(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 942 881 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
04.10.2001 Bulletin 2001/40

(21) Application number: **97947588.6**

(22) Date of filing: **19.11.1997**

(51) Int Cl.[7]: **B65D 85/16**, B65D 5/00

(86) International application number:
PCT/US97/21158

(87) International publication number:
WO 98/24711 (11.06.1998 Gazette 1998/23)

(54) **IMPROVED PACKAGE FOR COMPRESSIBLE PRODUCTS AND METHOD FOR PRODUCING SAME**

VERPACKUNG FÜR ZUSAMMENDRÜCKBARE PRODUKTE UND VERFAHREN ZU DEREN HERSTELLUNG

EMBALLAGE AMELIORE POUR PRODUITS COMPRESSIBLES ET SON PROCEDE DE PRODUCTION

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU NL PT SE

(30) Priority: **26.11.1996 US 756754**

(43) Date of publication of application:
22.09.1999 Bulletin 1999/38

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EP 0 942 881 B1

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention relates to packages which may be used for efficiently packaging and shipping compressible products. The present invention further relates to methods for producing same.

BACKGROUND OF THE INVENTION

[0002] When transporting finished products from the point of manufacture to the point of sale, or to an intermediate storage facility, it is often desirable to enclose a plurality of products within a larger, more durable package. Not only does this preserve the products in their desired, saleable condition, but it minimizes the number of individual items to be handled and generally provides more uniformly shaped items for stacking and handling.

[0003] Through the years such packages have frequently taken the form of conventional, often rectangular, rigid or semi-rigid packages formed of corrugated or non-corrugated cardboard having dimensions suitable for enclosing a predetermined number of finished products. For other products requiring protection from contamination but not from physical harm, "soft" flexible packaging materials such as polymeric films and papers of varying thicknesses have been employed in similar fashion. While such packages have proven effective in protecting the finished products during transport and storage, they are generally inefficient in terms of space occupied and material required for transporting and storing compressible products having a significant void volume within.

[0004] In an effort to address this shortcoming, various methods have been devised for subjecting compressible products to compressive forces prior to their loading into a package such that the package holds them under tension until it is opened. Although an improvement over conventional packaging methods, this approach frequently requires complex machinery to compress the product(s) and to maintain them in a compressed state during their insertion into a pre-formed package or while a package is secured around them. Moreover, in many instances some portion of the compression is lost due to the volume occupied by the compression apparatus which is vacated when the machinery is withdrawn from the package.

[0005] US-A-3,345,796 to Belsinger discloses a process, container and apparatus for confining yieldable material, and is more particularly concerned with a fiber board container, an apparatus for compressing the container and the process of packaging compressible material in a compressed condition within said fiber board container.

[0006] Another approach for packaging compressible products has been to combine the compression process with the package fabrication process such that the package seal is formed while external compression forces are applied to the products and surrounding package components. While this approach addresses the compression-loss issue discussed above with regard to within-the-package product compression apparatus, there remains the problem of forming an adequate package seal or joint under tension.

[0007] Accordingly, it would be desirable to provide a package which is suitable for efficiently packaging and shipping compressible products. It would be further desirable to provide such a package which is easy to open and economical in its construction, yet durable in service.

SUMMARY OF THE INVENTION

[0008] In accordance with the present invention, products may be contained within a continuous sleeve which is unitarily formed or joined to itself to form a cylindrical sleeve in a low- or no-tension condition. Products may be inserted into the interior of the sleeve after formation or captured within the sleeve during its formation. The sleeve forms a continuous path encircling the product (s) in at least one plane through the products and package, defining an axial direction normal to the plane and a circumferential direction around the product(s) within the plane. One or more axially-extending pleats are unitarily formed from the material comprising the cylindrical wall of the sleeve, such that the circumference of the cylindrical sleeve is reduced. By reducing the circumference of the cylinder the interior volume of the sleeve, and thus the finished package, is reduced, thus subjecting the products within the package to a compressive force. The compressive force may be imparted in a single direction, such as by translationally moving a panel of the package inwardly, or may be imparted in more than one direction by a plurality of compression steps or by a uniform reduction in circumference resulting in a uniform inwardly-directed product compression. Where a panel is moved inwardly forming two parallel pleats, the distance travelled by the panel is approximately equal to the finished width of the pleat and the reduction in circumference is approximately equal to the sum of the width of the finished pleats or, in the case of pleats of equal size, twice the width of a finished pleat. Where a single pleat is formed so as to uniformly reduce the circumference of the sleeve, the reduction in circumference is approximately equal to the finished width of the pleat. Multiple pleats multiply the reduction in circumference.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, it is believed that the present invention will be better understood from the following description in conjunction with the accompanying Drawing Fig-

ures, in which like reference numerals identify like elements, and wherein:

Figure 1 is a perspective view of a package according to the present invention in a fully assembled condition;
Figure 2 is a plan view of a blank suitable for forming a package such as that of Figure 1;
Figure 3 is a top plan view of the blank of Figure 2 after initial folding showing the glue application areas;
Figure 4 is a top plan view of the flattened sleeve made from the blank of Figure 2;
Figure 5 is a perspective view of the sleeve of Figure 4 after being squared for transformation into the package of Figure 1;
Figures 6A-6E are cross-sectional views of the sleeve of Figure 5 taken along section line 6-6, depicting the sequence of steps to impart compression to the products in the package in accordance with the method of the present invention;
Figure 7 is a perspective view similar to that of Figure 5 after the product and package compression process has been completed;
Figure 8 is a perspective view of the package of Figure 1 in an open condition with the top raised;
Figure 9 is a perspective view of another embodiment of a package in accordance with the present invention;
Figure 10 is a plan view of a blank suitable for forming a package such as that depicted in Figure 9;
Figure 11 is a perspective view of a sleeve formed from the blank of Figure 10 after being squared for transformation into the package of Figure 9 and after the product compression process of the present invention has been accomplished;
Figure 12 is a perspective view of a further embodiment of a package in accordance with the present invention;
Figure 13 is a perspective view of a sleeve suitable for forming a package such as that of Figure 12 after the package and product compression process has been accomplished;
Figure 14 is a perspective view of another embodiment of a package but not in line with the claims, and
Figure 15 is a perspective view of the package of Figure 14 during the product compression step of its formation.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Figure 1 illustrates a package 10 constructed in accordance with the present invention. The package depicted is a presently preferred embodiment in accordance with the present invention, and comprises a generally rectangular parallelepiped formed of a rigid or substantially rigid material. While packages in accordance with the present invention may constructed in many different configurations and by many different construction techniques, a presently preferred approach is to utilize a unitary piece of material known as a "blank" to minimize waste of material and the need to handle many different individual components during package assembly.

[0011] Figure 2 is a plan view of a unitary blank 20 of package material suitable for forming a package such as package 10 depicted in Figure 1. As shown in Figure 2, the blank 20 incorporates five main panels 24, 26, 28, 30, and 32, and four pleat sides.92, 94, 82, and 84, which are successively connected to each other along transverse score lines 34, 36, 38, 40, 91, 93, 81, and 83. The five main panels, from top to bottom, include a front outer panel 24, a top panel 26, a back panel 28, a bottom panel 30, and a front inner panel 32. The transverse boundaries of each of these panels 24, 26, 28, 30, and 32 are defined by axial score lines 42 and 44. The axial score lines 42 and 44 also serve to connect each panel 24, 26, 28, 30, and 32 to an end flap 46 through 55 at each transverse edge.

[0012] The end flaps associated with the front inner panel 32 and the back panel 28 are the major flaps 54, 55, and 50, 51. The major flaps 50, 51, 54, and 55 preferably have substantially the same transverse dimension as the axial dimension of the top panel 26, and even more preferably have substantially the same overall dimensions as the resulting end wall of the package 10. The end flaps associated with the bottom panel 30 are the minor flaps 52 and 53. The minor flaps 52 and 53 are somewhat smaller in transverse dimension than the major flaps 50, 51, 54, and 55. The end flaps associated with the top panel 26 will hereinafter be referred to as ears 48 and 49. The transverse dimension of the ears 48 and 49 is substantially smaller than the transverse dimension of the major flaps 50, 51, 54, and 55.

[0013] The end flaps associated with the front outer panel 24 will hereinafter be referred to as extension panels 46 and 47. In this embodiment, these extension panels 46 and 47 have substantially the same transverse dimension as the major flaps 50, 51, 54, and 55. The front outer panel 24 and its associated extension panels 46 and 47 have a transverse tear strip 56 extending thereacross. Tear strip 56 is preferably two transverse parallel lines 50% cut into the outer side of the front outer panel 24 and extension panels 46 and 47. A 50% cut is a continuous cut which extends from the surface of the material down to a depth which is half of the thickness of the material. The 50% cut assures a clean tear at the surface which leaves a relatively pleasing appearance, particularly when the package 10 is printed, although depending upon the particular application other means of providing a weakened line such as perforation may be employed. An optional reinforcing tape (not shown) may be attached to the inner side of tear strip 56 to help prevent tear strip 56 from breaking into pieces as it is removed from the package 10. One end of the tear strip

preferably extends beyond the axial edge of the extension panel 47, providing a tab to facilitate grasping tear strip 56 to initiate the opening process.

[0014] A glue flap 59 comprising proximal locking portion 58 and distal attachment portion 64 is connected to the lower transverse edge of the front inner panel 32 via a cut score line 60. The cut score line 60 is preferably cut deeply enough to facilitate bending of the proximal locking portion 58 about cut score line 60 but not so deep as to permit the proximal locking portion 58 to separate from front inner panel 32 during repeated normal opening of the package 10. In addition, the cut score line 60, being a partial cut instead of a full cut, prevents leakage of or contamination of package contents prior to opening.

[0015] Proximal locking portion 58 is connected to distal attachment portion 64 along a full length line of weakness which comprises remotely spaced land areas 65. A pair of tabs 62 and 63 are located along the lower transverse edge of the proximal locking portion 58 opposite a pair of matching cutouts 66 and 67 along the upper transverse edge of distal attachment portion 64. The engagement between tabs 62 and 63 and cutouts 66 and 67 in use permits the package to be repeatedly opened and locked down, as will be discussed hereinafter.

