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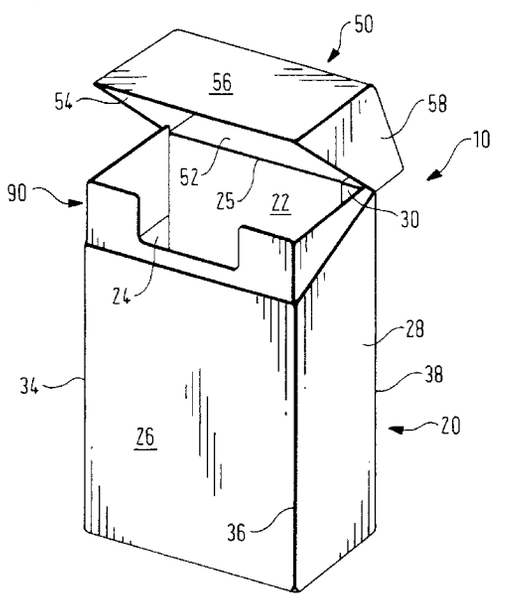
(54) Metal package and a method for making a metal package

(57) A method for making a metal package includes providing a sheet of metal, dividing the sheet to define separating and folding lines for forming a package blank, heating the blank in the region of the folding lines to soften the metal for folding, separating the blank from the sheet, folding the blank along the folding lines and joining predetermined portions to form a package. The invention also relates to a metal package formed by the method of the invention.

FIG. 1



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Description

FIELD OF THE INVENTION

The present invention relates to a method for making a package from a metal material, such as aluminum. More particularly, the present invention relates to a method for making an aluminum package from a blank by preparing a blank from a sheet of metal, providing folding lines on the blank, pretreating the folding lines to prepare the metal for folding and folding the blank on the prepared folding lines. The invention also relates to a metal package formed by the method of the invention.

BACKGROUND AND SUMMARY OF THE INVENTION

Cigarette packages are typically made from paper or paperboard, and may include an inner foil liner and an outer film wrapper. Cigarette packages contain a preselected bundle of cigarettes and serve to protect the cigarettes from mechanical and environmental damage. In addition, a package maintains the freshness of the cigarettes, which deteriorates with exposure to air.

A serious problem with packaging of all kinds is in disposal. Landfills and other disposal sites are becoming overwhelmed by packaging materials, and alternatives, such as reusable or recyclable packaging are being sought. While paper-based cigarette packaging can be recycled, there are many practical impediments to paper recycling. For example, paper packages typically include paints, inks and coatings that are difficult and expensive to separate from the paper. In addition, packages are assembled of different materials, plastics, foils, and others, that must be separated before the individual materials can be recycled. Another difficulty is that paper can be recycled only a limited number of times before the recovered pulp becomes unusable.

The present invention provides a cigarette package comprising a major portion that may be recycled after use, rather than discarded as waste. The present invention provides a method of making a cigarette package from a recyclable material that can be recycled an indefinite number of times.

More particularly, the present invention provides a method of making a hinged lid cigarette package from a metal material such as aluminum in which a blank is cut from a sheet of aluminum, folding lines are indicated on the blank, a narrowly confined region around the folding lines is pretreated to prepare the folding lines for folding, and the blank is folded to form a lidded package.

According to a preferred embodiment of the invention, the blank has a lateral and a longitudinal direction. The blank is divided into segments and folded so that a package formed from the blank has at least a front panel, a rear panel and opposing side panels, the folding lines between adjacent panels being longitudinally oriented. The segments that become the panels are set out on the blank in relative lateral positions, the rear panel segment being adjacent a first side panel segment, which is adjacent to the front panel segment, and which is adjacent to a second side panel segment. The blank is formed from the sheet of aluminum so that, preferably, the longitudinal folding lines substantially align with the grain direction of the metal sheet to facilitate folding and forming the package.

Another aspect of the present invention includes providing an inner frame at a open edge of the body portion where the body portion and a lid portion of the package meet. The inner frame provides an engaging surface cooperating with the lid for retaining the lid in a closed position adjacent to the body. With the lid in a closed position, the inner frame also provides a barrier at a seam between the lid and body to help preserve freshness of the contents of the package.

The inner frame may be formed from a separate metal blank and attached to the package blank. Alternatively, the blank is shaped and cut so that an inner frame is formed as part of the package blank. In this embodiment, the blank is creased so that the segments forming the front and rear panels are positioned longitudinally relative to each other.

