizontal plane.

Overall, the container of the present invention possesses many of the attributes of a can or bottle, but at the same time eliminates many of the negatives. Also, the method of manufacturing of the present invention is efficient and inexpensive.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of one embodiment of the container of the present invention.

Fig. 2 is a schematic of an apparatus for manufacturing the container of the present invention.

Fig. 3 is a perspective view of one embodiment of the intermediate structure of the container of the present invention.

Fig. 4 is a top view of one embodiment of the intermediate structure of the container of the present invention.

Fig. 5 is a top view of one embodiment of the intermediate structure of the container of the present invention illustrating the preferred position of the side edge weld lines,

Fig. 6 is a perspective view of the intermediate structure of Fig. 5 illustrating separated legs.

Fig. 7 is a top view of the intermediate structure of Fig. 4 illustrating the preferred position of the oblique weld lines.

Fig. 8 is a perspective view of the intermediate structure of Fig. 7 illustrating separated legs.

Fig. 9 is a top view of the intermediate structure illustrating the preferred position of the leg weld line.

Fig. 10 is a perspective view of the intermediate structure having one leg folded.

Fig. 11 is a perspective view of the intermediate structure having both legs folded.

Fig. 12 is a cross-sectional view of the lower portion of the container of the present invention in its collapsed state.

Fig. 13 is a top view of an intermediate structure wherein one leg is longer than the other.

Fig. 14 is a cross-sectional view of the lower portion of the intermediate structure having legs of different sizes in folded position.

Fig. 15 is a perspective view of one embodiment of the intermediate structure having the corner positions of the legs removed.

Fig. 16 is a cross-sectional view of the container of the present invention in partially opened condition.

Fig. 17 is a cross-sectional view of the container of the present invention in fully opened condition.

Fig. 18 is a perspective view of one embodiment of the container of the present invention having partially separated subsections.

Fig. 19 is a perspective view of one embodiment of the container of the present invention having fully separated subsections.

Fig. 20 is a perspective view of the intermediate structure having both legs folded and having one ply of the endmost portions of the leg removed.

Fig. 21 is a perspective view of one embodiment of the container of the present invention having its side-walls folded inwardly.

Fig. 22 is a perspective view of one embodiment of the container of the present invention having a filling nozzle inserted between its subsections.

Fig. 23 is a perspective view of one embodiment of the container of the present invention having sealed top edges.

Fig. 24 is a perspective view of one embodiment of the container of the present invention having thickly sealed top edges.

Fig. 25 is a schematic of an apparatus for manufacturing the container of the present invention from multiple webs of material.

Fig. 26 is a perspective view of an intermediate manufactured structure manufactured using multiple webs of material.

Fig. 27 is a perspective view of one embodiment of the container of the present invention having reinforced side edges.

Fig. 28 is a cross-sectional view of an intermediate structure having a middle member in its V-fold section.

Fig. 29 is a perspective view of an intermediate structure having a middle member in its V-fold section.

Figs. 30-33 show a succession of operations performed on the section of material shown in Fig. 29 in early stages of production of the container.

Fig. 34 shows two successive portions of the sheet for clarity in illustrating a step in removing portions of the material following the production step shown

in Fig. 33.

Figs. 35-37 illustrate two more steps formed in sequence on the single portion of material.

Figs. 38-40 again shown two successive portions of the sheet for clarity in illustrating latter stages of production.

Figs. 41 and 42 illustrate final steps in producing the container, the produced container which is shown in Fig. 57.

Fig. 43 is a perspective view of a portion of the same continuous sheet of material 200 being advanced in an early stage of the production of a container embodying principles of the invention in yet another preferred form.

Figs. 44-47 show a succession of operations performed on the section of material shown in Fig. 43 in early stages of production of the container.

Fig. 48 shows two successive portions of the sheet for clarity in illustrating a step in removing portions of the material following the production step shown in Fig. 47.

Figs. 49-51 show three intermediate stages of production, in sequence.

Figs. 52-54 again show two successive portions of a material in three latter stages of production.

Figs. 55 and 56 show final stages of production on a single portion of material in producing the container illustrated in its manufactured form in Fig. 57.

Figs. 58 and 59 show a succession of operations performed on the section of material of the same continuous sheet of material 34 or 200 in early stages of production of the container embodying principles of the invention in yet another preferred form, while Figs. 60 and 61 illustrate two intermediate stages of production, in sequence, and Figs. 62 and 63 illustrate final steps in producing the container, which is shown in Fig. 57.

BEST MODE OF CARRYING OUT THE INVENTION

Fig. 1 illustrates a flexible container 10 of the present invention. The container 10 has a front wall 12, a rear wall 14, a pair of sidewalls 16, 18 and a reinforced bottom wall 20. As illustrated in Fig. 12, the bottom wall 20 is preferably comprised of a pair of folded leg members 80, 82 extending from the lower edges of the front and rear walls 12, 14. The lower portions of the sidewalls 16, 18 are reinforced with endmost portions 112, 114, which are

integral with the folded leg members 80, 82. The top edge 28 of the container 10 may be welded closed to form a hermetically sealed package. Leg weld line 100a is located at the intersection of the front wall 12 and the bottom wall 20, and leg weld line 100b is located at the intersection of the rear wall 14 and the bottom wall 20, both for further maintaining the container 10 in upright position. The weld lines 100a,b also reinforce the intersection of the front wall 12 and the bottom wall 20 and prevent flex-cracking of container material, particularly aluminum foil type material.

Fig. 2 illustrates an apparatus 30 which may be used to manufacture the container 10 of the present invention. A single web 32 of container material 34 is delivered from a roller 36 to a standard V-plow 38. The V-plow 38 creates a V-fold in the approximate center of the material 34, such as shown in Fig. 3, and the material 34 is passed through the remaining processes along a conveyor belt 42, preferably in a horizontal orientation.

As shown in Fig. 3, an intermediate structure 40 has a first subsection 44 having an upper edge 46 and a lower edge 48, a second subsection 50 underlying the first subsection 44 and having an upper edge 52 and a lower edge 54, and a V-fold section 56 intermediate the first subsection 44 and the second subsection 50. The V-fold section 56 includes a first V-fold member 58 attached to the lower edge 48 of the first subsection 44 and a second V-fold member 60 attached to the lower edge 54 of the second subsection 50. The top edge of the first V-fold member 58 is connected to the top edge of the second V-fold member 60 along a common point such as first fold line 62. The length of the member 58, 60 may be identical or different. For example, the length of each of the V-fold members 58, 60 in the present embodiment is 2X. The intermediate structure 40 is capable of being collapsed into a relatively flat, multiple-ply structure, so that a single weld made on the first subsection may produce weld lines on both the first and second subsection 44, 50.

The container 10 is preferably comprised of a two-ply laminated materials, such as a coextruded solid sheet of low density/high density polyethylene or a laminated multilayered sheet. Typically this material will have an inner ply which is plastic, and hence heat-sealable, and an outer ply which is not. In the steps of manufacturing the container 10, it is sometimes necessary to attach one surface of the intermediate structure 40 to another. This attachment may be accomplished with adhesives, or may alternatively be accomplished by other means of attaching one surface to another, such as standard cold or heat-sealing. To the extent that heat sealing is used, it may be necessary to expose the heat-sealable inner ply by removing the outer-ply at a point of attachment. For example, weld-spots 64, 120 and 130 are shown in Figs. 3 and 4 at positions which will eventually be attachment points for forming the container 10. Also, the term weld used herein is defined as any means of attaching one surface to another.

As shown in Figs. 5 and 6, once the V-fold section 56 is formed, a first side edge weld line 66 is made connecting the juxtaposed upper edges 46, 52 and lower edges 48, 54. The line 66 should be relatively thick, for example about one-half inch thick, so that it may be later cut in half while maintaining its seal. The result of the first side edge weld line 66 will be the attachment of the upper portion 68 of the first subsection 44 to the upper portion 70 of the second subsection 50, the lower portion 72 of the first subsection 44 to the first V-fold member 58 and the lower portion 74 of the second subsection 50 to the second V-fold member 60. Similarly, a second side edge weld line 76 is made at a distance away from the first side edge weld line 66. The result of the second weld line 76 will also be connecting upper edges 48, 54 and lower edges 48, 52 the attachment of the upper portion 68 of the first subsection 44 to the upper portion 70 of the second subsection 50, the lower portion 72 of the first subsection 44 to the first V-fold member 58 and the lower portion 74 of the second subsection 50 to the second V-fold member 60. The first and second side edge welds 66, 76 will thereby form an upper container portion 78, a first leg portion 80 and a second leg portion 82, as shown in Fig. 6.

As shown in Figs. 7 and 8, in the present embodiment, a first oblique weld line 84 is placed interconnecting the common point 86 of intersection of the first side edge weld line 66 and the top edges of the V-fold members 58, 60, when the subsections 44, 50 are in underlying position, to the lower edge 48 of the first subsection 44. When the V-fold members 58, 60 are attached along the first fold line 62, the common point 86 will also be the intersection of the first fold line 62 and weld line 66. The first oblique weld line 84 results in the attachment of the lower portion 72 of the first subsection 44 to the first V-fold member 58 along line 84a and the lower portion 74 of the second subsection 50 to the second V-fold member 60 along line 84b. Similarly, a second oblique weld line 88 is placed interconnecting the point 90 of intersection of the second side edge weld line 76 and top edges and the lower edge 48. The second oblique weld line 88 results in the attachment of the lower portion 72 of the first subsection 44 to the first V-fold member 58 along line 88a and the lower portion 74 of the second subsection 50 to the second V-fold member 60 along line 88b. Both the first and second oblique weld lines 86, 88 should be at approximately 45° angles. Additionally, the entire area between the first oblique weld lines 84a,b and corners 92, 94, as well as between the second oblique weld lines 88a,b and corners 96, 98, may be welded together.

In an alternate embodiment of the present invention, as shown in Fig. 28, the V-fold section 61 may include an uncreased or unfolded middle member 63 attached at a first end 65 to the first V-fold member 58 and at a second end 67 to the second V-fold member 60. This construction eliminates the first fold or fold line 62, which may be undesirable with material which may be subject

to flexcracking upon folding. The terms fold line, fold and crease are meant to be used interchangeably where material has been stressed beyond its elastic limit. In this embodiment, the first oblique weld line 84 is begun at the common point 69, which corresponds to the intersection of the first side edge weld line 66 and the top edges of the V-fold members 58, 60 plus one-half the width of the middle member 63. For example, as seen in Fig. 27, if the width of the middle member 63 is 2X, as measured between first end 65 and second end 67, the common point 69 will be located a distance of 1X above the intersection of the V-fold members 58, 60 and the first side edge weld line 66. The first oblique weld line 84 will extend between the common point 69 and the lower edge 48 of the first subsection 44 at an approximately 45° angle. Similarly, the second oblique weld line 88 is provided between a common point 69, as defined above, along second side edge weld line 88 and the lower edge 48 of the first subsection 44. Thus, it should be understood that the middle member 63 forms a bottom wall of the container having only peripheral folds. The remaining steps in the formation of the container 10 may be as set forth above.

As shown in Fig. 9, a leg weld line 100 may be made between the first side edge weld line 66 and the second side edge weld line 76 at approximately the middle line 102 of one of the legs 80, 82, resulting in weld line 100a on the first leg 80 and line 100b on the second leg. It is preferred that the line 100 be made slightly (i.e., one-sixteenth of an inch) above the midline 102 of the legs 80, 82. As shown in Fig. 10, the first leg 80 is folded along the first weld line 100a so that the lower edge 48 of the first subsection 44 is adjacent the first fold line 62. Similarly, as shown in Fig. 11, the second leg 82 is folded along the leg weld line 100b so that the lower edge 54 of the second subsection 50 is adjacent the first fold line 62 and the lower edge 48 of the first subsection 44. As shown in Fig. 12, the legs 80, 82 may be maintained in folded position by adhesives or by spot-welding, such as at weld-spots 64, thereby forming bottom wall 20. In the present embodiment, the width of each leg 80, 82 will be 1X. However, as shown in Figs. 13 and 14, the length of one leg, for example leg 82, may be greater than the length of the remaining leg 80. In such a case, the longer leg 82 is folded a plurality of times, such as illustrated in Figs. 14. Also, the legs 80, 82 may be shortened so as not to be adjacent the first fold line 62, but rather to be merely adjacent leg weld lines 100a,b. For example the portion of the legs 80, 82 below the leg weld lines 100a,b may be eliminated to provide a container 10 having a single-ply bottom 20. Also as shown in Fig. 15, the corners 104, 106, 108, 110 of the folded legs 80, 82 may be removed, such as by die cutting, for aesthetic reasons. It should be noted that even at this stage of manufacturing the structure 40 can be collapsed flat so that the first subsection 44 may be overlying the second subsection 50.