[0016] Distal attachment portion 64 comprises an opening tab 68 along its lower transverse edge. After tear strip 56 has been removed, opening tab 68 will aid the user by providing a convenient means to open the package 10, as will be discussed hereinafter.

[0017] As discussed briefly above, the blank 20 includes a plurality of small panels known as pleat sides. The pleat sides are arranged in pairs and defined from the adjoining panels by triple parallel lines of weakness (score lines, perforations, creases, or the like), and each pair of pleat sides form a pleat. In the blank 20 depicted in Figure 2, pleat 80 includes pleat sides 82 and 84, which are in turn defined by transverse score lines 40, 81, and 83, while pleat 90 includes pleat sides 92 and 94, which are in turn defined by transverse score lines 38, 91, and 93. Accordingly, pleats 80 and 90 are preformed before the package is assembled because the score lines defining the pleat sides will form naturally weaker regions of the blank where bending can occur. The importance and functionality of pleats 80 and 90 in packages according to the present invention will become apparent from the discussion which follows.

[0018] To assemble the package 10 the blank 20 of Figure 2 is first folded and glued to form the sleeve shown in Figure 4. Initially, glue flap 59 is folded downwardly as a unit 180° about the transverse cut score line 60 to lie against the outer side of front inner panel 32. Glue is then applied to distal attachment portion 64. Then the blank is folded 180° about the transverse score line 40 which separates the front inner panel 32 from the bottom panel 30 to place front inner panel above bottom panel 30 and the lower portion of back panel 28. Glue is then applied to the front outer panel 24 in the two locations indicated as 74. The result of these steps is shown in Figure 3. The blank is then folded 180° about the transverse score line 36 which separates the top panel 26 from the back panel 28 so that front outer panel 24 overlies glued flap 59 and inner panel 32. Thus, the distal attachment portion 64 of glue flap 59 is adhered to the inner side of the front outer panel 24 above tear strip 56. In addition, front outer panel 24 and extension panels 46 and 47 are adhered below the tear strip 56 to the front inner panel 32 and the major flaps 54 and 55 associated therewith. The finished sleeve is seen in Figure 4. Note that pleat 80 remains in a substantially planar configuration and is in the same plane as front panel 24, while pleat 90 is also substantially planar and is in the same plane as back panel 28 but is hidden from view behind the front panel 24.

[0019] In accordance with the present invention, as seen in Figure 5 the sleeve is squared so that each of the five main panels 24, 26, 28, 30, and 32 are at substantially right angles to their adjacent major panels. Accordingly, the sleeve forms a continuous cylindrical tube-like structure having two open ends. As utilized herein, the term "cylindrical" refers to hollow elongated geometrical structures not limited to circular cross-sections but also including elliptical, triangular, quadrilateral, and other polygonal cross-sections. As shown in Figure 5, a coordinate system may be defined to identify directions and planes within the package/product context. As depicted in Figure 5, the X direction extends in a direction parallel to the interior of the sleeve, while the Y and Z directions are orthogonal thereto. Accordingly, a plane parallel to the Y-Z plane (such as a cross-section taken through the sleeve at section line 6-6) would reveal that the sleeve forms a continuous path around the product(s) within the package in the plane. Accordingly, this continuous path can be utilized to define a circumference of the sleeve, or in other words a perimeter length of this continuous path encircling the product regardless of the cross-sectional shape of the sleeve.

[0020] Figures 6A-6E are cross-sectional views of the sleeve of Figure 5 taken along line 6-6 of Figure 5. While products have been omitted from the interior of the package 10 in Figure 5, products are shown within the interior of the package/sleeve of Figures 6A-6E to depict the effects of product and package compression after packaging. Note also that while the opening feature is arranged so that the products may be readily dispensed through the top of the package by opening the top panel 26, in Figures 6A-6E the package 10 is depicted in an inverted position for the compression process since in many instances equipment considerations dictate that the packages be supported from below and the compressive force be applied from above.

[0021] In Figure 6A, the interior of package 10 has been filled with five representative products 99, although any number of products can be utilized therein. Note that for purposes of this illustration the five prod-

ucts and the package 10 are sized such that the entire interior volume of package 10 is occupied by the products 99. Products 99 can be placed within the sleeve after it has been formed and squared, as is presently preferred, or alternately the sleeve may be assembled around the product or products. In Figure 6A, the products are under minimal, low, or no compression such that the package material is under minimal, low, or no tension. Accordingly, package 10 may be filled in any suitable manner without having to overcome frictional forces or exert compressive forces on the products.

[0022] Figure 6B depicts the sleeve after the application of a force F to the bottom panel 30 between the preformed pleats 80 and 90 via a plunger, shoe, guide, or other suitable method known in the art. Pleats 80 and 90 have begun to depart from their initial orientation parallel to the front inner panel 32 and the back panel 28. Front inner panel 32, back panel 28, and top panel 26 are supported and maintained in their initial orientation by appropriate supports, guides, templates, etc., such that bottom panel 30 moves relatively inwardly toward the top panel 26. As will be apparent from a comparison between Figures 6A and 6B, the interior volume of the package 10 has begun to be reduced proportionately by the volume swept by the translationally-moving bottom panel 26 as it moves inwardly toward the center of the package. As the bottom panel 26 moves inwardly, the circumference of the sleeve also decreases. Note also that the products 99 have begun to be compressed likewise by a pro-rata proportion (assuming the products are equally compressible) of the volume decrease of the package 10, since the front inner panel 32, back panel 28, and top panel 26 are constrained.

[0023] In Figure 6C, the bottom panel 30 has reached the limit of its travel such that bottom panel 30 is now substantially even with the bottom edges of the front inner panel 32 and the back panel 28. The interior volume of the package 10 has been reduced by an amount equal to the swept volume of the bottom panel (its area times the distance travelled), and the circumference of the sleeve has been reduced by twice the distance travelled by the bottom panel. Accordingly, the products 99 have been compressed a pro-rata proportion of this volume reduction. In this condition, the pleats 80 and 90 are fully formed and their respective pleat sides 82, 84 and 92, 94 are substantially in contact with one another. For each pleat, the outer score lines of each triplicate set of score lines defining the pre-formed pleats are also substantially in contact with one another leaving the central score line of each triplicate set forming the apex of the pleat.

[0024] Figure 6D depicts pleats 80 and 90 as they have begun to move toward one another inwardly over the bottom panel 30. Since the pleats 80 and 90 are unitarily formed as part of the sleeve, and are therefore attached to the lower ends of the front inner panel 32 and the back panel 28, as the pleats move inwardly so as to extend over portions of the bottom panel 30 they serve to prevent bottom panel 30 from moving back outwardly away from top panel 26 due to product re-expansion when the applied compressive force F is removed. Alternatively, pleats 80 and 90 could be rotated outwardly away from one another and downwardly over the front and back panels, still performing a similar locking function to constrain the bottom panel.

[0025] In Figure 6E the pleats have been fully bent inwardly over the bottom panel 30 and have been secured to the bottom panel 30 by any suitable means known in the art such as adhesives, tapes, staples, etc. The pleat sides may be secured to one another continuously along their length or at discrete locations, or alternatively or additionally the pleat apex 81, 91 may be secured to the bottom panel 30. Accordingly, pleats 80 and 90 are prevented from pivoting away from bottom panel 30 and releasing bottom panel 30 from its inward position. Products 99 are therefore maintained in a compressed state due to the permanently reduced interior volume of the package 10 and the permanently reduced circumference of the sleeve.

[0026] In accordance with the present invention, products may be contained within a continuous sleeve which is unitarily formed or joined to itself to form a cylindrical sleeve in a low- or no-tension condition. Products may be inserted into the interior of the sleeve after formation or captured within the sleeve during its formation. The sleeve forms a continuous path encircling the product (s) in at least one plane through the products and package, defining an axial direction normal to the plane and a circumferential direction around the product(s) within the plane. One or more axially-extending pleats are unitarily formed from the material comprising the cylindrical wall of the sleeve, such that the circumference of the cylindrical sleeve is reduced. By reducing the circumference of the cylinder the interior volume of the sleeve, and thus the finished package, is reduced, thus subjecting the products within the package to a compressive force. The compressive force may be imparted in a single direction, as in Figures 6A-6E, by translationally moving a panel of the package inwardly, or may be imparted in more than one direction by a plurality of compression steps or by a uniform reduction in circumference resulting in a uniform inwardly-directed product compression. Where a panel is moved inwardly forming two parallel pleats, the distance travelled by the panel is approximately equal to the finished width of the pleat and the reduction in circumference is approximately equal to the sum of the width of the finished pleats or, in the case of pleats of equal size, twice the width of a finished pleat. Where a single pleat is formed so as to uniformly reduce the circumference of the sleeve, the reduction in circumference is approximately equal to the finished width of the pleat. Multiple pleats multiply the reduction in circumference.

[0027] After the compression has been imparted to the package and its contents in accordance with Figures 6A-6E, the sleeve is sealed at each end either sequen-

tially or simultaneously to fully enclose the product(s). To fold and seal one end, the minor flap 52 associated with the bottom panel 30 is first folded 90° about the axial score line 42 to a position perpendicular to the bottom panel 30. The major flap 50 associated with the back panel 28 is folded 90° about the axial score line 42 and preferably adhered to the end flap 52 associated with the bottom panel 30. The major flap 54 associated with the front inner panel 32 and the extension panel 46 associated with the front outer panel 24, adhered thereto, are then folded 90° about the axial score line 42 and adhered to the exterior side of the major flap 50 of the back panel 28. Lastly, the ear 48 associated with the top wall 26 is folded 90° and adhered to the exterior of the front outer panel 24 extension panel 46. The folding and sealing operation of the other end is then carried out identically to that described above.

[0028] At this point, the package 10 is fully enclosed and assumes the configuration depicted in Figure 1. As shown in Figure 1, the package 10 is an enclosure formed by the various panels and flaps. These panels and flaps are the corresponding walls of the package 10. The top 26, bottom 30, and back panels 28 are the top 26, bottom 30, and back 28 walls, respectively. The front wall 70 is made up of the front inner panel 32 and the front outer panel 24. The end walls 72 are made from the remaining flaps, panels, and ears. The top wall 26 opposes the bottom wall 30, the front wall 32 opposes the back wall 28, and the end walls oppose each other. Pleats 80 and 90 are parallel to the front and back panels, respectively, and lie along the transverse edges of the bottom panel 30.