According to another embodiment of the invention, a blank is formed in separate body and lid portions which are folded into hollow, tubular shapes. A top end cap, and a bottom end cap are provided to close the top of the lid portion and the bottom of the body portion, respectively. The body portion and the lid portion are fitted together and joined by a flexible adhesive tape that forms a hinge.

According to yet another embodiment of the invention, a blank is formed and folded into a hollow, rectangular tube. A top end cap, having an opening aperture, is fastened to a top end of the tube and a bottom end cap is fastened to a bottom end of the tube. The opening aperture provides access to an interior of the tube, and reclosable sealing means is provided to selectively close the aperture.

In a preferred embodiment of the method of the invention, the pretreating step comprises localized heating of narrowly confined regions around the folding lines and is performed by directing a laser light beam at the predetermined regions. The focus of the light beam is positioned a predetermined distance from a surface of the blank so that a beam of predetermined width strikes the surface of the sheet. A shield having an aperture for the light beam is interposed between the blank and the laser light to prevent reflected light from returning to and damaging the laser. Alternatively, an infrared light source is used to provide the energy to heat the blank, and is directed at the surface of the blank at the predetermined region around the folding lines. According to a further embodiment of the invention, the heating step may be performed by positioning a heated platen in contact with the sheet in proximity with the predetermined regions for conductive heating, while simultaneously

tensioning the sheet to prevent distortion.

According to yet another embodiment, the heating step may be performed by positioning an inductive heat source, for example, an electromagnetic field, in proximity with the sheet at the predetermined areas to heat the predetermined areas.

A further aspect of the heating step includes preparing the surface of the blank to absorb light energy by reducing surface reflectance at the region around the folding lines. In this step, the surface may be darkened by roughening the surface of the sheet, or by application of coloring material. Other suitable means are also possible.

According to another aspect of the invention, printed material and a clear protective coating are applied to the blank after the blank is pretreated, but before it is folded. The printed material includes labelling, graphics and coloring. The printed material may be incorporated in the coating, preferably reverse printed on the underside of the coating, or directly printed on the surface of the blank, and the coating applied over the printed matter.

A metal lidded package of the present invention is inherently air impermeable, except where the lid portion is joined to the body portion. Fusion of the coating or film assists in forming an impermeable seal when bonding folded flaps at a top and bottom of the package. The package thus eliminates the need for a total enclosure by an outer plastic film to seal the package to preserve freshness. A band of shrink film or an adhesive backed tape, removable by a consumer, is applied over the seam between the lid portion and the body portion of the package to close this zone of the mitered seam to the outside.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

The present invention can be further understood with reference to the following description in conjunction with the appended drawings, wherein like elements are provided with the same reference numerals. In the drawings:

Fig. 1 is a perspective view of a metal cigarette package according to one aspect of the present invention;

Fig. 2 is a plan view of a cigarette package blank for forming the package of Fig. 1;

Fig. 3a is a schematic illustration of a heating step of the method of the present invention for softening the hard tempered aluminum along folding crease zones;

Fig. 3b is a schematic illustration of an alternative embodiment of a heating step incorporating conductive heating means;

Fig. 3c is a schematic illustration of another alternative embodiment of a heating step incorporating alternative conductive heating means;

Fig. 3d is a schematic illustration of a further alternative embodiment of a heating step using inductive heating means;

Fig. 4 is a plan view of an inner frame for the cigarette package formed from the blank of Fig. 2;

Fig. 5 is a plan view of an alternative embodiment of a cigarette package blank;

Fig. 6 is a plan view of a body portion blank of another alternative embodiment of a cigarette package;

Fig. 7 is a plan view of a lid portion blank for the body portion blank of Fig. 6;

Fig. 8 is a bottom view of a bottom cap for the body portion blank of Fig. 6;

Fig. 9 is a side view of the bottom cap of Fig. 8;

Fig. 10 is a top view of a top cap for the lid portion blank of Fig. 7;

Fig. 11 is a side view of the top cap of Fig. 10;

Fig. 12 is a perspective view of the body portion of Fig. 6 folded and assembled;

Fig. 13 is a perspective view of the lid portion of Fig. 7 folded and assembled;

Fig. 14 is a plan view of an alternative embodiment of a package blank;

Fig. 15 is a perspective view of a package formed from the blank of Fig. 14; and,

Fig. 16 is a bottom plan view of a top cap of the package of Fig. 15.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 is a perspective view of a cigarette package 10 of one aspect of the present invention. The package 10 comprises a body portion 20 and a lid portion 50. The body 20 and the lid 50 are joined at a hinge 25, so that the lid can pivot relative to the body to an open position, illustrated in Fig. 1, to provide access to contents (not illustrated) of the package 10. An inner frame 90 is provided in the package 10 at an upper end of the body 20. The inner frame 90 extends from the upper edges of the body 20 to frictionally engage the lid 50 when the lid is in a closed position to hold the lid in a closed position adjacent to the body.