The structure 40 may be divided into individual con-

tainers 10 by cutting along the approximate midlines of the first side edge weld line 66 and the second side edge weld line 76. It is advisable that the first and second side edge weld lines 66, 76 be of sufficient width to provide an adequate seal between the first and second subsections 44, 50 after cutting. This will allow the formation of two sealed container 10 edges by a single cut.

Referring to Figs. 12, 16 and 17, the interior space of the container 10 is provided by separating the first subsection 44 from the second subsection 50. As can be seen in Fig. 17, when the subsections 44, 50 are fully separated, the lower portion of the container 10 acquires a squared-off shape, and the bottom wall 20 will be seamless. The container 10 may be opened by a forming turret 142, such as shown in Fig. 2.

Referring to Fig. 18, upon separation of the first subsection 44 and the second subsection 50, a first endmost portion 112 of the folded legs 80, 82 pivots upwardly along the lateral axis of the bottom wall 20 towards the first side edge weld line 66, preferably along the point 166 where the leg weld line 100 intersects the first oblique weld lines 84a,b. Similarly, a second endmost portion 114 of the legs 80, 82 pivots upwardly towards the second side edge weld line 76, preferably along the point 118 where the leg weld line 100 intersects the second oblique weld lines 88a,b. Weld-spots 120 may be provided for attaching the endmost portions 112, 114 to the side edges of the container 10, such as to the first subsection 44 and the second subsection 50. Also, as shown in Fig. 19, fold lines 122, 124 may be provided in the first subsection 44 between points 116, 118 and the upper edge 46, and fold lines 126, 128 may be provided in the second subsection 50 between points 116, 118 and the upper edge 52, for providing the container 10 with clearly defined squared-off side edges 16, 18, which will be like sidewalls. However, in some embodiments the sidewalls may not be clearly defined. The first side edge weld line 66 and the second side edge weld line 76 may be attached to the first subsection 44, such as by pinching or by weld-spots 130, to further reinforce the sidewalls 16, 18. Of course, the side edge weld lines 66, 76 may alternatively be folded in an opposite direction and attached to the second subsection 50. Also, as shown in Fig. 27, the front wall 12 and rear wall 14 may be attached to the side edges 16, 18 along side edge fold lines 122, 124, 126, 128 to further stabilize the container 10.

Referring to Fig. 20, it may be desirable to remove one of the plies from each of the endmost portions 112, 114, such as for aesthetic reasons in instances where less reinforcement is needed at the container side walls 16, 18.

Once the sidewalls 16, 18 are formed, the container 10 may be filled and sealed. This procedure may be performed on a standard filling turret 132, such as shown in Fig. 2. As shown in Fig. 21, 22 and 23, a standard filling nozzle 134 may be used to place products into the container 10. Because of its unique constructions, the container 10 may be self-standing during the filling process.

Once the container 10 is full, the nozzle 134 may be removed and the upper edge 46 of the first subsection 44 may be welded or otherwise sealed to the upper edge 52 of the second subsection 50, such as by a top weld line 138. The sealing of the container 10 top may be performed with the container 10 in self-standing upright position on a standard sealing turret 140. As shown in Fig. 24, the top weld line 138 may be made thick and with one corner 136 squared-off to provide an easy pouring spout for the container 10. A handle opening may be provided in it.

It is also possible to manufacture the container 10 of the present invention using multiple webs. For example, as shown in Figs. 25 and 26, the first subsection 44, the second subsection 50 and the V-fold section 56 may each be provided from separate webs 144, 146, 148 and welded or otherwise attached to form the intermediate structure 40. In such a case, the lower edge 48 of the first subsection 44 will be attached to a first edge 150 of the V-fold section 56 and the lower edge 52 of the second subsection 50 will be attached to a second edge 152 of the V-fold section 56. Once the intermediate structure 40 is formed, the remaining steps of the manufacturing process may be as set forth above or the equivalent.

With reference next to Figs. 29-42 another method of producing a container from a sheet of flexible material is shown, the end product of which is shown in Fig. 57. The sheet of material 200 here is thermally bondable on its inside surface 201 which is shown in heavy stippling. The outside need not be thermally bondable. The sheet of material is preferably between 3 and 20 mils thick with a layer of thermally bondable polyethylene on its inside and a layer of relatively strong, relatively non-thermally bondable but stronger nylon or polyester on its outside.

As shown in Fig. 29 the continuous web of sheeting 200 is cut at single container forming intervals or portions with two U-shaped incisions 204. It should be noted that both of these are oriented in the same direction with the two legs of the U extending upwardly as shown in Fig. 29. In Fig. 30 the sheet is folded along parallel fold lines A and A' that straddle the two incisions 204. Here also it is seen that the material is folded between the ends of the legs of the two U-shaped incisions parallel to fold lines A and A' along folds B and B' to form two flaps 205 and 206. The flaps are shown here folded outwardly from the sheet to form two open windows 208 and 209 in the sheet.

Referring next to Fig. 31, the folds B and B' are seen to be extended laterally from the flaps which are shown now pivoted 180° from their original positions closing the windows. Note that window 209 is now hidden from view. The material is next refolded along fold lines A and A', as shown in Fig. 32, to form two pleats 211 and 212 with the thermally bondable surfaces of the components of each pleat in intimate contact. Note also that the formation of the pleats cause the windows 208 and 209 to become closed with the thermally bondable inside surface of a pleat ply facing outwardly through the windows as

bondable extensions of the inside surface of the flaps 205 and 206. The pleats are then heat sealed where indicated in Fig. 33 in light stippling. Sealed areas in all the remaining figures of the drawings are shown in light stippling.

The next step in the process is shown in Fig. 34 in which is illustrated two consecutive container forming portions of the sheet 200. Here, two segments 211' and 212' of the pleats are cut away. The flap 206 is folded towards fold A as shown in Fig. 35. The flap 205 is then folded towards fold A', as shown in Fig. 36, against the inside surface of the material that faces outwardly from window 209. This causes flap 206 also to be pressed against the material that faces outwardly from window 208. The material is then thermally bonded where shown by the light stippling of Fig. 36. This area forms a reinforced, double wall bottom of the container.

The next step in the process is shown in Fig. 37 where the material is formed into the shape of a T by folding the sheet 200 along two folds above and parallel with fold lines A and A'. This brings inside surfaces 201 of the sheet against each other. Side edge seals 215 and bottom seals 216 are then formed by thermal bonding as shown by the light stippling in Fig. 38. Diagonal seals 217 are now also formed in the pleats aside the flaps as shown in Fig. 39. Triangular segments 219 of the sealed pleats are then cut away as shown in Fig. 40 leaving only thin convergent seals 220 extending convergently from the double wall container bottom.

Finally, side seal extensions 215' are formed by thermal bonding in a pattern specifically designed for the container sides as shown in Fig. 41 and excess material cut away as shown in Fig. 42. This leaves only a center portion 222 unsealed to provide an opening in the top of the container. Once filled with a supply of liquid or granular material, the flexible container assumes the shape shown in Fig. 57.

It should be noted that in the procedure just described that no fold or crease is created in the interior or exterior of the container bottom. The container bottom is free of non-peripheral folds or creases, i.e. it has only peripheral folds. This is a very important feature of the process since it avoids the risk of material fracture, particularly where thin plastic films or foils are used. It should also be appreciated that all of the seals or welds are made with the inner, sealant layers in ultimate contact.

A modified form of the procedure just described and illustrated in Figs. 29-42 is shown in Figs. 43-56 in forming the container shown in Fig. 57, with only the unshown bottom of the container differing in structural detail. An important difference here is that the same sheet of material 200 is formed with two sets of holes 230 and 231 instead of with the flaps and windows. The sheet is folded along parallel fold lines C and D as shown in Fig. 44 and again along folds E and F as shown in Fig. 45 to form two pleats 233 and 234. Again, the thermally bondable, inside surface of the pleat portion of the sheet are in intimate contact and an inside surface 201 closes and fac-

es outwardly from the holes 230 and 231.

The pleats 233 and 234 are next folded into a parallel relation as shown in Fig. 46 and bonded as shown in Fig. 47. Pleat segments 233' and 234' are cut away as shown in Fig. 48. The remaining portions of the pleats 233 and 234 are then folded against the outside surface of a bottom portion 240 as shown in Fig. 50. This brings the inside surface 201 of the sheet that faces outwardly through the holes 230 and 231 against the bottom portion 240 and thermal bonds are then made. This serves to form a triple layered reinforced container bottom.

The material is then formed into the shape of a T as shown in Fig. 51 and side edge seals again made. The remainder of the process is essentially the same as that which was described in conjunction with Figs. 38-41, as shown in Figs. 53-57. Again, with this procedure no folds or creases are formed in the bottom of the container as with most of the prior art procedures using V folds and gussets. However, here seals are made between the inside and outside of the material.

With reference next to Figs. 58-63 another method of producing a container from a sheet of flexible material is shown, the end product of which is shown in Fig. 63. The sheet of material 200 here is thermally bondable on its inside surface which is shown in light stippling. The outside need not be thermally bondable.

As shown in Fig. 58 the sheet is folded along parallel fold lines A and A' to form a central portion 290 straddled by two end portions 291. The next step in the process is shown in Fig. 59 where the material is formed into the shape of a T by folding the end portions 291 along two fold lines B and B' oriented below and parallel with fold lines A and A' respectively, to form wing portions 294 and side wall portions 295. The material is also folded along fold line A and A' so that the two wing portions 294 overlay the central portion 300. This brings opposed inside surfaces of the central portion 290 against the inside surface of the wing portions 294 to form two coextensive pleats 302 and 303. The inside surfaces of the side wall portions 295 are also brought against each other. Side edge seals 304 and bottom seals 305 are then formed by thermal bonding as shown by the heavy stippling in Fig. 59. Diagonal seals 307 are also now formed in the pleats as shown in Fig. 61.

The next step of the process is shown in Fig. 62 where the triangular segments 309 of the sealed pleats are cut away leaving only thin, convergent seals 310 extending convergently to the small remaining sections of the pleat bottom seals 305.

Finally, side seal extensions 312 are formed by thermal bonding in a pattern, specifically designed for the container sides as shown in Fig. 63, and the pleats folded along parallel fold lines C and C' to form the generally rectangular bottom 313 of the container. The excess material is then cut away similarly as shown in Fig. 42. This leaves only the top end 315 of the finished container unsealed. If desired, it too may be sealed with or without an infitment.

Once filled with a supply of liquid or granular material, the flexible container assumes the shape shown in Fig. 57 with its two wing portions 294 separated from the central portion 290 and the side wall portions 295 separated from each other. Again, with this procedure no folds or creases are formed in the bottom 313 of the container as with most of those of the prior art procedures using V folds and gussets. However, here seals are made between the inside and outside of the material.

While this invention has been described in detail with particular reference to the preferred embodiments thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as previously described and as defined in the claims. For example, the sequence of the steps set forth herein may be altered, and welds may be accomplished by lines of adhesive or other attachment means. As an alternative to the method of mass producing containers 10 set forth above, each individual container 10 may, using the method of the present invention, be produced from a single sheet of material rather than from a continuous web. Therefore, while the above description contains many specificities, these should not be construed as limitations on the scope of the invention, but rather as an amplification of one preferred embodiment thereof.