[0029] To open the package 10 for access to the products therein, the consumer or user grasps the tab of the tear strip 56 and pulls the tear strip 56 away from the package 10. Removal of the tear strip 56 exposes opening tab 68 to the user. At this point, the tear strip may be disposed of in a responsible manner. The user grasps the opening tab 68 and pulls the opening tab upward. This separates the top, which includes the front outer panel 24 and associated panel extensions 46 and 47 above the tear strip 56, the top wall 26, the ears 48 and 49, and the distal attachment portion 64, from the remainder of the package 20. The top is a three-sided lid which is now free to rotate. As the lid is rotated about the transverse score line 36, which joins the top wall 26 to the back wall 28, the proximal locking portion 58 of glue flap 59 is separated from the distal attachment portion 64. Rotating the lid along this score line 36 to an open position allows access to the contents of the package 10. Moreover, in this preferred configuration since the compression imparted to the products was imparted in a direction normal to the plane of the lid, opening the lid releases the products from compression such that they may easily be extracted from the package.

[0030] As the lid is rotated, proximal locking portion 58 is pulled in an upward direction about cut score line 60. After dispensing the desired contents of the package, the package 10 may be closed by rotating the lid back to the closed position. As the lid is rotated back to the closed position, tabs 62 and 63 of proximal locking portion 58 engage cutouts 66 and 67 of distal attachment portion 64. When completely closed, the proximal locking portion 58 and distal attachment portion 64 together hold the lid in closed condition until it is forcibly lifted. The disengaging and engaging of proximal locking portion 58 with distal attachment portion 64 via opening and closing of the package lid can be repeated until the contents of the package 10 have been emptied.

[0031] Further details regarding the fabrication and operation of packages of the type depicted in Figures 1-8, less of course the product compression features of the present invention, may be found in commonly-assigned U.S. Patent No. 5,161,734, issued November 10, 1992 to Ruehl et al., the disclosure of which is hereby incorporated herein by reference. Other packages of similar construction and operation are described in greater detail in U.S. Patent Nos. 4,949,899, 5,154,343, 5,236,123, 5,265,799, 5,314,114, 5,366,141, 5,439,133, 5,505,374, and 5,515,996.

[0032] It should be understood that, as used herein, the term "product" is intended to encompass not only solid, individual compressible items, but also individual compressible packages which enclose a compressible product or products in liquid, powdered, granular, particulate, or discrete forms. For products in "loose" form such as liquids and particulate materials, suitable means to contain the product during the compression process should be employed to prevent product loss. Accordingly, packages according to the present invention may contain a single individual product, but are particularly suitable for containing a plurality of products which may themselves be packages or carriers of individual product units.

[0033] Products of particular interest in accordance with the present invention include products which are compressible, i.e., capable of undergoing a reduction in volume and circumference when subjected to external compressive forces. Such products include those which are resiliently compressible, i.e., which return to substantially their original volume and external dimensions when external forces are released. Products of these varieties include disposable diapers, feminine hygiene products, adult incontinence products, paper and tissue products such as paper towels, bathroom tissue, facial tissue, wipes, as well as a wide variety of other products.

[0034] The package may be constructed in any desired dimensions, depending upon the particular product or products to be contained therein. More particularly, the proportions of the package may likewise be varied as desired to suit the proportions of the products and the desired overall package shape. The portions of the package providing strength to the package may be altered to provide the desired attributes depending upon the weight of the products to be contained therein, as well as ultimate stacking heights, and other parameters.

[0035] Accordingly, the present invention is not limited to packages such as that depicted in Figures 1-8. To illustrate other types of packages within the scope of the present invention, Figures 9-15 have been provided as discussed hereinafter.

[0036] Figure 9 depicts a package 110, constructed similarly to package 10 of Figure 1, but constructed without the flip-top recloseable opening features of the package of Figures 1-8. Accordingly, the package 110 of Figure 9 resembles a conventional corrugated-type carton wherein four sides are sequentially connected to one another to form a sleeve and the end panels are formed from four inwardly-folded overlapping flaps. Figure 10 depicts a blank 120 suitable for forming a package 110. The panels, flaps, pleats, and the like of Figures 9 and 10 are formed similarly to their counter parts of Figures 1-8 and are correspondingly numbered, although given the omission of the flip-top opening feature the former inner front panel 32 has been reduced to a tab 32 which is bonded to the lower inner edge of the front panel 28 to form a sleeve. The flaps depicted have also been shortened in the interest of conserving material such that each pair of flaps overlap the other pair of flaps and nearly meet to form the end panels. Figure 11 is a perspective view similar to Figure 7, depicting the blank 120 formed into a sleeve after the product compression process of Figures 6A-6E has been performed. Package 110 may be opened in any suitable manner, such as by the use of externally-applied sharp implements, by tearing the package material, by opening one or more flaps, etc. in any direction desired. However, as discussed above opening of the package in line with the direction of product compression is advantageous in releasing the products from tension for easier removal.

[0037] Figure 12 is a package 210 similar to package 10 but formed from a flexible packaging material such as polymeric film or kraft paper, for example. Accordingly, the package is not fabricated from a pre-formed "blank" but is instead a predetermined length of a stock material. Additionally, since the material is formable/deformable and flexible, pleats may optionally be preformed or may be formed from the sheet material during the course of the product compression. Figure 13 depicts a sleeve formed from a sheet of material as an intermediate stage in forming the package 210 of Figure 12, after product compression has been accomplished and pleats 80 and 90 have been formed and secured. Note that a sleeve of the type depicted in Figure 13 may be formed from a simple rectangular piece of material having no pre-formed flaps, ears, tabs, pleats, or the like to assume the general form of an open cylindrical tube of the desired cross-section. Accordingly, the package is assembled, folded, and wrapped about the product and assumes the general shape of the product. The material is then pleated, reducing the circumference of the sleeve about the product in at least one plane and imparting compressive forces thereto. Since the material is flexible, the pleats may be folded into the end flaps 201, 202 of Figure 12 without undue difficulty and the end flaps secured to one another to effect a closure means for the package.

[0038] Figure 14 depicts another package 310. Package 310 contains a plurality of products 99 which have been compressed in the X direction in the X-Y plane during final assembly of the package. Package 14 also includes an optional handle 301 on one side thereof which is unitarily formed with the package. Package 310 may be formed form a unitary single sheet of material and formed about the products as described above. Alternatively, package 310 may be initially formed as a preformed bag which is closed on all sides but one, for example, side 302, through which products may be inserted. Side 302 may then be sealed so that the products are completely enclosed, including in the X-Y and X-Z planes, but under low or minimal compression. To impart product compression, an external force F may be applied to the side 302 in the X direction via a plunger or other means known in the art while the rest of the package is constrained. A pleat 300 is then formed in the material comprising the end 302 of the package 310 around the marginal edge of the end 302 as shown in Figure 15, thus reducing the circumference of the package in the X-Y plane. A cross-section through the package in either the X-Y or X-Z planes would reveal a pleat construction similar to that depicted in the preceding figures, but in this instance the pleat is annular (non-linear) in nature. The pleat 300 is then flattened and secured to the end 302 as shown in Figure 14 to permanently secure the products in a compressed state.

[0039] In any packages in accordance with the present invention, including but not limited to those illustrated and specifically described herein, pleats may be secured as has been described but alternatively may be left extending outwardly from the package provided that the pleat sides have been sufficiently secured to one another (or the outer margins of the pleat material such as fold lines 40 and 83 of Figure 2) may be secured to one another to maintain pleat geometry and thus the reduction in circumference of the package. Additionally, pleat geometry and construction may be employed to participate in the package opening process by providing that portions of the pleats may be disengaged from one another or from the package so as to release product compression prior to opening of the package, or such that the pleats may provide all or part of the opening feature of the package. Opening features may provide opening of the package in the direction of product compression or otherwise.

[0040] Product compression may be imparted in a single direction, in multiple directions either simultaneously or via sequential uni-directional compressions, or uniformly inwardly about the product circumference through a uniform reduction in circumference rather than a translational movement of a portion of the packages. All such manners of product compression are within the scope of the present invention.

[0041] Packages in accordance with the present invention may be fabricated from a wide variety of suitable materials including, but not limited to, paper, cardboard (corrugated and non-corrugated), wood, metal, and plastic (including polymeric films). For reasons of strength and economy, presently preferred materials for packages according to the present invention include non-corrugated cardboard for rigid packages and polymeric film for flexible packages.

[0042] Suitable means of securing various seams and flaps of such packages, as well as securing volume reducing pleats in their assembled condition, include tape, staples, and adhesives, of which hot melt adhesives are presently preferred.

[0043] While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

Claims

1. A package (10) suitable for enclosing and containing one or more compressible products (99), said package (10) comprising at least one compressible product (99) and a continuous cylindrical sleeve preferably having a circular or quadrilateral cross section forming a continuous path encircling said product in at least one plane passing therethrough, said sleeve defining an axial direction normal to said plane and a circumferential direction within said plane, **characterized in that** said package includes at least one axially-extending pleat, (80) preferably a pair of axially-extending pleats (80; 90), unitarily formed in said sleeve, said pleat (80) preferably extending substantially the length of said sleeve.

2. The package (10) of Claim 1, further **characterized in that** said pair of pleats (80; 90) are substantially parallel to one another and extend substantially the length of said sleeve.

3. The package (10) of Claim 1 or Claim 2, further **characterized in that** said sleeve is formed from a rigid or flexible material.

4. A blank (20) suitable for forming a package (10) suitable for enclosing and containing one or more compressible products, said blank (20) comprising a sheet of deformable material having two side edges adapted to be secured to one another to form a sleeve and two end edges intermediate said side edges, **characterized in that** said blank (20) includes at least one pre-formed pleat (80) unitarily formed in said sheet, said pleat including two pleat sides (82; 84) defined by three parallel lines of weakness.