The metal package 10 of the present invention eliminates the need for certain packaging materials found in conventional paper packages. The inner frame 90 is not necessary for structural integrity, and, therefore, is smaller and uses less material than the structural inserts of conventional paperboard packages. The metal package 10, once the seam between the lid 50 and the body 20 is sealed, is inherently air and moisture impermeable. The package 10 does not require an outer film wrapper, or an inner foil wrapper around the cigarettes, which may advantageously be omitted, saving manufacturing time and material, and disposable waste.

A preferred embodiment of a package blank 80, illustrated in Fig. 2, is first described. The method of the

present invention is described below in conjunction with the preferred embodiment as an illustrative example. The blank 80 is formed from a sheet of metal, preferably aluminum (not illustrated). Generally, the sheet is positioned and separating lines 82 are designated at predetermined locations to divide the sheet into package blanks 80. The separating lines 82 define an outer edge of the blank 80 that allow the blank to remain part of the sheet while subsequent operations are performed, and be easily separated from the metal sheet. The metal sheet is also provided with folding lines where the blank 80 is folded to form the package.

The folding and separating lines define segments of the body portion 20 and the lid portion 50 that form the finished package 10, as illustrated in Fig. 1. The body portion segments include a rear panel 22, a first side panel 24, a front panel 26, a second side panel 28 and a joining panel 30. As shown in Fig. 2, the panel segments are arranged adjacent to one another, and are separated by folding lines between the panels, a rear-first side folding line 32, a first side-front folding line 34, a second side-front folding line 36, and a second side-rear folding line 38.

The body portion 20 includes bottom segments, corresponding in relative location to the body segments, that are folded to form a bottom closure of the body. The segments include a rear flap 40, a first side flap 42, a front flap 44, and a second side flap 46. Because of the strength and stability of metal, the flaps forming the bottom closure need not overlap entirely, as is common in paperboard packages. The flaps can therefore be sized to overlap an amount sufficient for bonding and forming the closure, thus saving material.

The lid portion 50 folding lines define lid segments that are folded to form a rear part 52, a first side part 54, a front part 56, a second side part 58 and a rear joining part 59. As illustrated in Fig. 2, the lid segments are arranged on the blank 80 so that corresponding segments, for example, the rear panel 22 and the rear part 52, are adjacent to one another.

Between the lid segments and the body segments for the first and second sides and the front, the blank 80 is scored-to provide frangible separating lines, that is, locations at which the segments are separated by the consumer so that the lid 50 may be pivoted from the body 20 to open the completed and filled package 10. The frangible lines include a first side break 60, a front break 62, and a second side break 64. As illustrated in Fig. 1, the frangible lines allow the first 54 and second 58 side parts and the front part 52 of the lid portion 50 to separate from the first 24 and second 28 side panels and the front panel 26 for opening the package 10. A rear folding line 66 and joining part folding line 68 form a hinge in the folded package 10.

The lid portion 50 includes segments that are folded to become top closure flaps in the folded package 10. These segments, corresponding in relative location to the lid segments, are the rear top flap 70, first side top flap 72, front to flap 74 and second side top flap 76. As described in connection with the bottom closure flaps, the top flaps may also be sized to overlap only an amount sufficient for bonding and forming the top closure, without entirely overlapping as is common in paper packages.

The blank 80 is preferably oriented on the sheet so that a grain direction of the metal is aligned substantially in the direction of arrow A in Fig. 2, although this is not required. In the preferred orientation, the relatively long folding lines 32, 34, 36 and 38 are aligned in parallel with the grain direction, which facilitates folding the blank along the folding lines.

The method for forming the blank 80 is described for the package blank 80 set forth above, but also applies to alternative embodiments of package blanks which are described below. Although the method is described herein for a single blank on the sheet, it is understood that providing separating lines, scoring, and pretreating the sheet provides a multiplicity of blanks that may be formed simultaneously for separation into individual packages of the present invention.