Claims

1. A flexible container formed of a continuous sheet of flexible material into a structure having a front wall, a rear wall, two side walls and a bottom wall comprised of an inner ply having only peripheral folds or creases and which is reinforced by an outer ply comprised of two folded leg members extending from said front and rear walls which completely overlay said bottom wall.
2. The container of claim 1 wherein said bottom wall leg members are welded to said bottom wall inner ply.
3. A flexible container formed of a continuous sheet of flexible material into a structure having a front wall, a rear wall, two side walls and a bottom wall comprised of an inner ply that is free of non-peripheral folds and creases, said inner ply being completely overlaid by a reinforcing out ply integrally extending from said rear wall.
4. The container of claim 3 wherein said outer ply comprises two folded leg members extending from said front and rear walls.
5. The container of claim 3 wherein said bottom wall leg members are welded to said bottom wall inner ply.

6. A method of producing a container from a sheet of flexible material having a thermally bondable inside surface, and with method comprising the steps of folding the material along first and second parallel fold lines to form an uncreased central portion between the first and second fold lines which forms the container bottom wall straddled by two end portions which form the container sides, folding the two end portions respectively along third and fourth fold lines parallel to the first and second fold lines to form the two end portions into two first portions overlying the uncreased central portion and two second portions overlying each other, thermally bonding together side edges of the first portions and side edges of the uncreased central portion, and thermally bonding together the side edges of the second portions. 5
7. The method of claim 6 wherein the uncreased central portion and the first portions are thermally bonded with four diagonal bonds. 10
8. The method of claim 6 wherein the steps are performed sequentially. 15
9. A method of producing a container from a sheet of flexible material having a thermally bondable inside surface, and with the method comprising the steps of
folding the material along first and second parallel fold lines forming an uncreased central portion therebetween; 20
folding the material straddling the uncreased central portion along third and fourth fold lines parallel to the first and second fold lines to form a two layered, generally T-shaped intermediate structure having two pleats formed of the uncreased central portion which forms the container bottom wall overlaid by two wing portions and a side wall portion extending from each wing portion, 25
welding side edges of the uncreased central portion and the wing portion of the pleats together, 30
welding side edges of the side wall portions together, and 35
separating the uncreased central portion and the wing portion of the two pleats and the side wall portion of the T-shaped intermediated structure to form an interior space. 40 45
10. The method of claim 9 wherein the steps are performed sequentially. 50
11. A container formed from a sheet of flexible material having a thermally bondable inside surface by folding the material to form a central portion straddled by two end portions which form an uncreased central portion straddled by two end portions which form the container sides, folding the two end portions to form two first portions overlying the central portion and two second portions overlying each other, thermally bonding together the side edges of the first portion and the side edges of the central portion, and thermally bonding together the side edges of the second portions. 55
12. The container of claim 11 wherein the uncreased, central portion and the first portions are thermally bonded with four diagonal bonds.
13. A container produced according to the method that comprises the steps of:
forming material into a generally T-shaped intermediate structure having an uncreased central portion, two wing portions underlying the central portion, each wing portion extending from an opposite end of the central portion, and two side wall portions substantially overlapping each other, each side wall portion extending from an end of one wing portion, welding the side edges of the central portion to the side edges of the overlying wing portions, welding the side edges of the side wall portion together, and separating the central portion from the wing portions and the side walls from each other to form an interior space.
14. The container produced according to claim 13 wherein the central portion and the wing portions are welded with two diagonal bonds on each side of the wing portions.

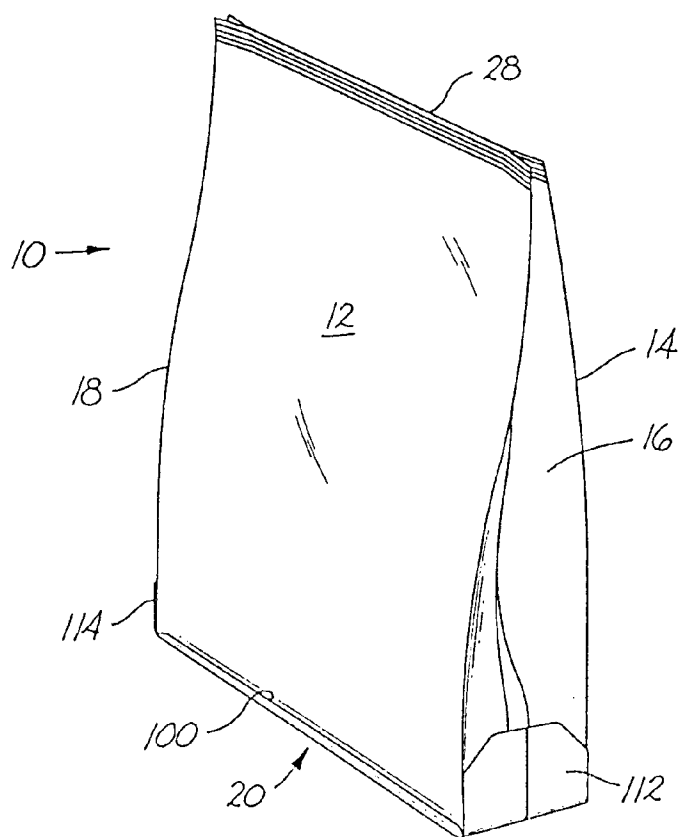


FIG. 1

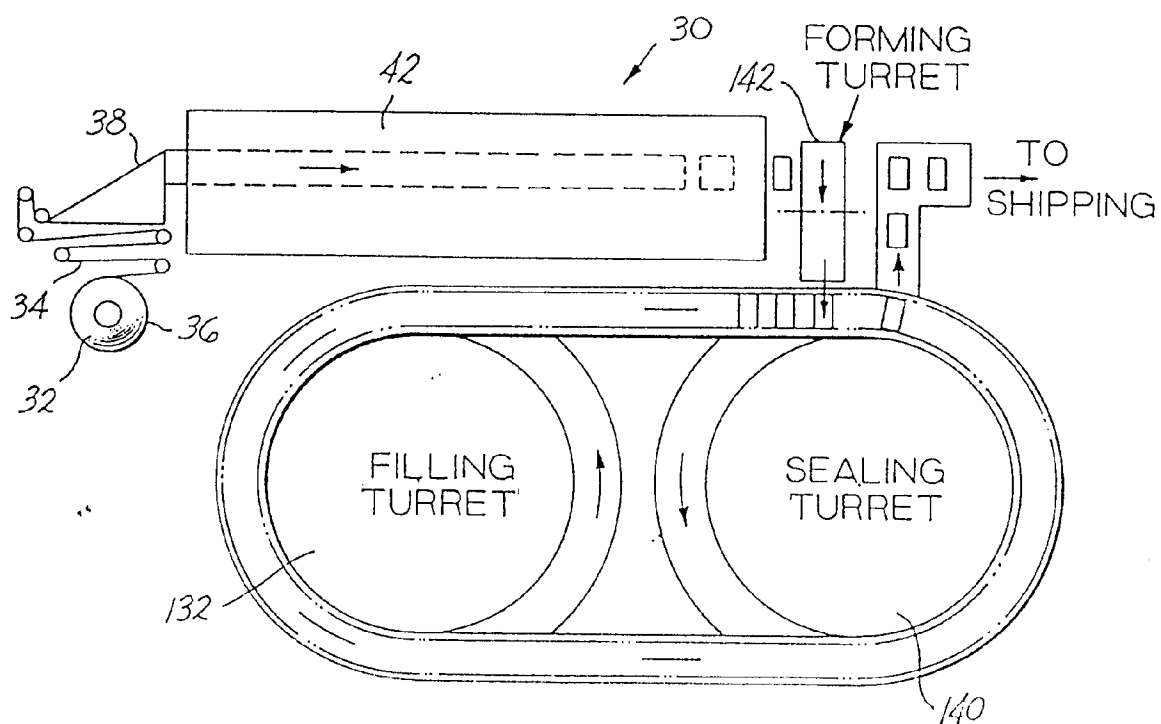
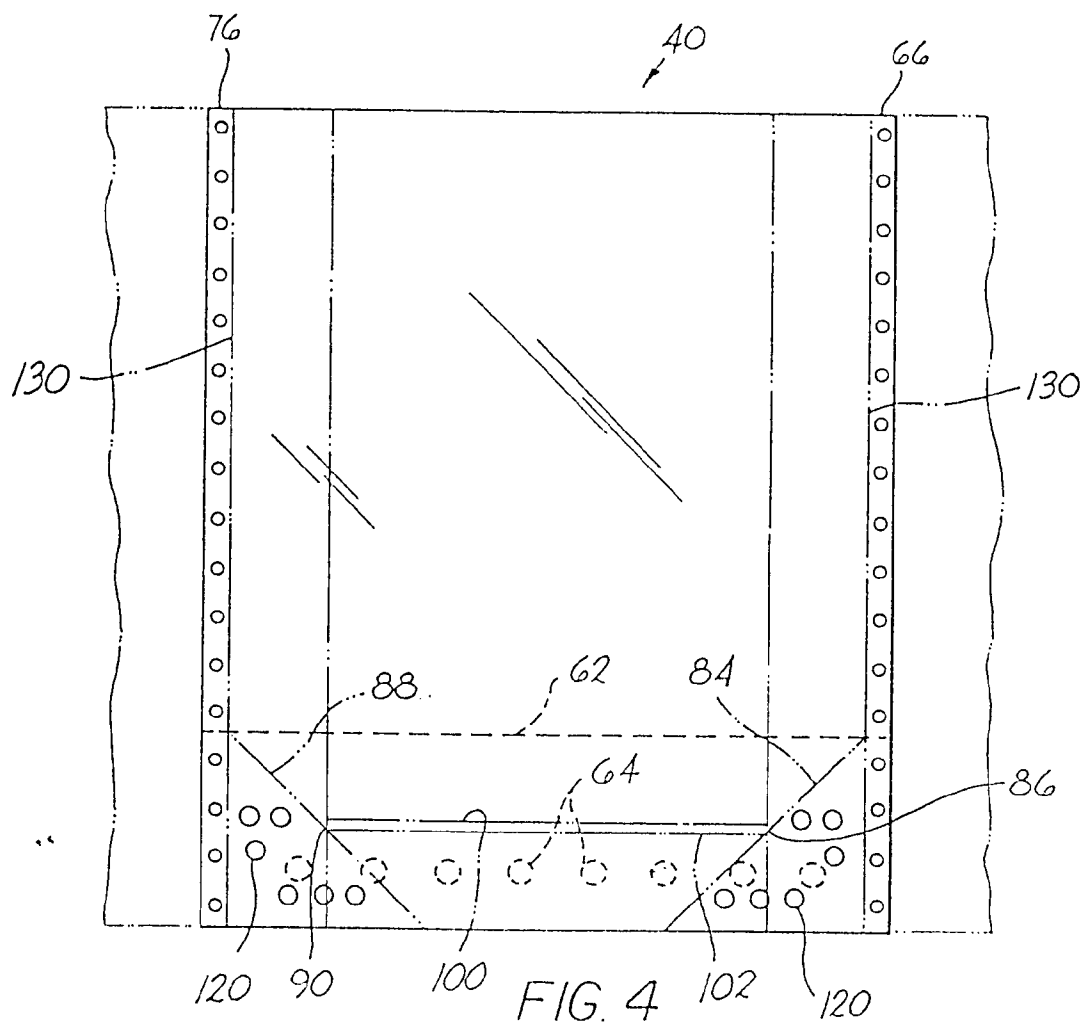
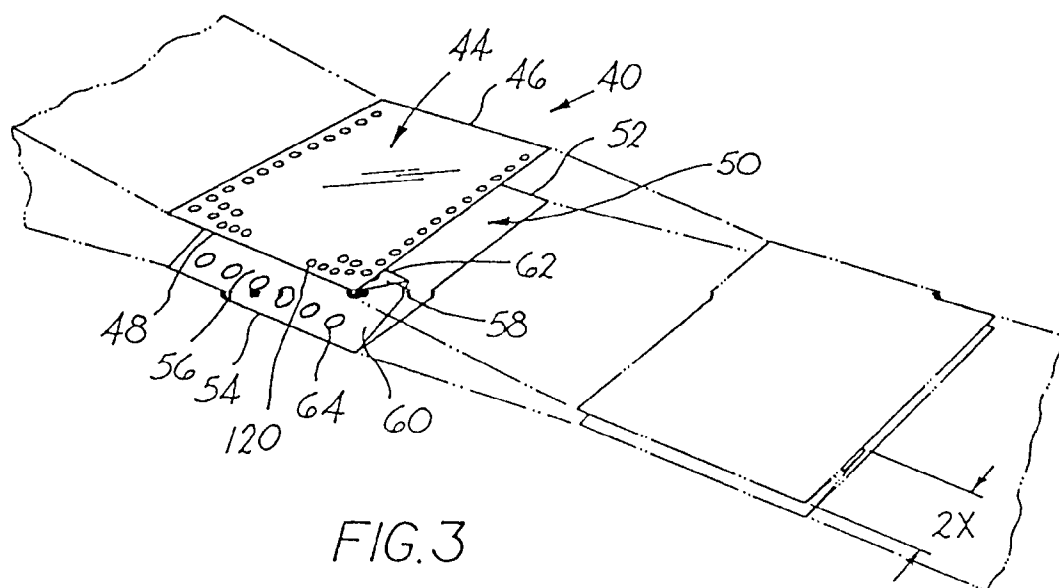