5. The blank (20) of Claim 4, further **characterized in that** said blank (20) includes two parallel preformed pleats (80; 90), each of said pleats (80; 90) including two pleat sides defined by three parallel lines of weakness.

6. The blank (20) of Claim 4 or Claim 5, further **characterized in that** said sheet comprises a rigid material, preferably cardboard or corrugated cardboard.

7. The blank (20) of Claim 4 or Claim 5, further **characterized in that** said sheet comprises a flexible material, preferably a polymeric film material.

8. A method of packaging products (99) under compression, **characterized in that** said method comprises the steps of:

   (a) providing a sheet of material having two side edges and two end edges intermediate said side edges;
   (b) forming said sheet of material into a continuous cylindrical sleeve by joining said side edges to one another to form a continuous path, said sleeve defining an axial direction therethrough and a circumference measured in a plane normal to said axial direction;
   (c) introducing a product into said sleeve;
   (d) reducing said circumference of said sleeve to impart compression to said product by forming at least one axially-extending pleat (80), preferably by forming two axially-extending pleats (80; 90), in said sleeve, said pleat (80) preferably being pre-formed in said sheet of material prior to said step of reducing said circumference.

9. The method of Claim 8, further **characterized in that** said pleats (80; 90) are formed by exerting a force on said sleeve between said pleats (80; 90) to force a portion of said sleeve between said pleats (80; 90) inwardly.

10. The method of Claim 8 or Claim 9, further **characterized in that** the step of forming said sheet of material into said sleeve and the step of introducing said product (99) into said sleeve occur concurrently by forming said sleeve around said product (99).

Patentansprüche

1. Verpackung (10), die geeignet ist, ein oder mehrere

zusammendrückbare Produkte (99) zu umschließen und zu beinhalten, wobei die Verpackung (10) mindestens ein zusammendrückbares Produkt (99) und einen zusammenhängenden zylindrischen Mantel umfaßt, der vorzugsweise einen kreisförmigen oder vierseitigen Querschnitt aufweist, der eine zusammenhängende, das Produkt in mindestens einer dort durchgehenden Ebene umgebende Bahn bildet, wobei der Mantel eine axiale, zu der Ebene senkrechte Richtung und eine Umfangsrichtung innerhalb der Ebene definiert, **dadurch gekennzeichnet, daß** die Verpackung mindestens einen axial verlaufenden Falz (80) umfaßt, vorzugsweise ein axial verlaufendes Paar von Falzen (80; 90), der einstückig in dem Mantel gebildet ist, wobei der Falz (80) vorzugsweise im wesentlichen die Länge des Mantels verlängert.

2. Verpackung (10) nach Anspruch 1, ferner **dadurch gekennzeichnet, daß** das Paar von Falzen (80; 90) im wesentlichen parallel zueinander verläuft und im wesentlichen die Länge des Mantels verlängert.

3. Verpackung (10) nach Anspruch 1 oder 2, ferner **dadurch gekennzeichnet, daß** der Mantel aus einem steifen oder flexiblen Material gebildet ist.

4. Zuschnitt (20), der geeignet ist, eine Verpackung (10) zu bilden, die in der Lage ist, ein oder mehrere zusammendrückbare Produkte zu umschließen und zu beinhalten, wobei der Zuschnitt (20) einen Bogen aus verformbarem Material aufweist, der zwei Seitenkanten umfaßt, die angepaßt sind, um aneinander befestigt zu werden, um einen Mantel und zwei Endkanten zwischen den Seitenkanten zu bilden, **dadurch gekennzeichnet, daß** der Zuschnitt (20) mindestens einen vorgeformten Falz (80) umfaßt, der einstückig in dem Bogen gebildet ist, wobei der Falz zwei Falzseiten (82; 84) aufweist, die durch drei parallele Schwächungslinien gebildet sind.

5. Zuschnitt (20) nach Anspruch 4, ferner **dadurch gekennzeichnet, daß** der Zuschnitt (20) zwei parallele vorgeformte Falze (80; 90) umfaßt, wobei jeder der Falze (80; 90) zwei Falzseiten aufweist, die durch drei parallele Schwächungslinien gebildet sind.

6. Zuschnitt (20) nach Anspruch 4 oder 5, ferner **dadurch gekennzeichnet, daß** der Bogen ein steifes Material aufweist, vorzugsweise Pappe oder Wellpappe.

7. Zuschnitt (20) nach Anspruch 4 oder 5, ferner **dadurch gekennzeichnet, daß** der Bogen ein flexibles Material aufweist, vorzugsweise ein polymeres Schichtmaterial.

8. Verfahren zum Verpacken von Produkten (99) unter Druck, **dadurch gekennzeichnet, daß** das Verfahren die Schritte umfaßt:

(a) Bereitstellen eines Materialbogens, der zwei Seitenkanten und zwei Endkanten zwischen den Seitenkanten aufweist;
(b) Formen des Materialbogens in einen zusammenhängenden zylindrischen Mantel durch Verbinden der Seitenkanten miteinander, um eine zusammenhängende Bahn zu bilden, wobei der Mantel eine axiale Richtung und einen Umfang definiert, der in einer Ebene senkrecht zu der axialen Richtung gemessen wird; und
(c) Einführen eines Produkts in den Mantel;
(d) Reduzieren des Umfangs des Mantels, um Druck auf das Produkt zu übertragen durch Bildung mindestens eines axial verlaufenden Falzes (80), vorzugsweise durch Bilden von zwei axial verlaufenden Falzen (80; 90) in dem Mantel, wobei der Falz (80) vorzugsweise in dem Materialbogen vor dem Schritt der Umfangsreduzierung vorgeformt wird.

9. Verfahren nach Anspruch 8, ferner **dadurch gekennzeichnet, daß** die Falze (80; 90) gebildet werden durch Ausübung einer Kraft auf den Mantel zwischen den Falzen (80; 90), um einen Abschnitt des Mantels zwischen den Falzen (80; 90) einwärts zu drücken.

10. Verfahren nach Anspruch 8 oder 9, ferner **dadurch gekennzeichnet, daß** der Schritt der Formung des Materialbogens zu dem Mantel und der Schritt der Einführung des Produkts (99) in den Mantel gleichzeitig stattfinden durch Formen des Mantels um das Produkt (99).

Revendications

1. Conditionnement (10) approprié pour renfermer et contenir un ou plusieurs produits compressibles (99), ledit conditionnement (10) comprenant au moins un produit compressible (99) et un manchon cylindrique continu ayant, de préférence, une section transversale circulaire ou quadrilatérale formant un trajet continu entourant ledit produit au moins dans un plan passant à travers celui-ci, ledit manchon définissant une direction axiale normale audit plan et une direction circonférentielle à l'intérieur dudit plan, **caractérisé en ce** ledit conditionnement comprend au moins un pli (80) s'étendant axialement, de préférence, une paire de plis (80 ; 90) s'étendant axialement, formé(s) de manière unitaire dans ledit manchon, ledit pli (80) s'étendant, de préférence, sensiblement sur la longueur dudit

manchon.

2. Conditionnement (10) selon la revendication 1, **caractérisé, en outre, en ce que** les deux plis (80 ; 90) sont sensiblement parallèles l'un à l'autre et s'étendent sensiblement sur la longueur dudit manchon.

3. Conditionnement (10) selon la revendication 1 ou la revendication 2, **caractérisé, en outre, en ce que** ledit manchon est formé à partir d'un matériau rigide ou flexible.

4. Flan (20) approprié pour former un conditionnement (10) approprié pour renfermer et contenir un ou plusieurs produits compressibles, ledit flan (20) comprenant une feuille de matériau déformable ayant deux bords latéraux pouvant être assujettis l'un à l'autre afin de former un manchon et deux bords d'extrémité entre lesdits bords latéraux, **caractérisé en ce que** ledit flan (20) comprend au moins un pli préformé (80) formé de manière unitaire dans ladite feuille, ledit pli comprenant deux côtés de pli (82 ; 84) définis par trois lignes de faiblesse parallèles.

5. Flan (20) selon la revendication 4, **caractérisé, en outre, en ce que** ledit flan (20) comprend deux plis (80 ; 90) préformés parallèles, chacun desdits plis (80 ; 90) comprenant deux côtés de pli définis par trois lignes de faiblesse parallèles.

6. Flan (20) selon la revendication 4 ou la revendication 5, **caractérisé, en outre, en ce que** ladite feuille comprend un matériau rigide, de préférence, du carton ou du carton ondulé.

7. Flan (20) selon la revendication 4 ou la revendication 5, **caractérisé, en outre, en ce que** ladite feuille comprend un matériau flexible, de préférence, un matériau de film polymère.

8. Procédé pour conditionner des produits (99) sous compression, **caractérisé en ce que** ledit procédé comprend les étapes consistant à :

(a) fournir une feuille de matériau ayant deux bords latéraux et deux bords d'extrémité entre lesdits bords latéraux ;
(b) former ladite feuille de matériau dans un manchon cylindrique continu en réunissant lesdits bords latéraux l'un à l'autre afin de former un trajet continu, ledit manchon définissant une direction axiale à travers celui-ci et une circonférence mesurée dans un plan normal à ladite direction axiale ;
(c) introduire un produit dans ledit manchon ;
(d) réduire ladite circonférence dudit manchon afin de conférer une compression audit produit en formant au moins un pli (80) s'étendant axialement, en formant, de préférence, deux plis (80 ; 90) s'étendant axialement, dans ledit manchon, ledit pli (80) étant préformé, de préférence, dans ladite feuille de matériau avant ladite étape consistant à réduire ladite circonférence.

9. Procédé selon la revendication 8, **caractérisé, en outre, en ce que** lesdits plis (80 ; 90) sont formés en exerçant une force sur ledit manchon entre lesdits plis (80 ; 90) afin de pousser vers l'intérieur une partie dudit manchon entre lesdits plis (80 ; 90).

10. Procédé selon la revendication 8 ou la revendication 9, **caractérisé, en outre, en ce que** l'étape consistant à former ladite feuille de matériau dans ledit manchon et l'étape consistant à introduire ledit produit (99) dans ledit manchon se produisent simultanément en formant ledit manchon autour dudit produit (99).