The method includes the steps of first, providing a metal material, preferably aluminum or another suitable material, in a coiled sheet. The metal sheet is generally hard tempered and is in arange of of about 0.1 to 0.3mm (0.005 to 0.012 inches) thick. The sheet is provided with registration holes in areas that are not used for forming blanks to assist in precise positioning of the sheet by the various apparatuses performing the steps described below.

The sheet is unwound from the coil and directed to a station where the sheet is positioned, and then provided with folding lines and separating lines. The sheet is also scored for the frangible lines described above in connection with Fig. 2. Scoring leaves a sufficient amount of material holding the metal segments together to remain intact until broken by a consumer.

The accurate folding of metal sheet typically involves overcoming the tendency of the metal to return elastically to its original flat shape, and of the hardened metal to crack while folding. To overcome this tendency, the sheet is pretreated in a narrowly confined region of the folding lines, illustrated by the cross hatched areas in Fig. 2, to facilitate the folding of the metal. In a preferred embodiment of the invention, pretreating is done by heating for localized stress relief annealing of the blank in the predetermined narrowly confined regions around the folding lines. It is not desired, however, to heat all of the metal. Excess pretreating would make the package blank difficult to form accurately along the folding lines. The major portions which form the panels and parts described above, remain hardened to provide strength and stability for the package. The blank 80 is therefore heated only in the cross hatched regions in proximity to the folding lines, indicated in Fig. 2.

A method of pretreating by localized stress relief annealing of the folding lines is illustrated schematically in

Fig. 3a. Light source 100 is positioned above the metal sheet 102. Light energy 104 from the light source 100 is directed to a predetermined area of the metal sheet 102 corresponding the folding lines of Fig. 2. The light energy 104 is precisely focused by a lens 106 so that a focal point 108 of the light is a predetermined distance from the sheet 102, resulting in a desired beam width 112 striking the sheet. Relative movement between the metal sheet 102 and the light source 100 is controlled so that an amount of energy sufficient for stress relief annealing is transferred to the sheet, that is, so that the metal may be bent without cracking. A shield 110 is interposed between the lens 106 and the metal sheet 102 so that light reflected from the sheet does not return to the light source 100, thus avoiding damage to the light means.

In a preferred embodiment of the method, the light source 100 is a laser. The output energy of the laser is controlled so that only a predetermined amount of heat is transferred to the sheet. Laser light advantageously provides a narrow beam that can be directed to the predetermined folding lines without also heating surrounding areas, which are to remain hardened.

To facilitate absorption of light energy by the metal sheet 102, the reflectance of the sheet is first reduced. The sheet 102 is darkened by mechanically roughening the surface. Alternatively, a coloring agent may be applied or other suitable means of reducing the reflectance employed.

Alternatively, an infrared light source may be employed as the heating means, with a suitable power control. A light shield having a slot of predetermined size is positioned between the infrared source and the sheet to limit the light to a narrowly confined area as previously described.

As an another alternative, shown schematically in Fig. 3b, the heating step may be performed by positioning at least one heated platen 113 in contact with the sheet 102 for a predetermined duration. The platens 113 are formed on an outer surface with raised areas 114 to contact the sheet 102 at the narrowly confined areas. The sheet 102 is passed between a platen 113 and a supporting surface, or between two platens as illustrated, at a predetermined rate. Contact with the heated, raised areas 114 heats the narrowly confined areas of the sheet. The temperature of the heated areas 114 is determined by the speed at which the sheet 102 is moved through the platens 113, that is, for the duration of contact between the platen and the sheet. Relatively higher temperatures being necessary for faster rates of travel. To prevent distortion of the sheet during heating, the sheet 102 is gripped and held in tension as it is moved between the platens 113.

An alternative method of contact heating illustrated schematically in Fig. 3c, employs strip heaters 115 mounted in a die plate 116 and connected to any suitable source of power. A bottom die plate 117 supports the sheet 102. The strip heaters 115 are located in the die plate 116 to contact the sheet 102 at the folding locations. The die plate 116 is moved in to contact with the sheet 102 for a limited duration, preferably about one second, and the strip heaters 115 heat the folding locations to a temperature in a range of 675°C to 750°C. The die plate 116 absorbs heat from the strip heaters 115 to prevent unwanted heating of adjacent areas of the sheet 102. It is advantageous if the bottom plate 117 is heated to approximately 500°C so that the sheet is heated before being contacted by the die plate 116 and strip heaters 115.