FIG. 2



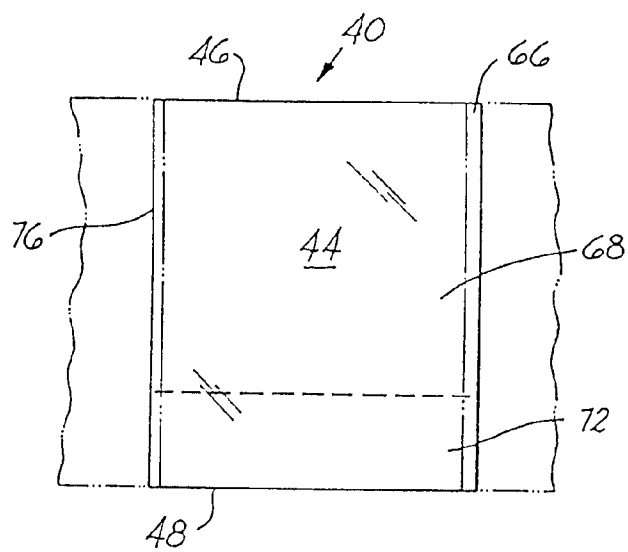


FIG. 5

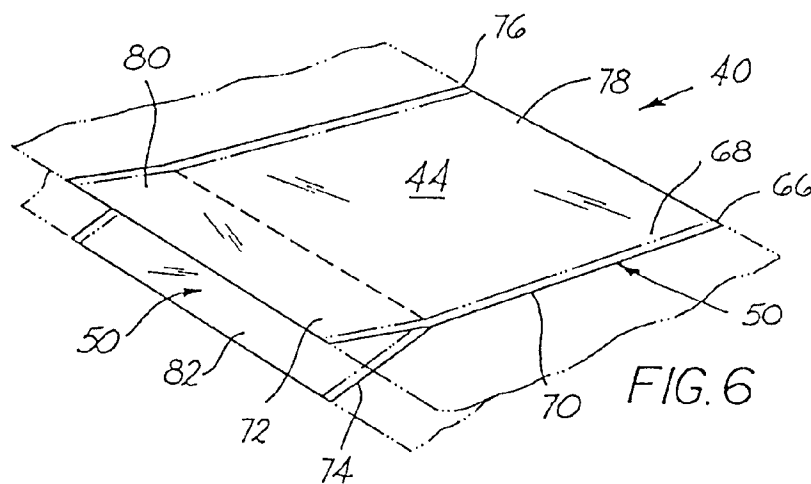


FIG. 6

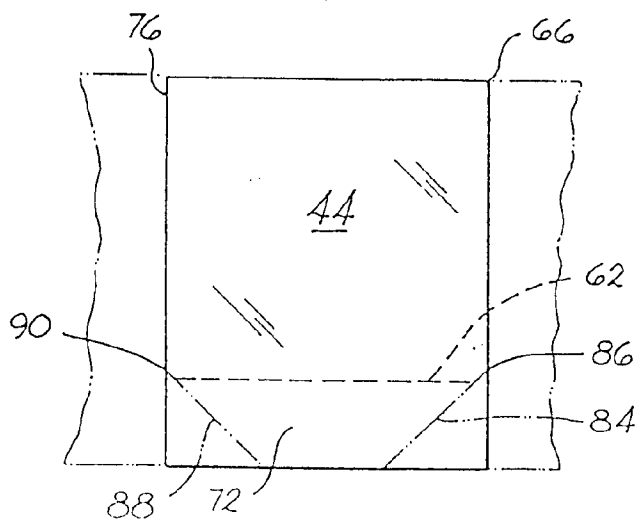


FIG. 7

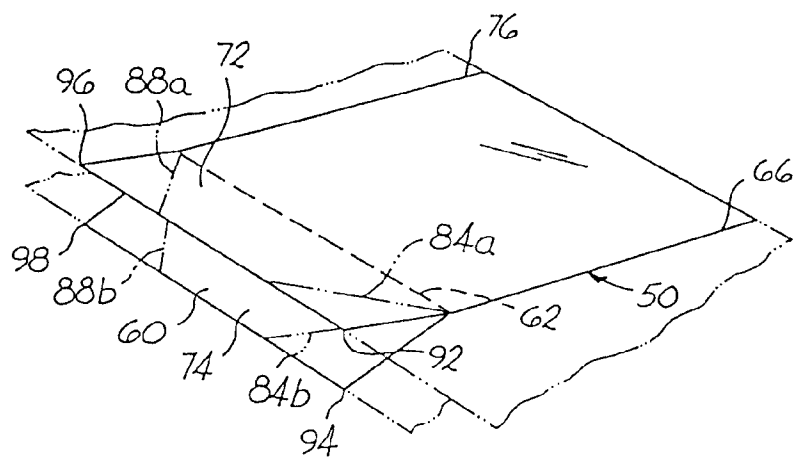


FIG. 8

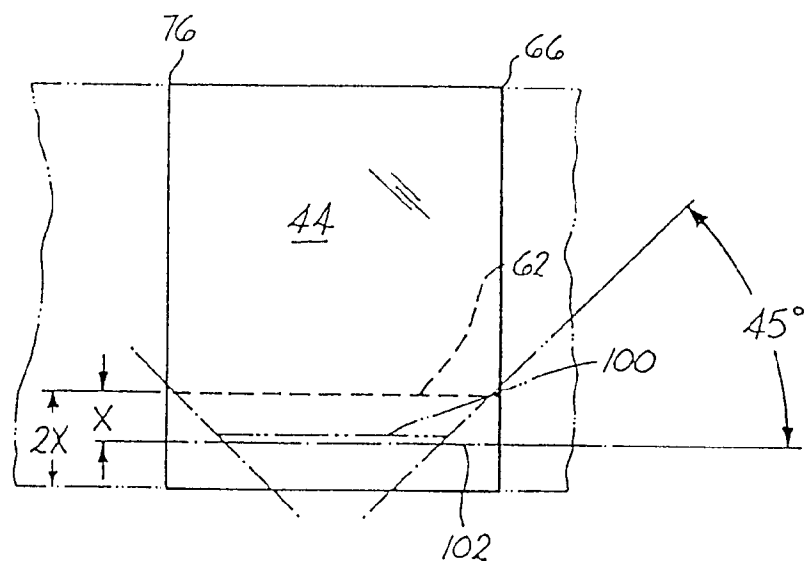


FIG. 9

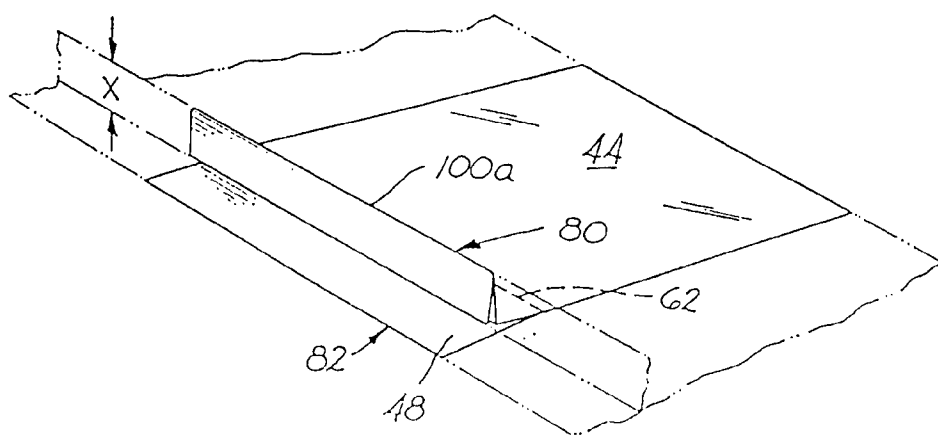
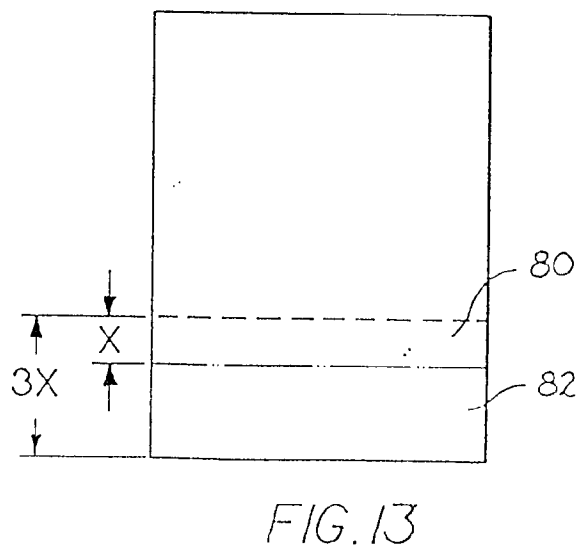
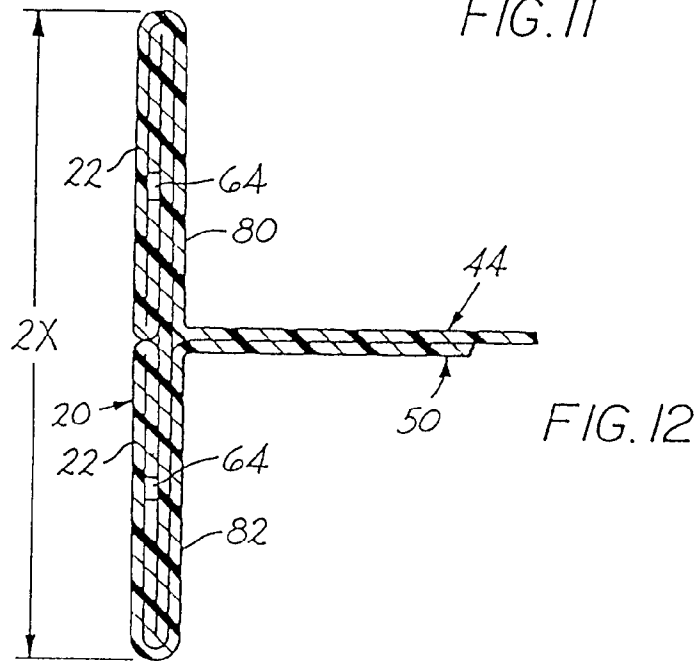
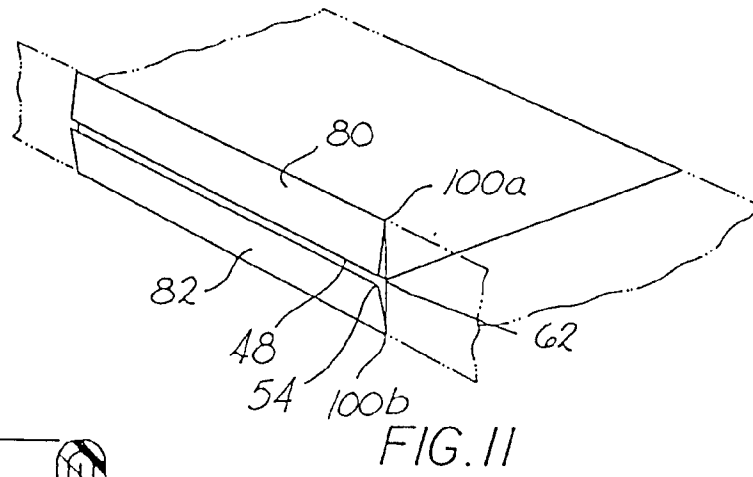