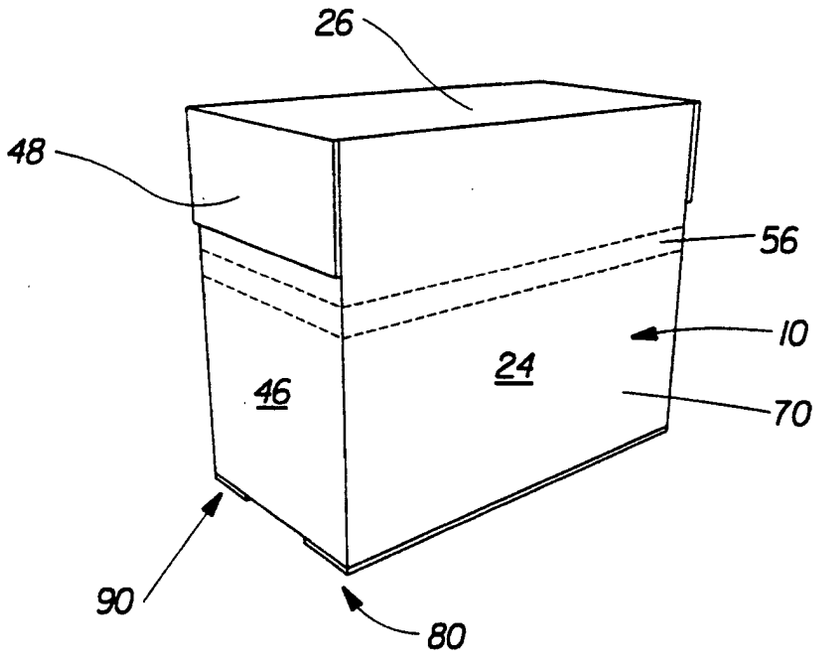

Fig. 1

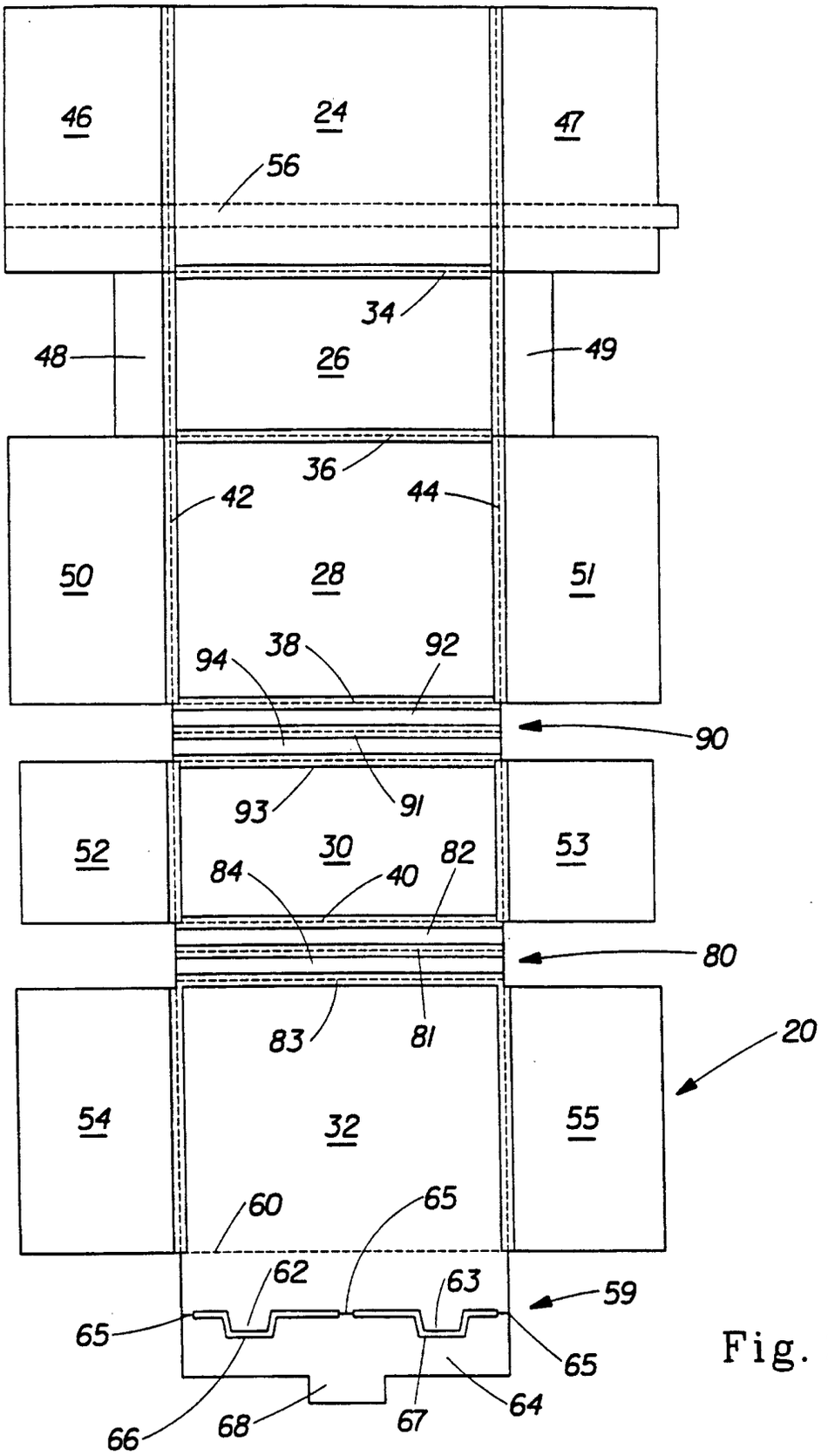
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Fig. 2

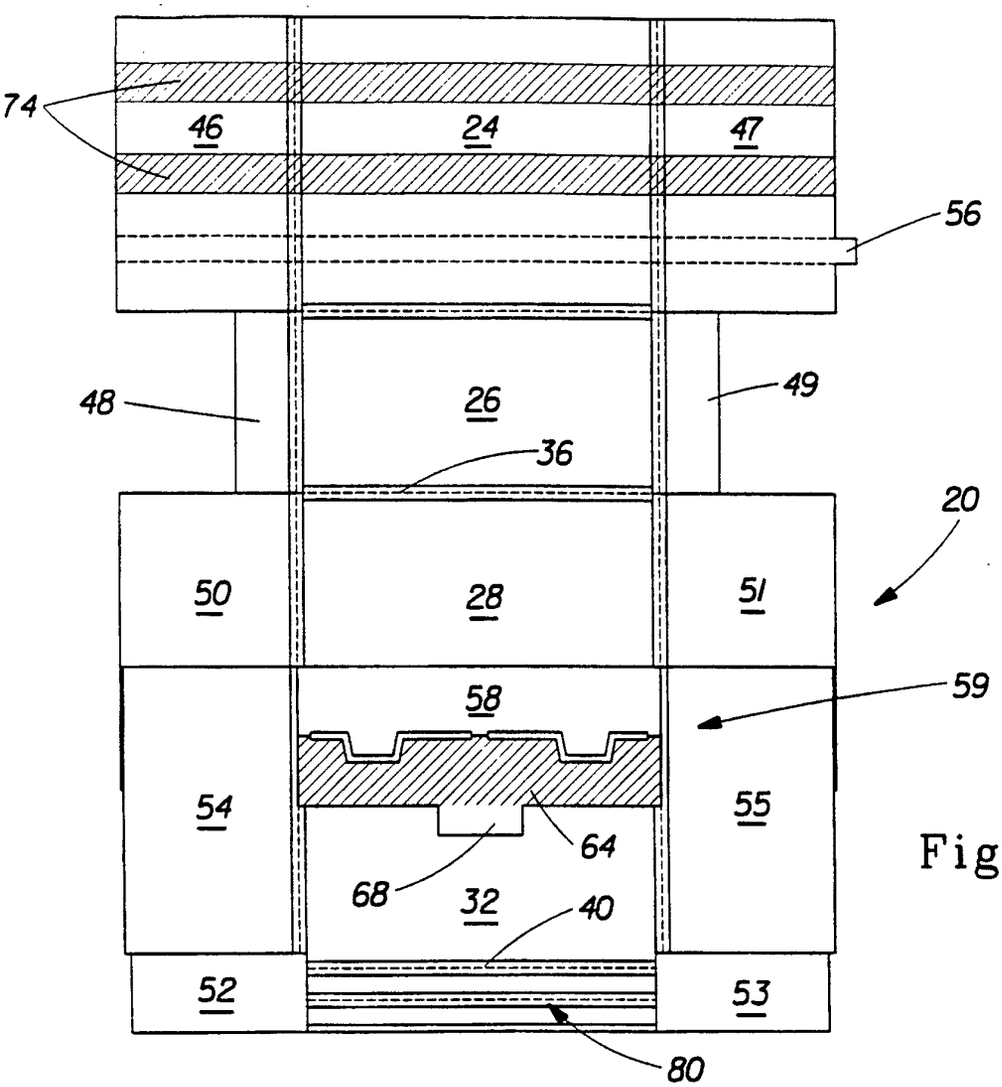
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Fig. 3