According to another alternative illustrated schematically in Fig. 3d, the heating step is performed by positioning an inductive heat source, for example, an electromagnetic field, in close proximity with the sheet 102 selectively at the narrowly confined areas. The inductive heat source is formed as a head 118 with a wire grid regions 119 arranged in a surface of the heat to provide an electromagnetic field at selective areas. The sheet 102 is passed in proximity with the head 118 so that the inductive heat source areas 119 are selectively positioned in proximity with the narrowly confined regions of the sheet 102 to heat the narrowly confined areas. Because the heat energy source is an electromagnetic field, the head 118 does not make contact with the sheet as the sheet passes.

Non-contact heating means are preferred because of the heat conductive ability of aluminum. Conductive heating is difficult to limit to the narrowly confined areas because the aluminum sheet conducts so efficiently, acting as a heat sink when in contact with a heat source. Inductive heating, which does not require contact of the heat source with the sheet, allows better control of the heating of the sheet.

In a preferred embodiment of the method, the pretreating of the folding lines is done entirely by heating the sheet. Alternatively, mechanical stress may be applied in the regions around the folding lines to supplement heating to ensure good fold lines in the finished package. Mechanical stressing without heating may also be employed for pretreating the folding lines between the top flaps and the lid parts, and the bottom flaps and the body panels.

Alternatively, the package blank may be partially folded in a progressive series of steps to form the package. By partial, progressive folding cracking can be avoided because the stress applied to the metal in any single step is reduced and the metal material can recover between folding steps.

After the folding lines are prepared, the sheet is partially die cut to form the broken out spaces between the flaps. The outer edges 82 are not cut at this time, because the blank remains part of the sheet for handling in subsequent steps. The partial die cutting step creates gaps between rear top flap 70 and first side top flap 72, between first side top flap 72 and front top flap 74, and between the front top flap 74 and the second side top flap 76. Similarly, the die cutting step forms the gaps be-

tween the first side bottom flap 42 and the rear bottom flap 40 and the front bottom flap 44, and between the front bottom flap 44 and the second side bottom flap 46.

In a subsequent step, the sheet is washed and etched to remove lubricating oil, dirt, and other impurities on the sheet. Etching also removes slivers of metal material that may remain from the partial die cutting step. Washing prepares the sheet for applying printed matter, such as labelling, graphics, and coloring.

The washed and etched sheet is then applied with printed matter, graphics and coloring. In a preferred embodiment of the invention, the printed matter is applied as a thin film of preprinted material bonded to the sheet by a suitable adhesive. Alternatively, the matter may be printed directly on the sheet. After the printed matter has been applied to the sheet, a coating of polymer or other suitable protective material is applied over the printed matter to protect it from scratches or other mechanical damage, and to provide a desired surface appearance. A heat activated adhesive is also applied to predetermined areas of the sheet, to the flaps and the rear joining panel, which are later overlapped and bonded to form the package. In addition, adhesive is applied to portions of the front panel 26 and the first and second side panels 24, 28, near the frangible lines 60, 62, and 64 for attaching an inner frame to the blank 80.

After the sheet has been coated, a second die cutting operation is performed to separate the blank from the sheet. In this step, the outer edges 82 of the blank 80, illustrated in Fig. 2, are cut, and the blank is removed from the sheet. Die cutting the metal sheet laminated with a coating renders exposed edges of the blank dull. The blanks 80 are then stacked for subsequent handling.

The completed cigarette package includes the inner frame 90 illustrated in Fig. 1. The inner frame 90 is formed in a separate series of steps, and is attached to the blank 80 prior to folding to form the package 10. Fig. 4 is a plan view of an inner frame blank 92. The inner frame blank 92 is a generally rectangular member that is creased into three segments, a first side 94, a center 96 and a second side 98. At an upper end of the center 96, a substantially rectangular gap 95 is provided. In the completed and filled package, the gap 95 facilitates a consumer's access to the contents of the package.

The method for forming the inner frame blank 92 is similar to the method for forming the package blank 80, and includes providing a coil of metal sheet, such as aluminum or another suitable material. Separating and folding lines are indicated on the blank to form the first 93 and second folding lines 97 and the outer separating edges of the blank 92. In a preferred embodiment of the invention, the sheet is pretreated by heating the sheet in the manner described above. Alternatively, the sheet may be mechanically creased using a conventional creasing apparatus as is known in the art.