FIG. 10



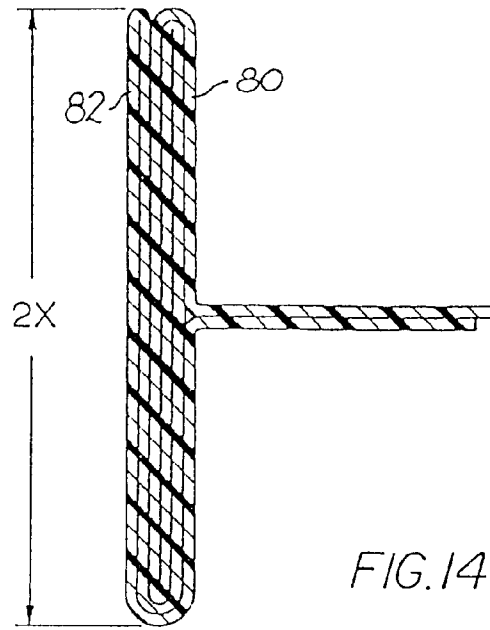


FIG. 14

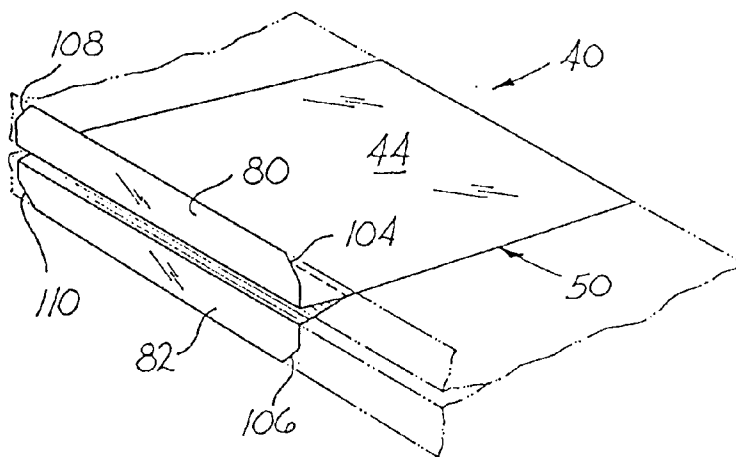


FIG. 15

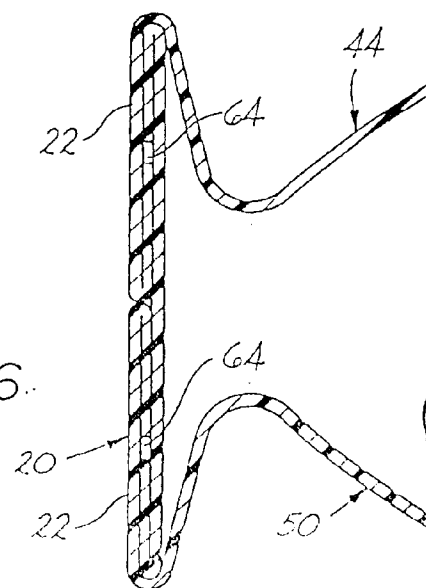
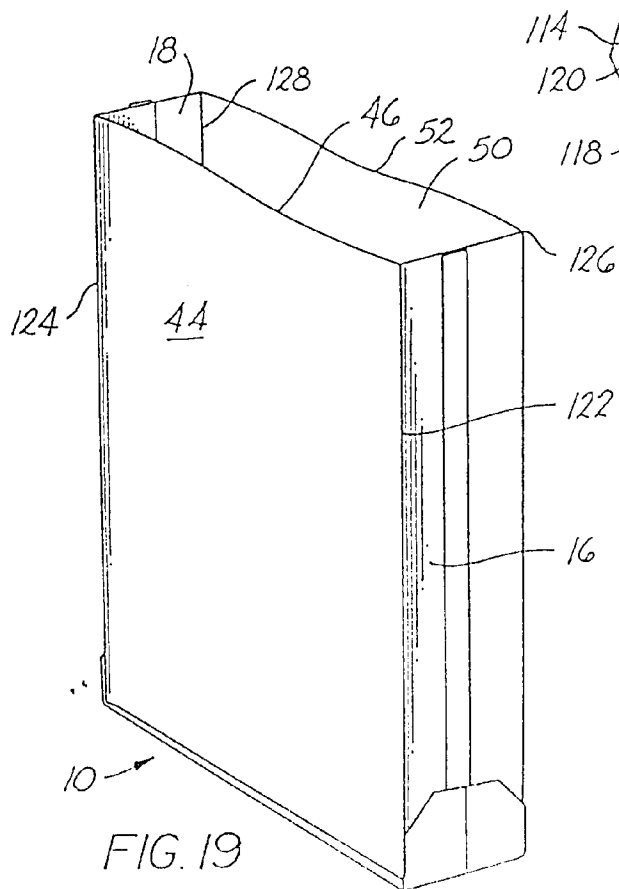
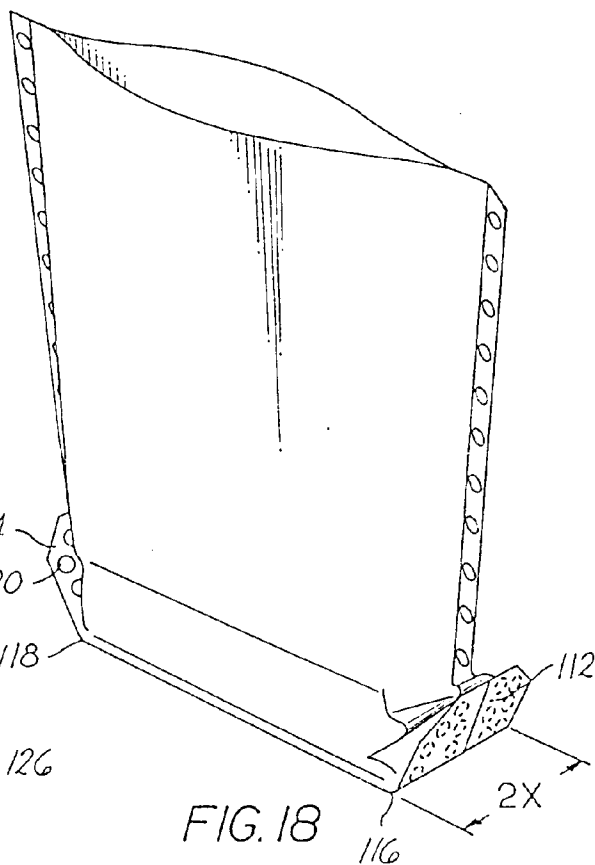
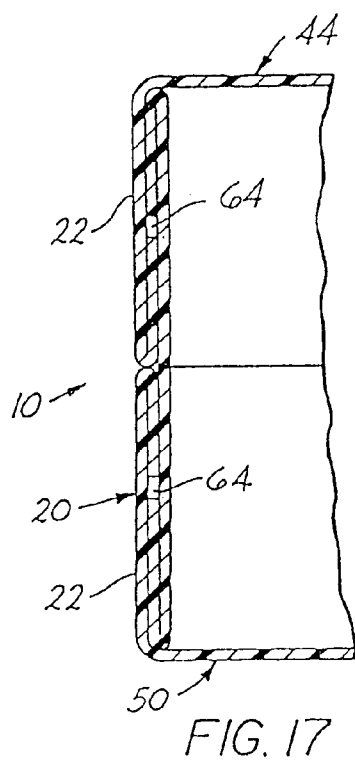


FIG. 16



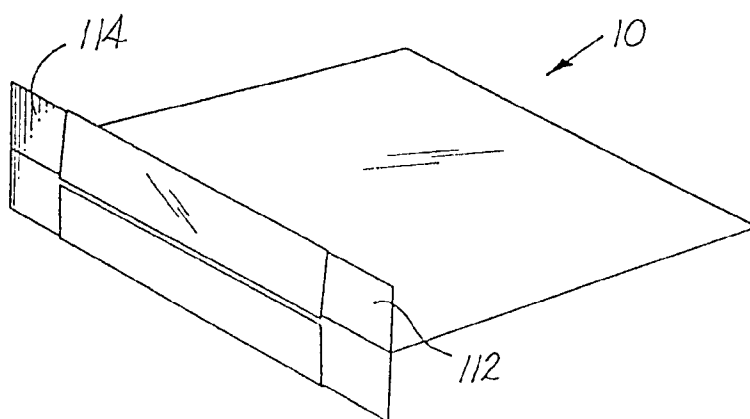


FIG. 20

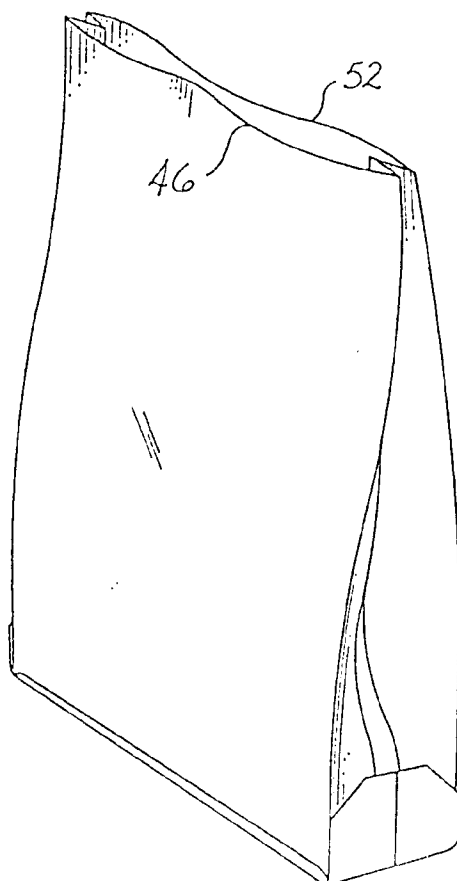
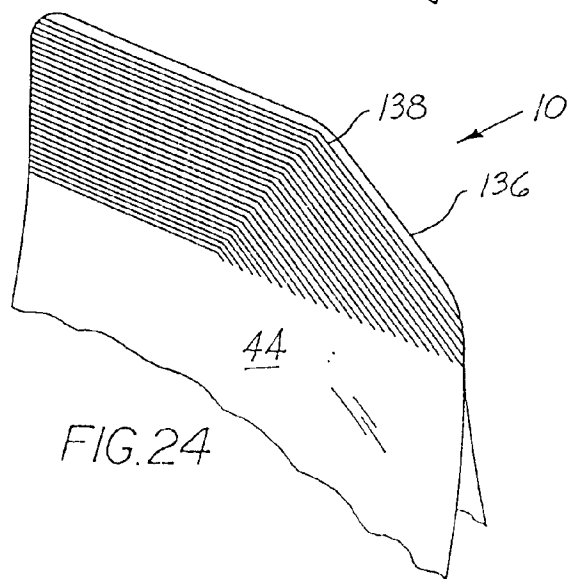
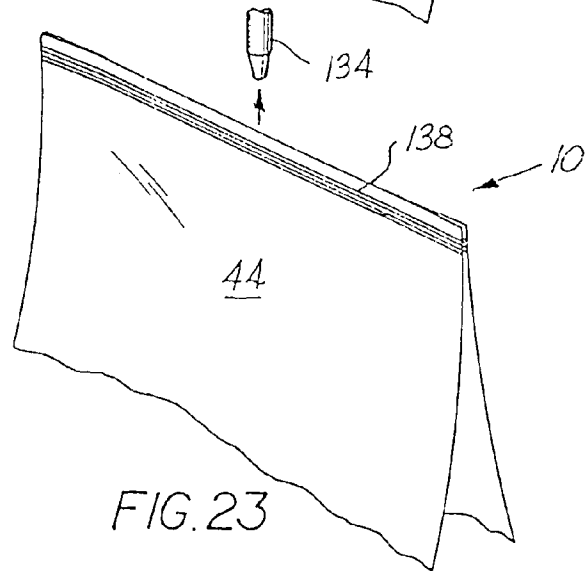
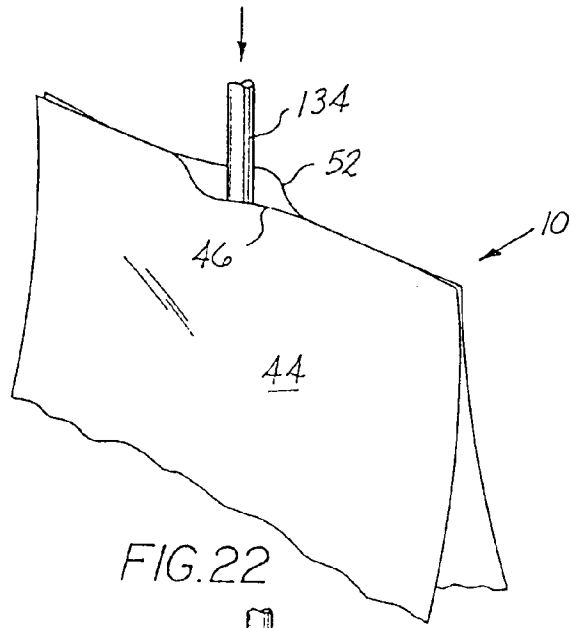