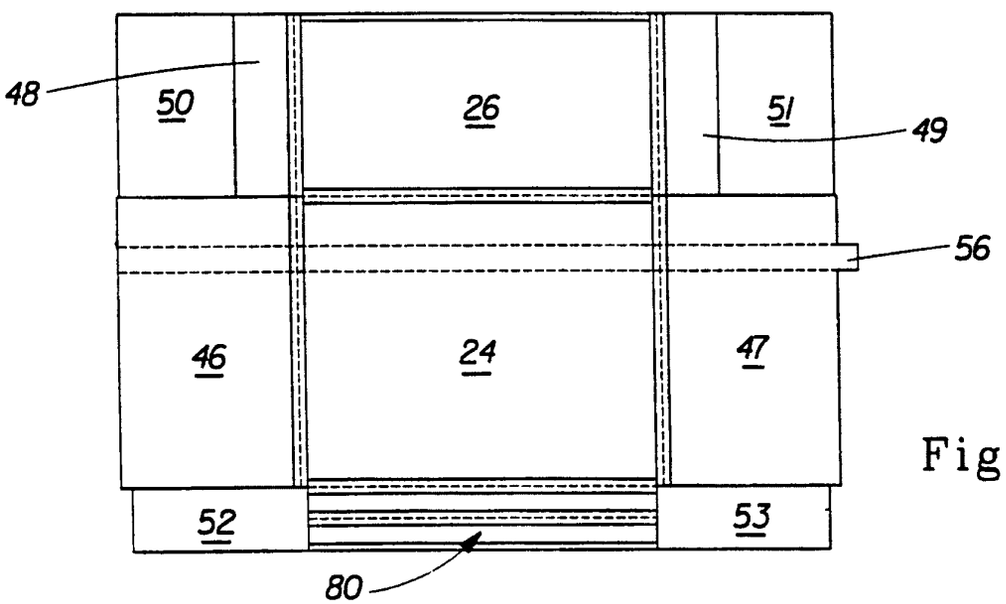
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Fig. 4

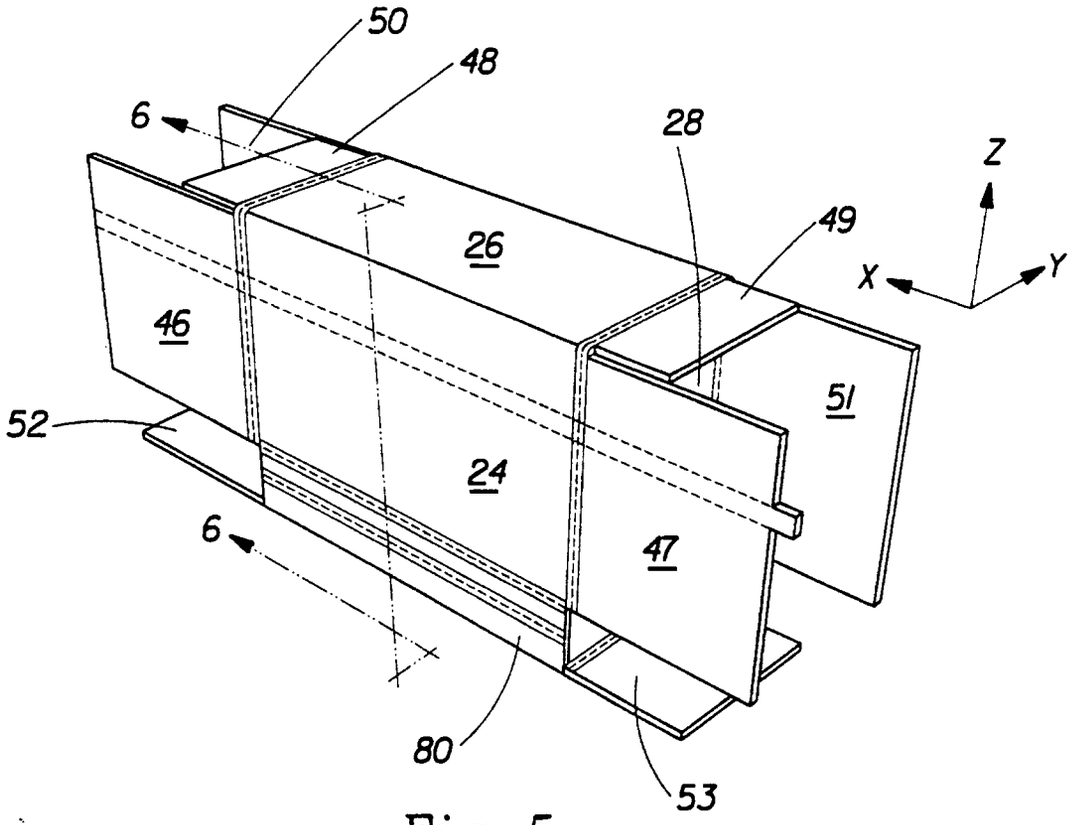

Fig. 5

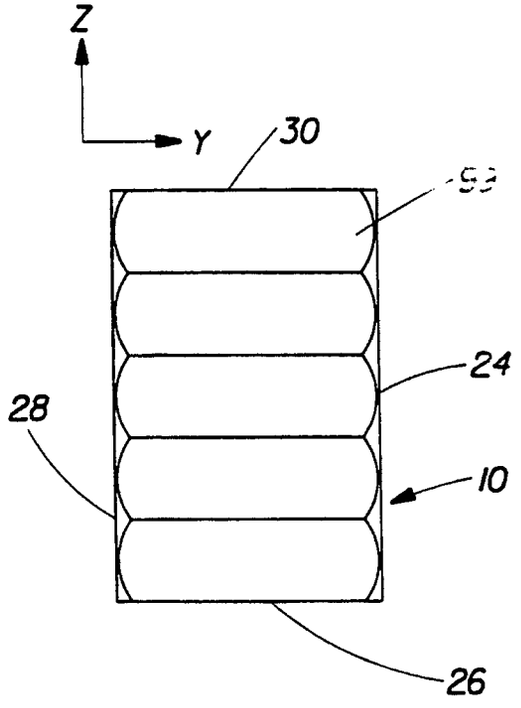

Fig. 6A

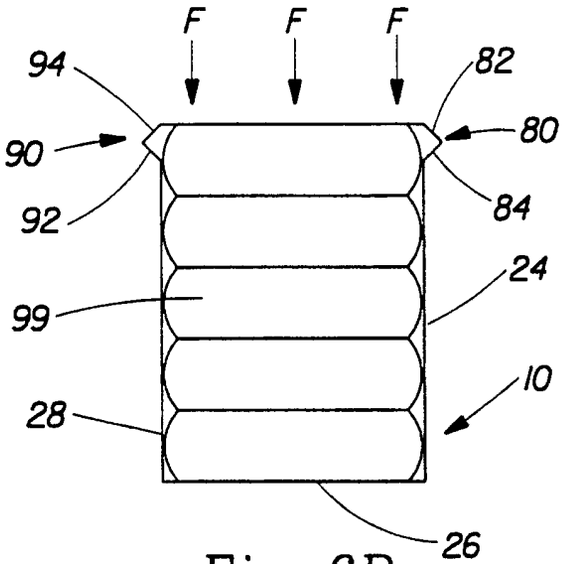

Fig. 6B

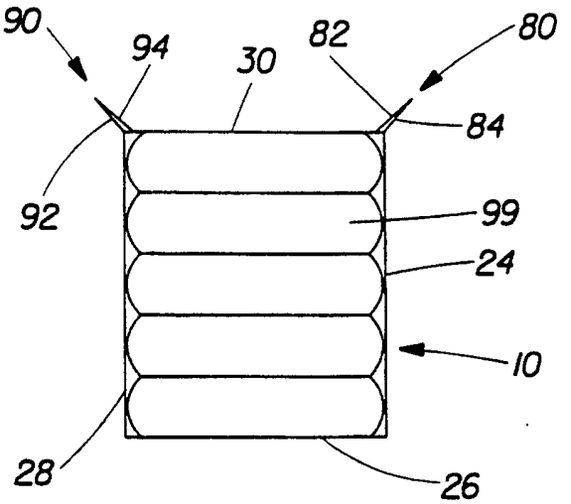

Fig. 6C

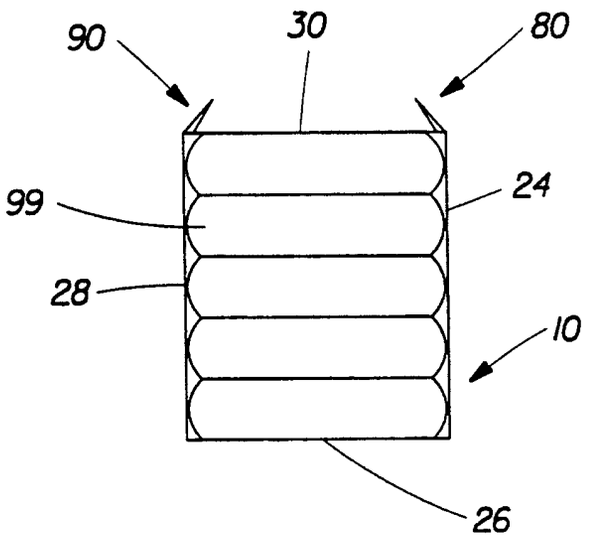

Fig. 6D

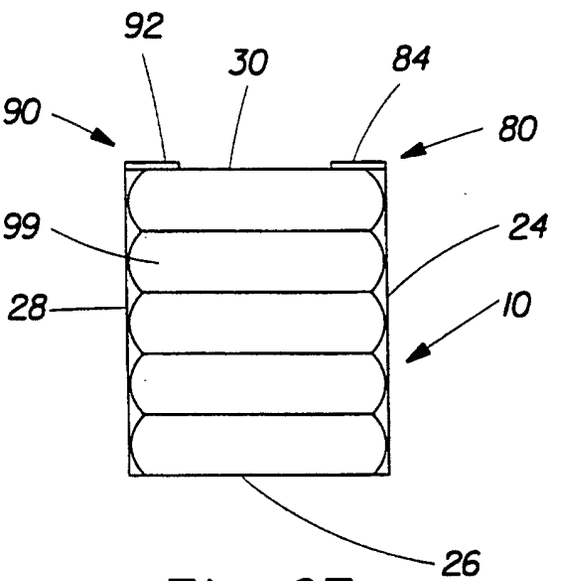

Fig. 6E

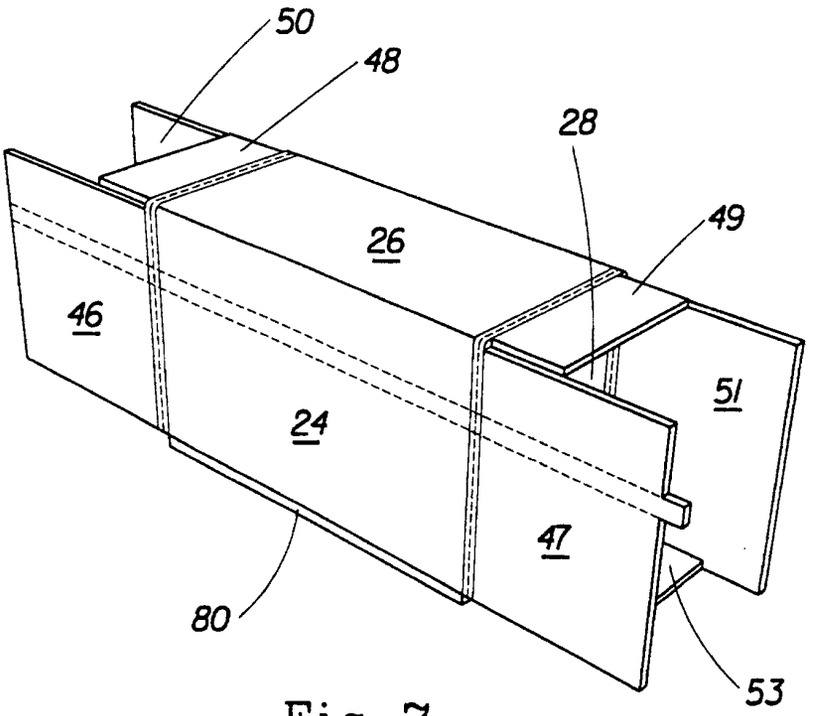
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Fig. 7