FIG. 21



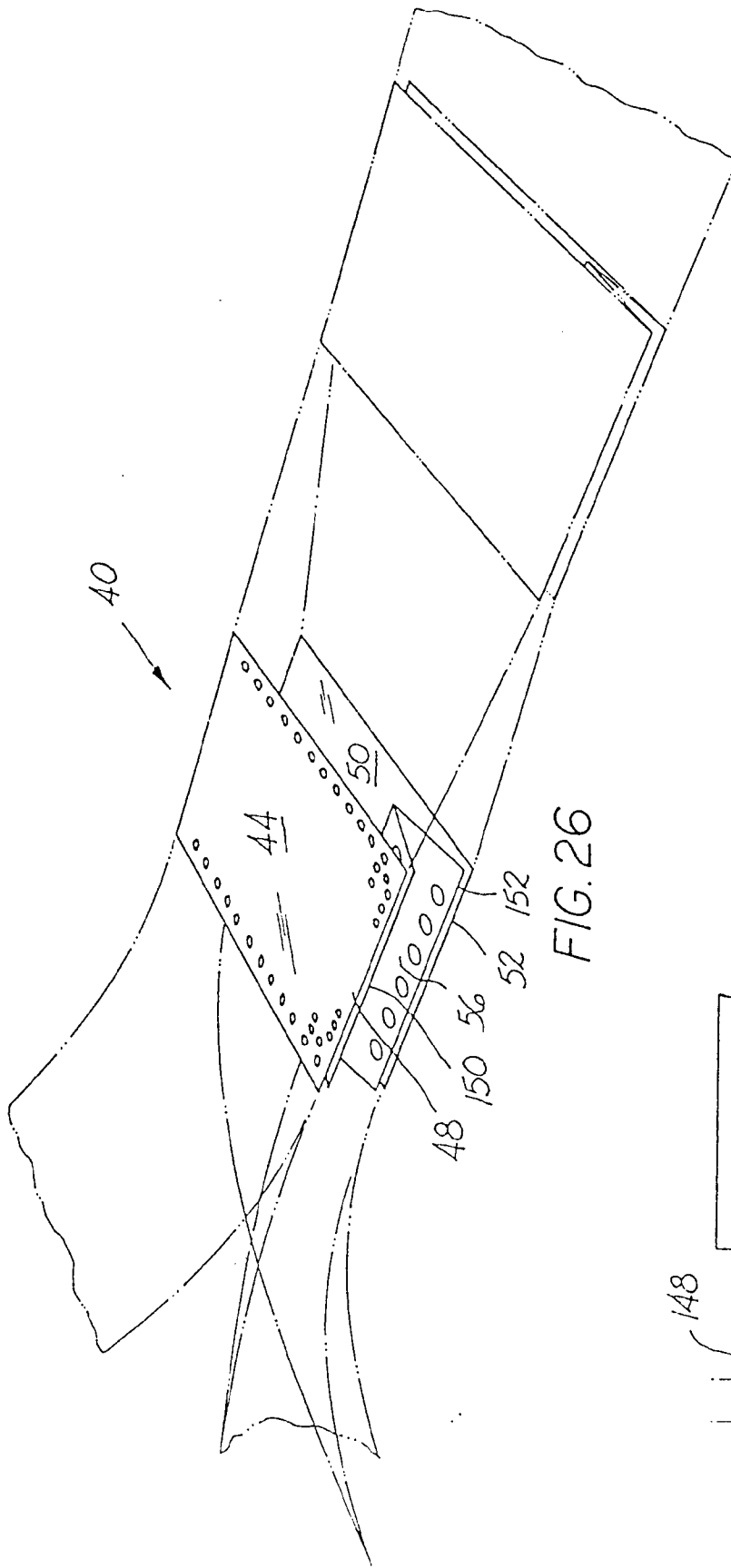


FIG. 26

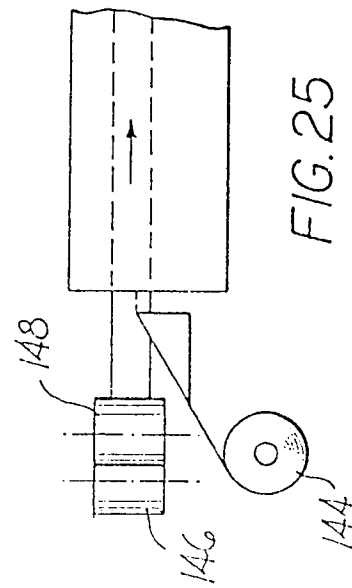


FIG. 25

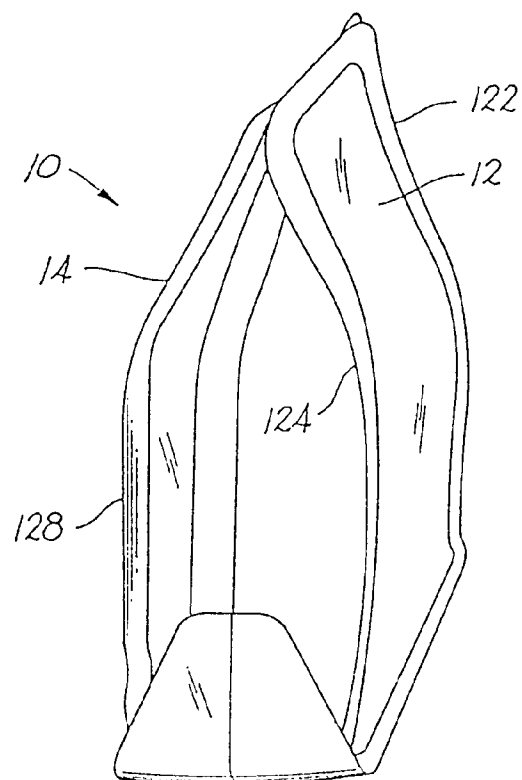


FIG. 27