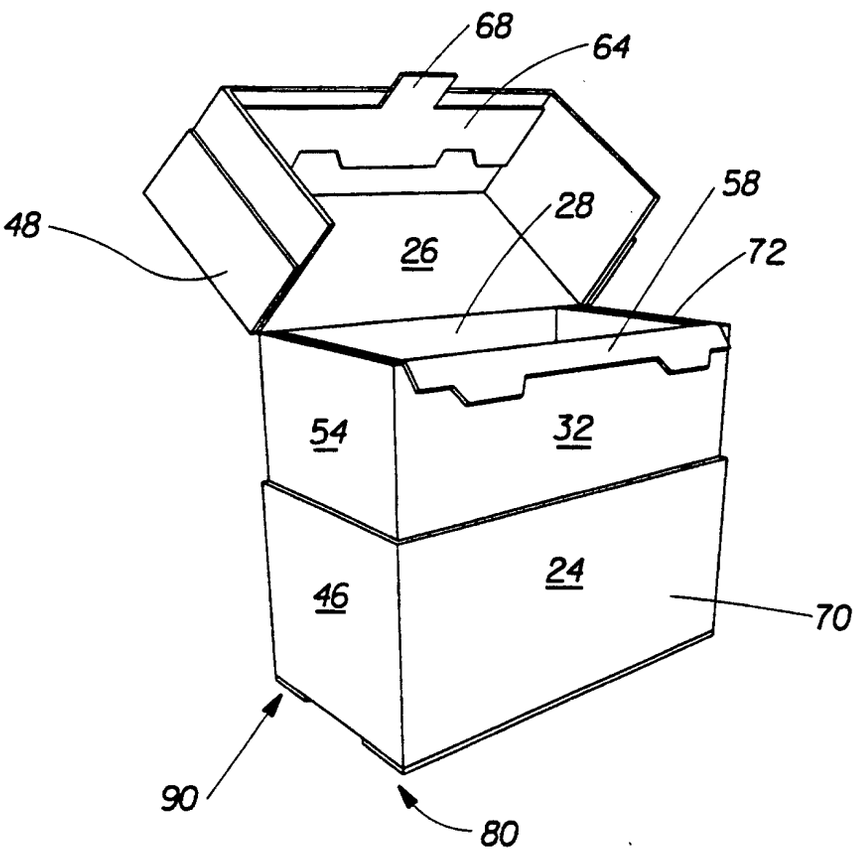
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Fig. 8

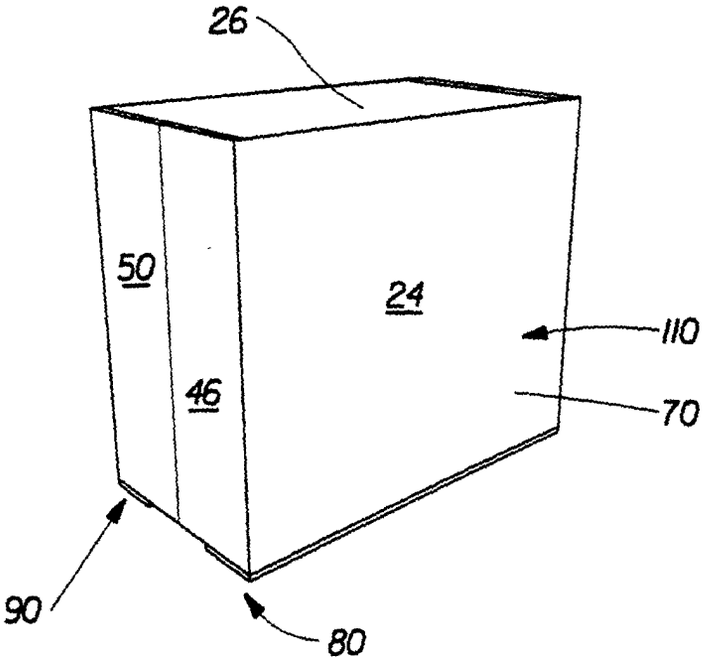

Fig. 9

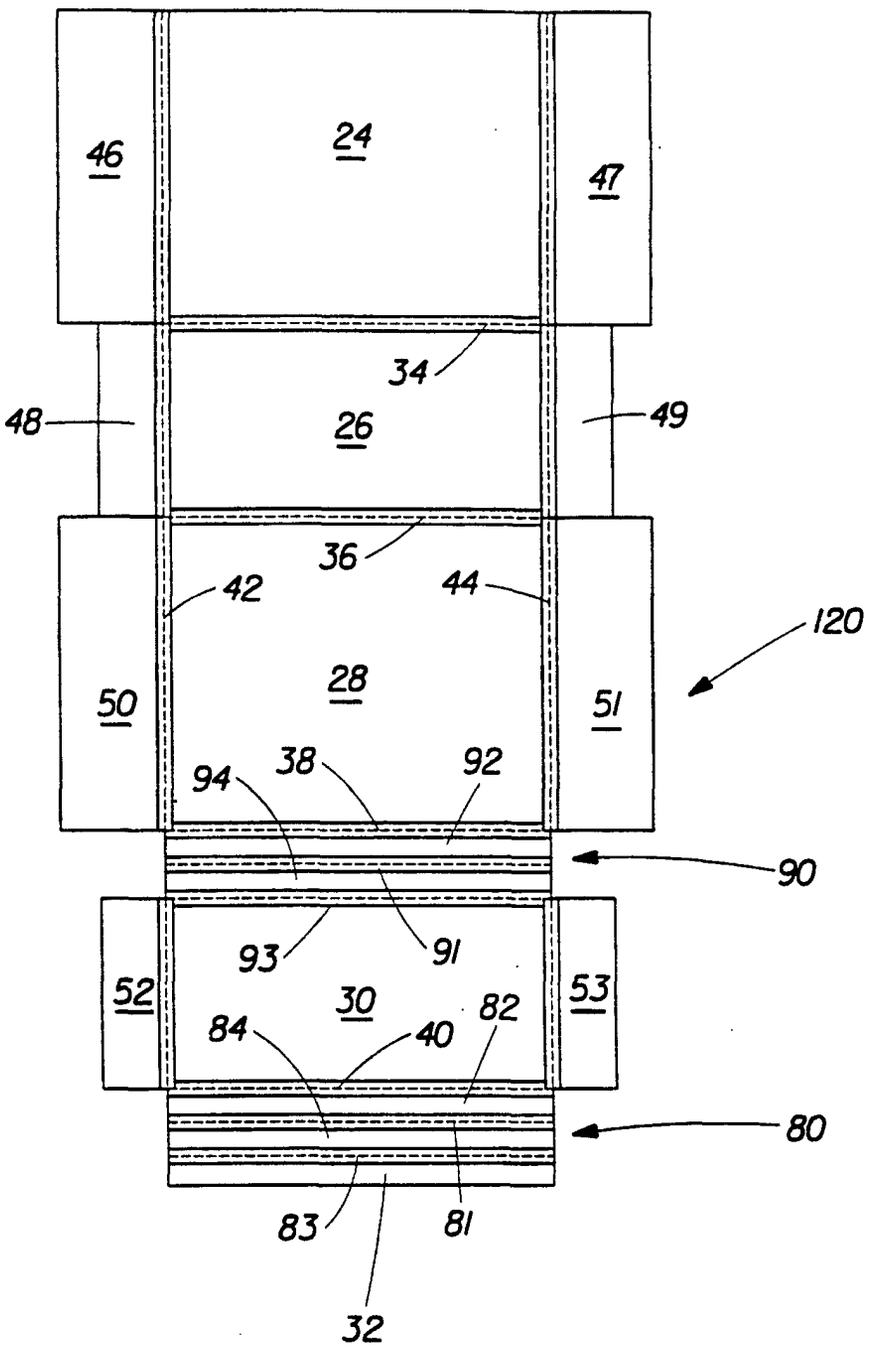
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Fig. 10

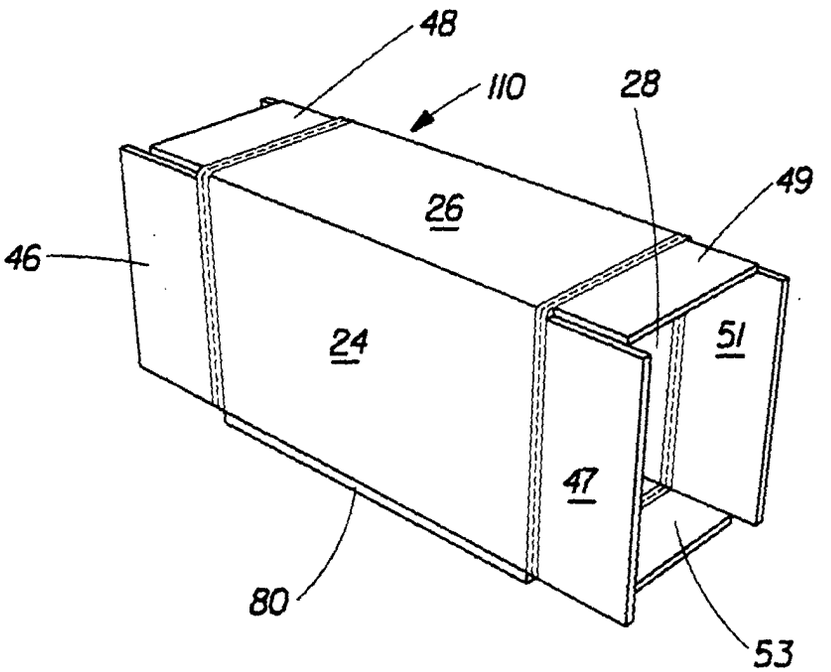

Fig. 11

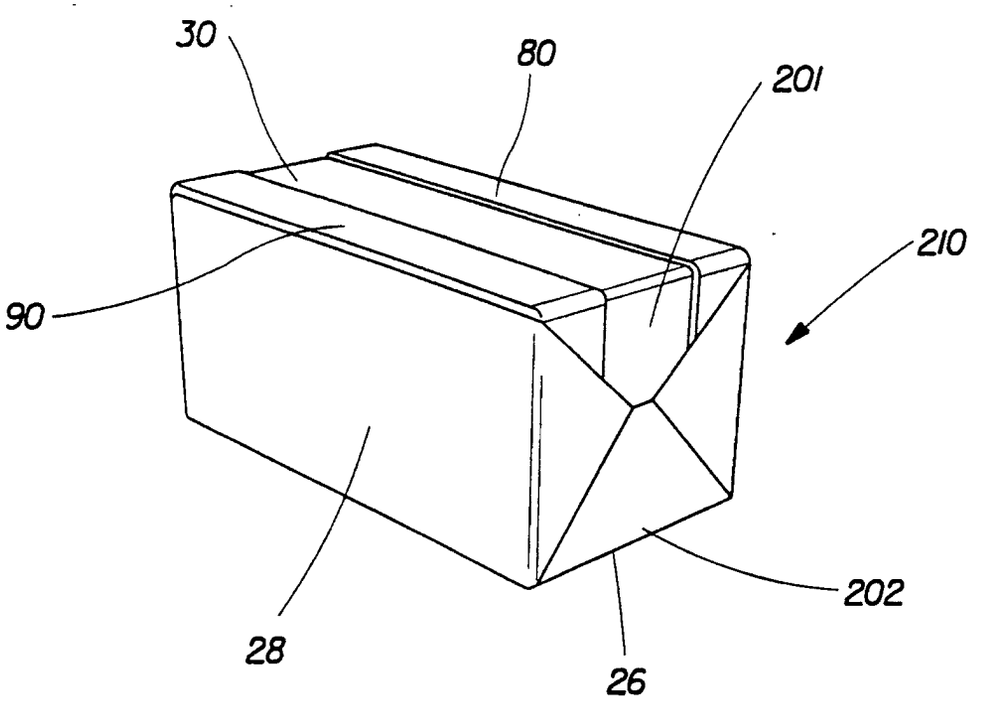

Fig. 12

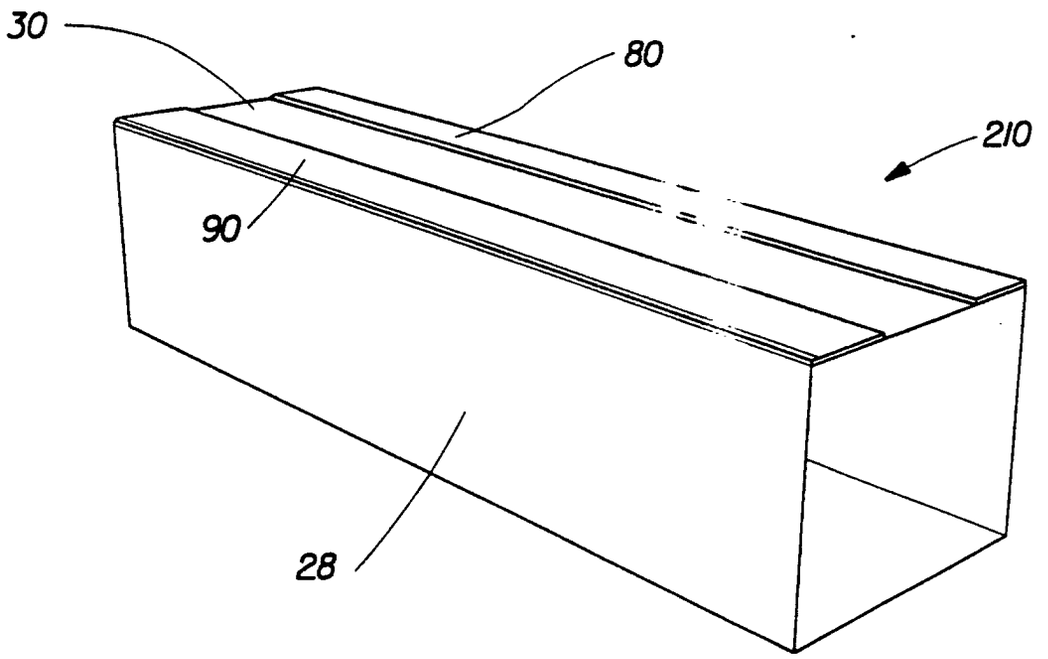

Fig. 13

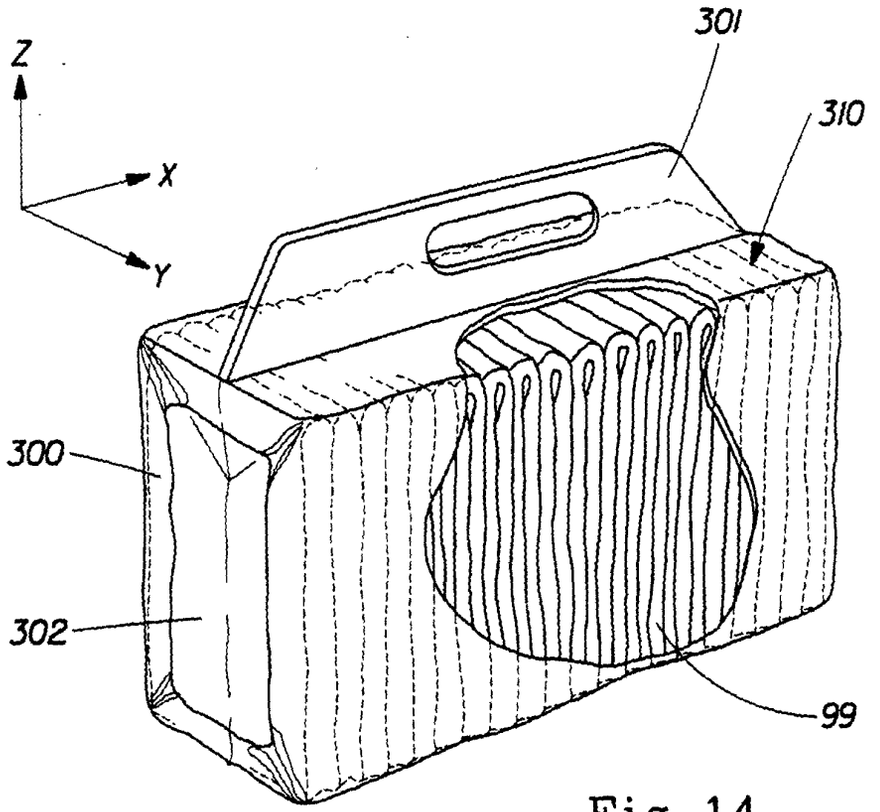

Fig. 14

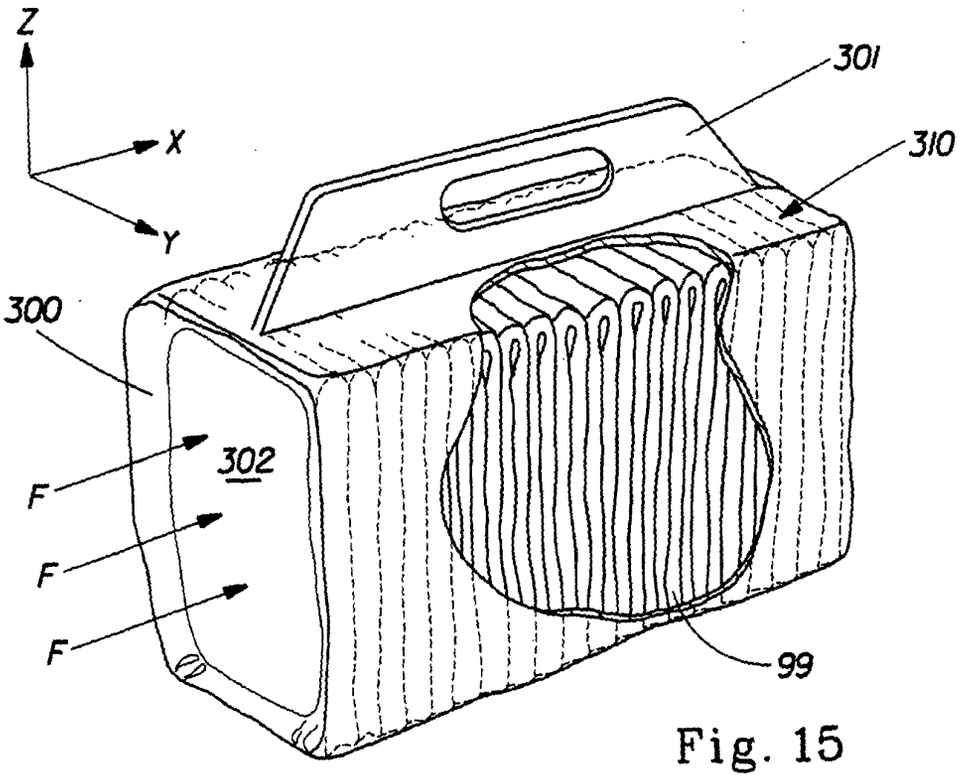

Fig. 15