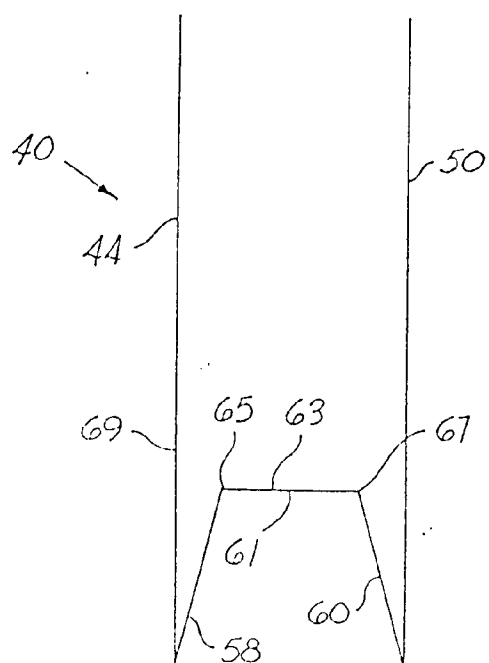
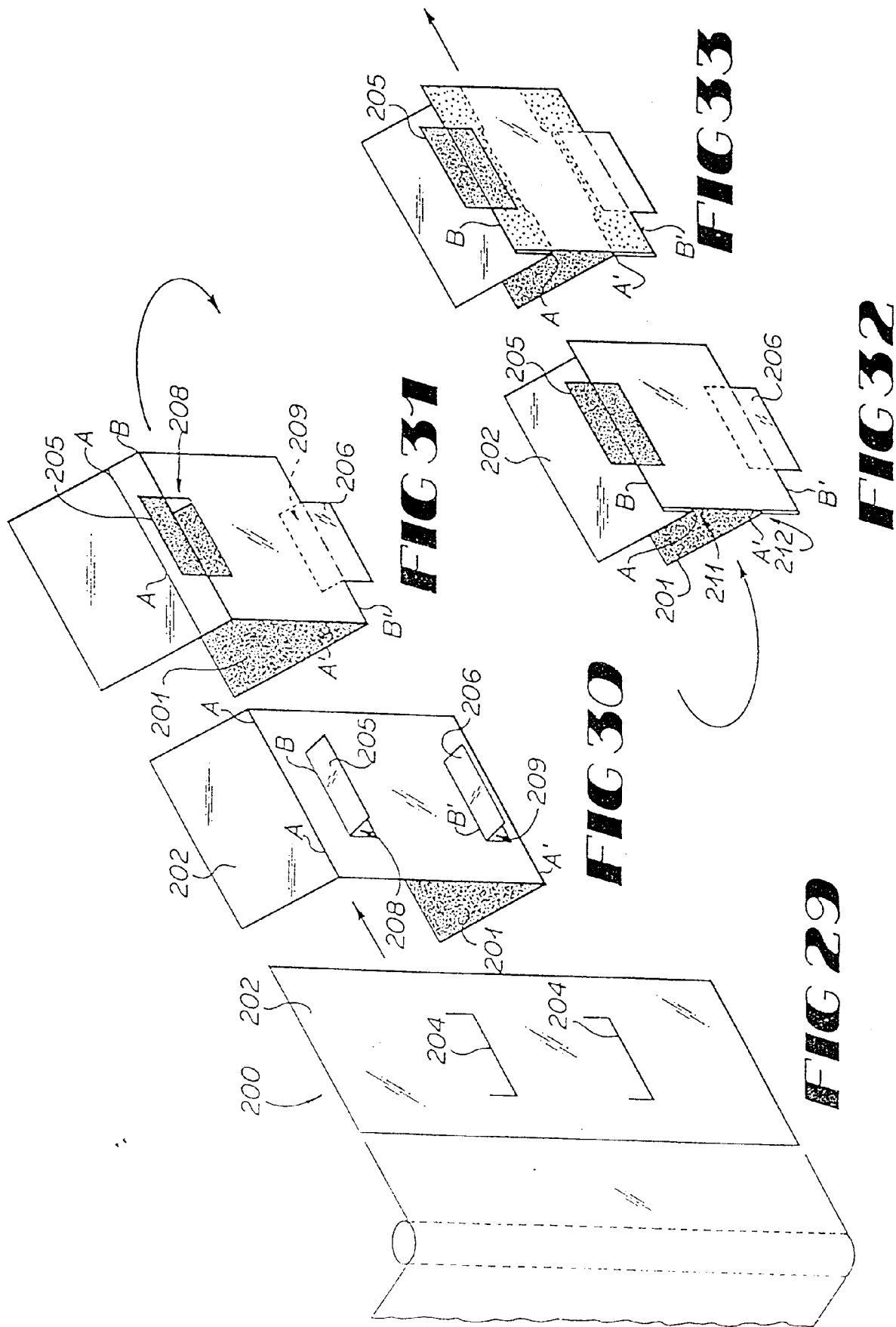
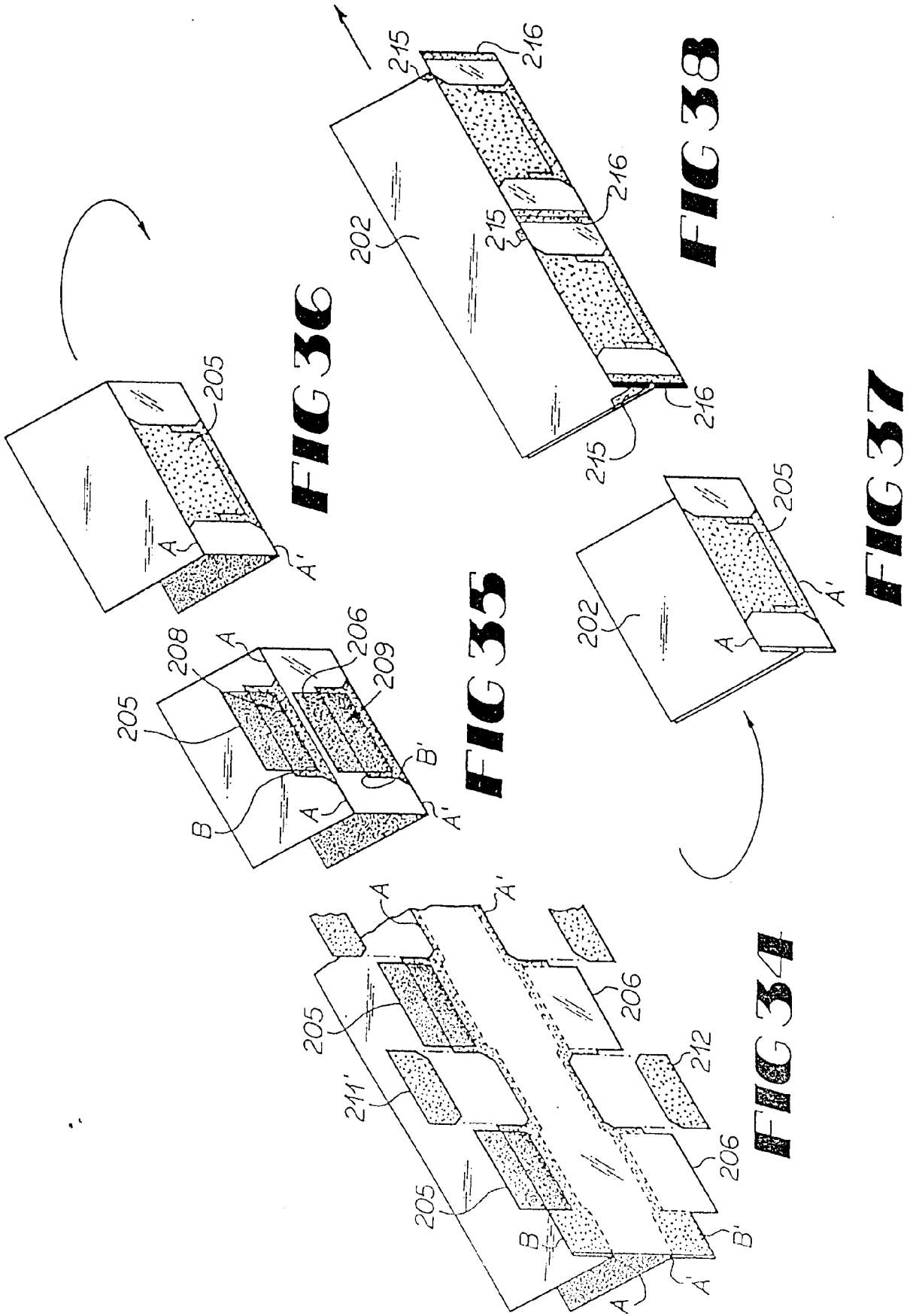
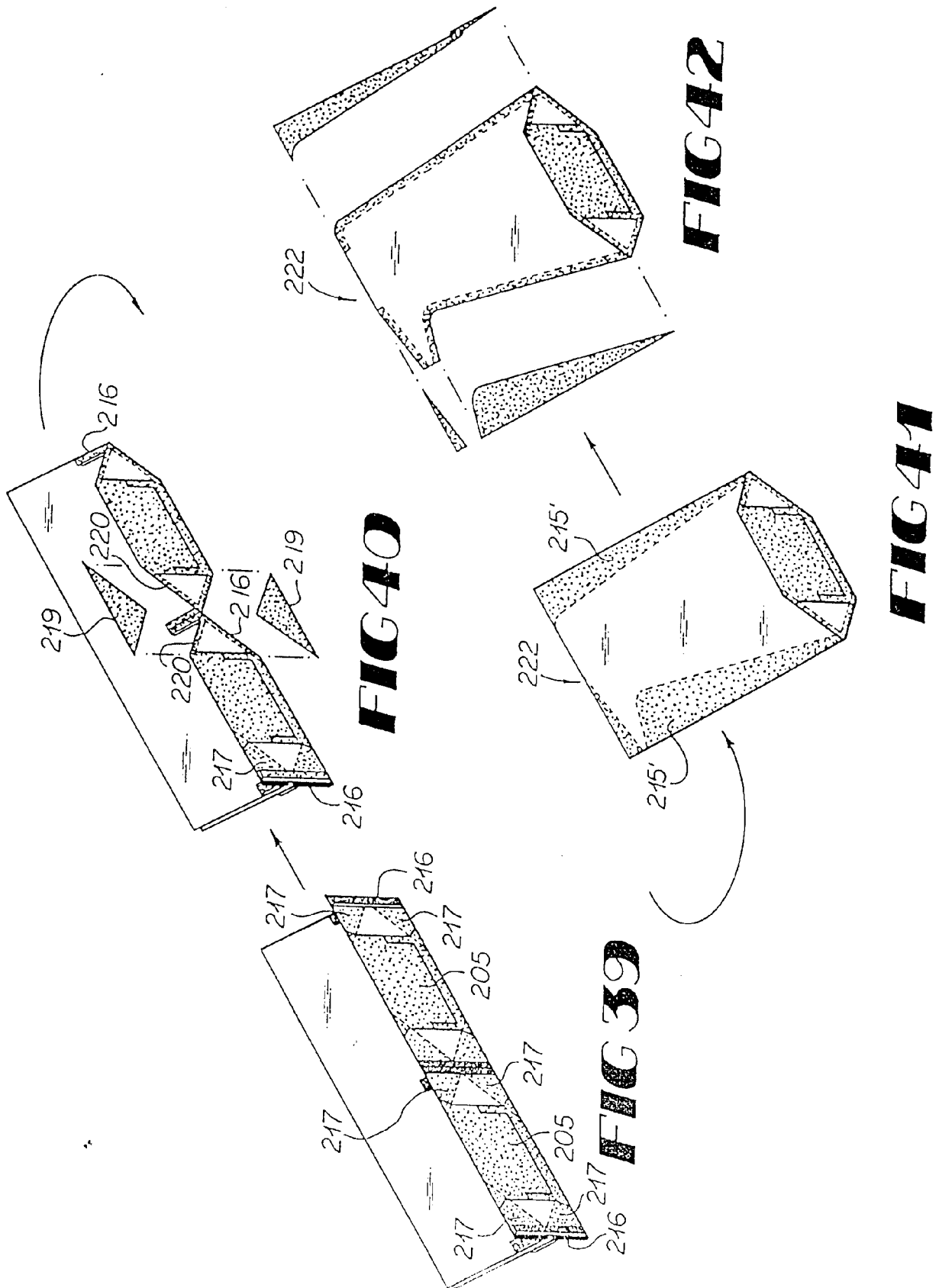
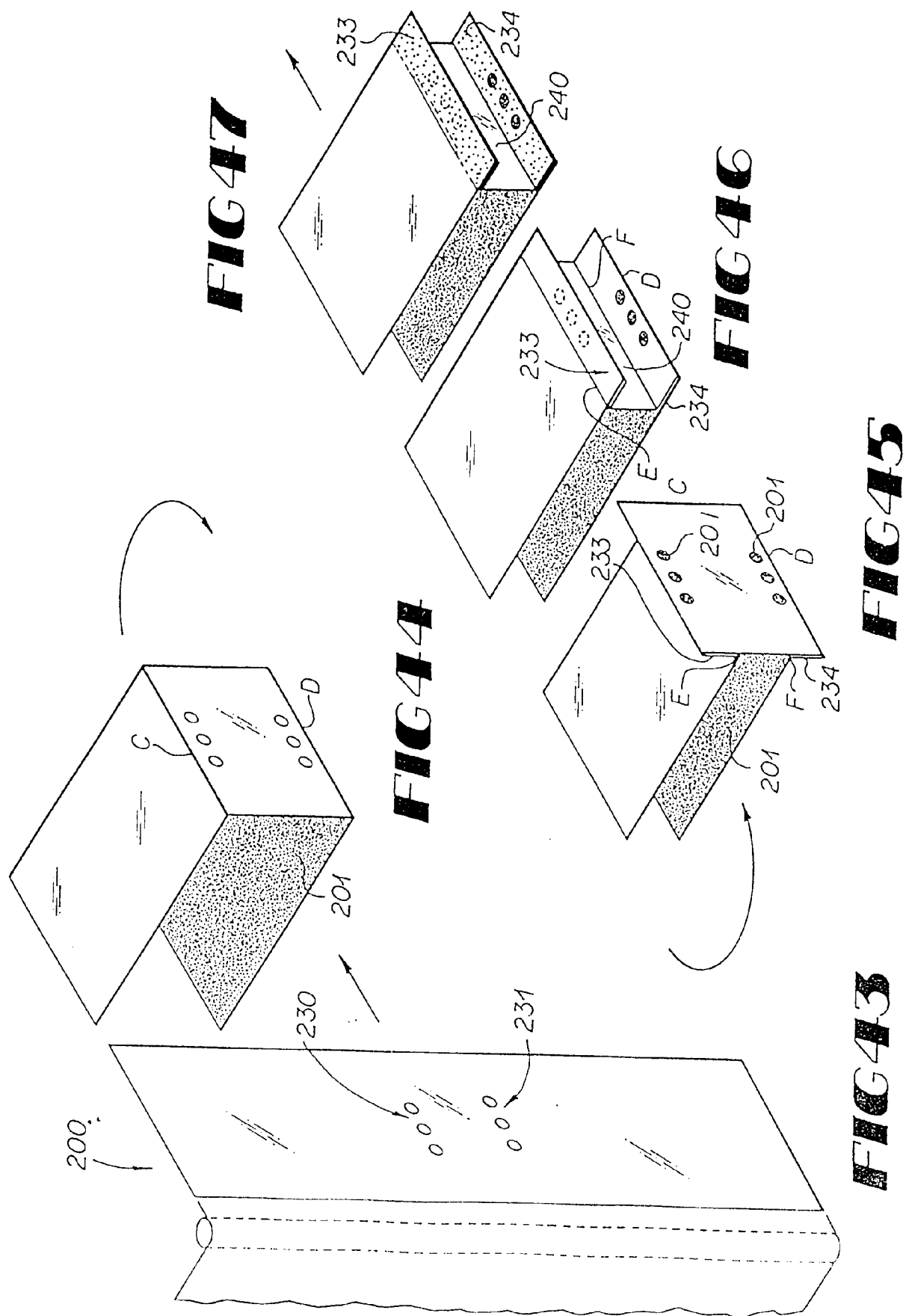


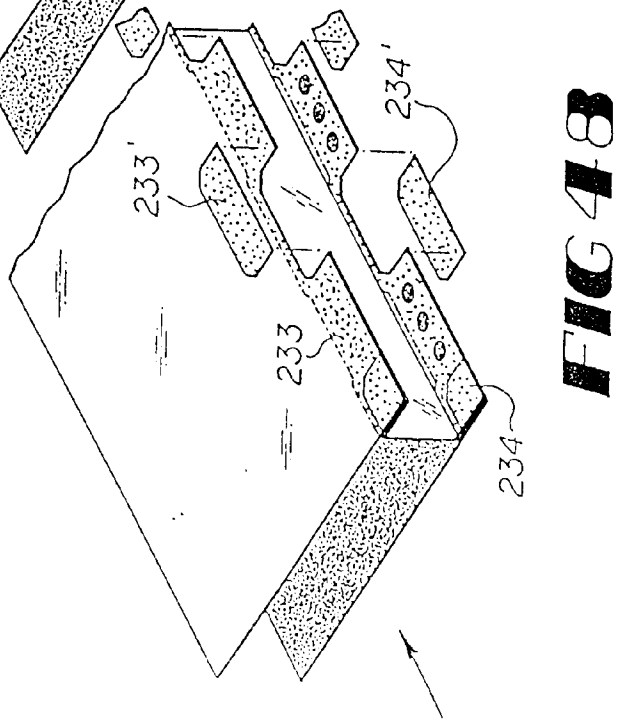
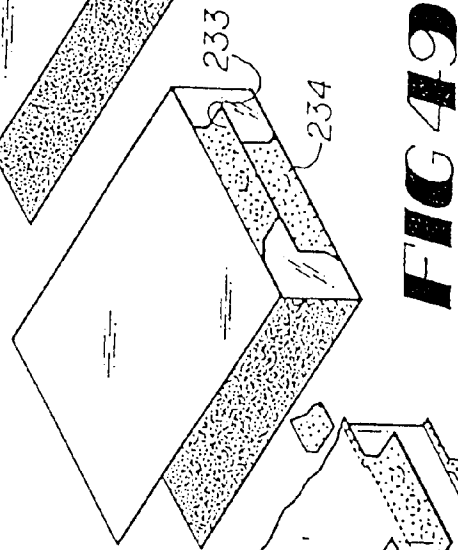
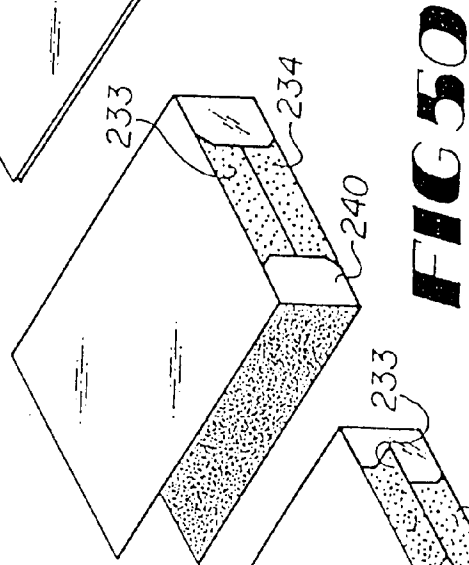
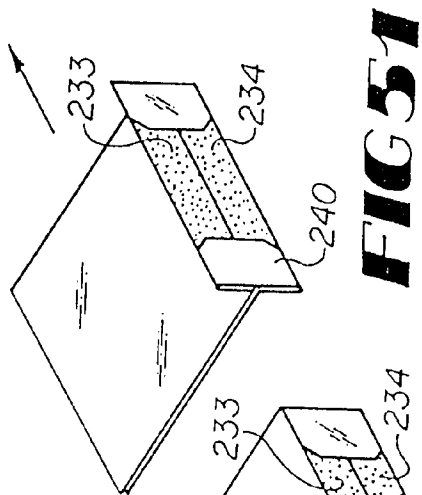
FIG. 28

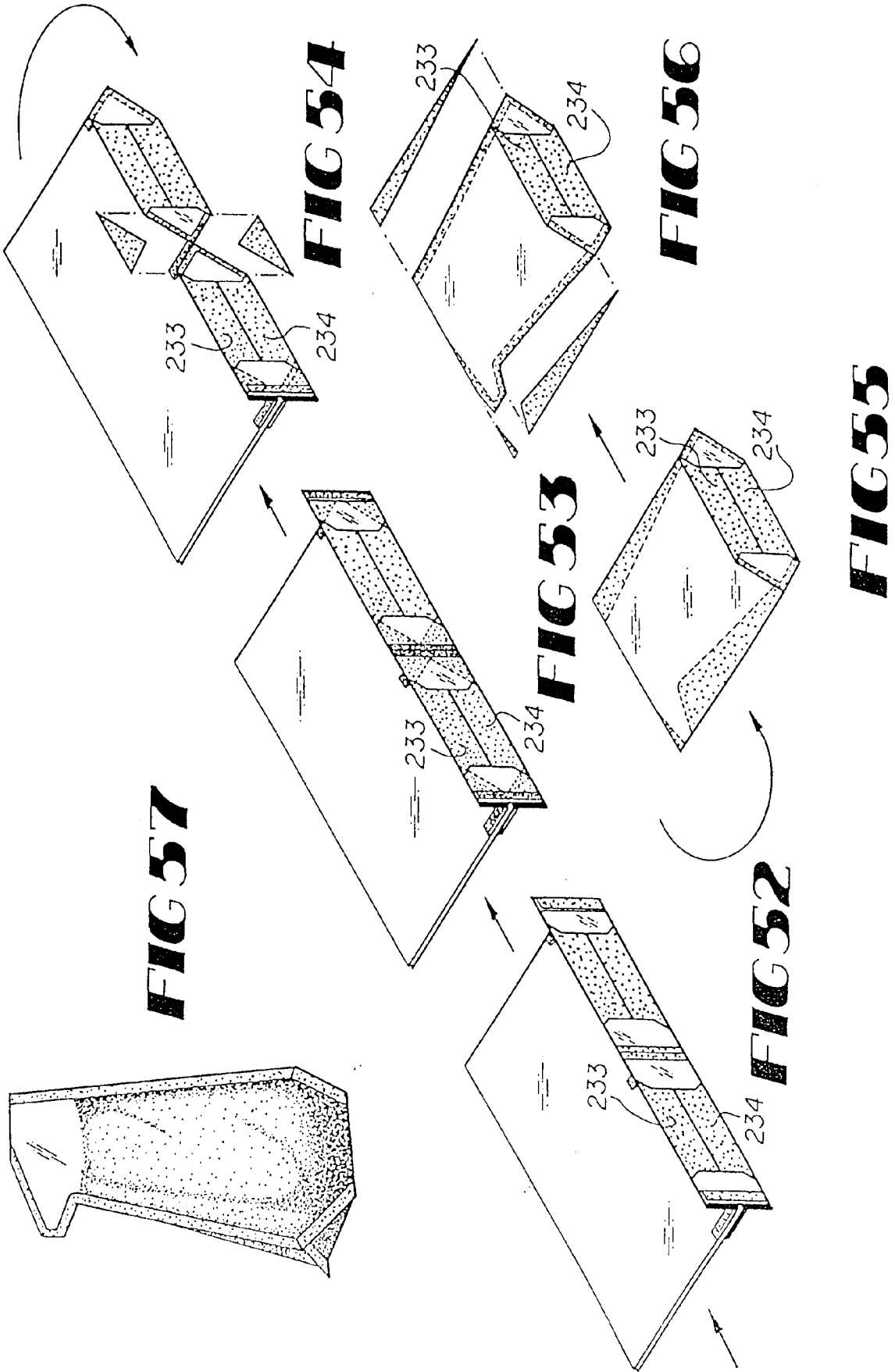












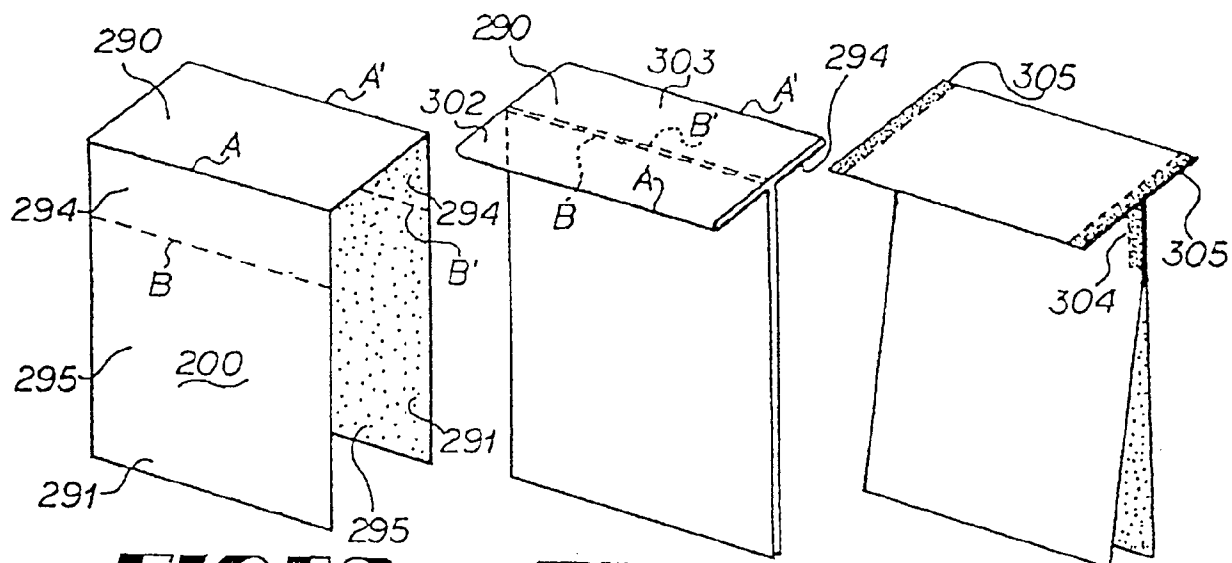


FIG 58

FIG 59

FIG 60

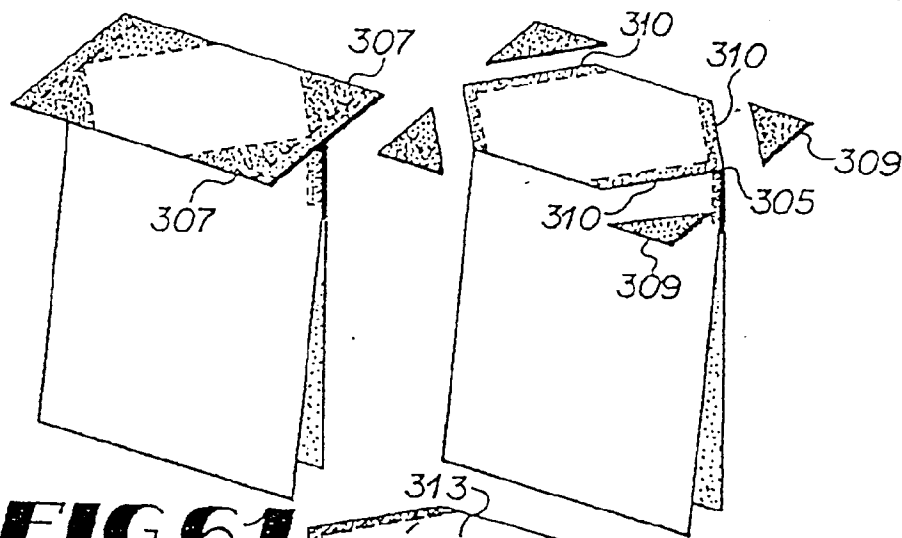


FIG 61

FIG 62

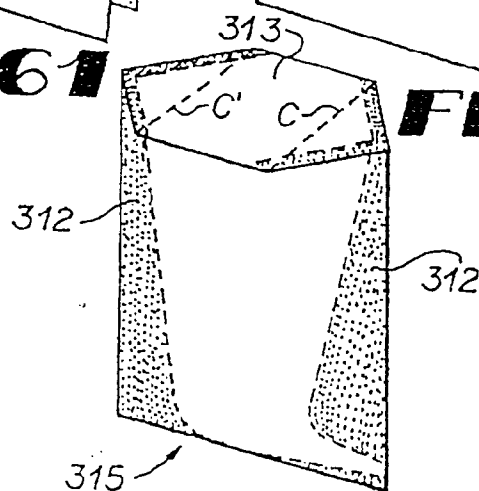


FIG 63



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 65 0041

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO-A-94 02370 (JEBCO) * the whole document *	1-14	B65D30/10
A	US-A-4 718 738 (BELL) * figures 5,6 *	6,9,11,13	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 January 1996	Examiner Bridault, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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