The inner frame blank 92 is separated from the sheet by die cutting or other suitable means, and the blank 92 is then washed and etched in preparation for being attached to the package blank 80. As mentioned, washing and etching cleans oil and dirt from the metal, and removes metal slivers or particles remaining from the die cutting step.

The inner frame blank 92 is attached to the package blank 80 so that the center 96 overlays the front panel 26 with the gap 95 positioned free of the front panel 26. In the completed package 10, as illustrated in Fig. 1, the inner frame 90 extends from an upper, open edge of the body 20.

The package 10 formed from the package blank 80 is formed by bending the blank 80 at the creases 32, 34, 36 and 38 so that a substantially rectangular tube is formed with the rear panel 22 substantially parallel to the front panel 26. The joining panel 30 and lid joining part 59 are overlapped on the rear panel 22 and rear part 52, respectively, and bonded so that rear joining panel and lid rear joining part are on the inside of the tube. The side bottom flaps 42, 46 and the side top flaps 72, 76 are folded to be substantially perpendicular with the sides of the body 20 and lid 50 portions. The rear bottom flap 40 is folded over the side bottom flaps 42, 46, and the rear top flap 70 is folded over the side top flaps 72, 76. The front top flap 74 is then folded over and bonded to the other flaps to close the lid portion 50 and the front bottom flap 44 is folded over and bonded to the other bottom flaps to close the body portion 20.

The package 10 formed by the method of the invention has rounded corners between the various panels as a result of bending the metal blank 80 along the pretreated folding lines.

To open the package 10, the frangible lines 60, 62 and 64 are broken by the consumer to separate the front 56 and sides 54, 58 of the lid 50 from the front 26, and sides 24, 28 of the body 20. The lid 50 may then be pivoted away from the body 20, to the open position shown in Fig. 1. The hinge 68 may be reinforced with a flexible tape or label adhered to the rear panel 22 and the lid rear part 52 to prevent cracking with repeated opening and closing of the lid 50.

Fig. 5 is a plan view of an alternative embodiment of a package blank 120 of the invention. The method of the invention, described above, is applied to form the alternative package blank illustrated in Fig. 5, with the exception of the steps for forming the inner frame blank 92 of Fig. 4. The package blank 120 of Fig. 5 includes an inner frame formed as part of the blank. The other steps of the method remain substantially the same.

The sheet is divided to define the blank 120 having a body 121 and a lid 160 portion. The body portion 121 includes segments that, when the blank 120 is folded, form a front panel 122, a bottom panel 124, and a rear panel 126. Front side panels 130, 132 depend laterally from the front panel 122. Bottom side flaps 134, 136 depend from the bottom panel, and rear side panels 138, 140 depend laterally from the rear panel 126.

At a free end of the front panel 122, the sheet is

creased to form the inner frame 150. Creasing the sheet offsets the inner frame 150 from the plane of the body segments. The crease 144 between the body portion segments forms a step from the front body segments to the inner frame segments. When the blank 120 is folded into a package, the inner frame 150 is offset toward the interior of the package, which allows sufficient clearance so that the lid portion 160 closes over the inner frame.

The lid portion 160 includes a rear part 162 with depending rear flaps 164, 166. A top part 168 extends from the rear part 162, and a front part 170 from the top part. Top sides 172, 174 extend from the front part 170, and top flaps 176, 178 depend from the top sides 172, 174. The crease 180 between the rear panel 126 and the lid rear part 162 becomes the hinge in the completed package.

To accommodate the inner frame 150 as part of the blank 120, the body and lid segments are laid out in a longitudinal pattern, rather than the lateral pattern of the blank 80 described above. The blank 120 is folded to form the package by folding the front panel 122 and the rear panel 126 to be perpendicular with the bottom panel 124. The bottom flaps 134, 136 are folded perpendicular to the bottom panel 126 and the rear side panels 138 and 140 are folded to overlap the bottom flaps. The front side panels 130, 132 are then folded to overlap the rear side panels 138, 140. The side panels are bonded together by suitable means, such as a heat activated bonding agent that may be applied during the coating step.

The lid portion 160 is formed by folding the rear side flaps 164, 166 perpendicular to the rear part 162, folding the top flaps 176, 178 perpendicular to the top sides 172, 174, and folding the top sides 172, 174 perpendicular to the front part 170. The front part 170 is folded perpendicular to the top part 168, and the top flaps 176, 178 overlap the top part. The top part 168 is folded perpendicular to the rear part 162, and the rear flaps 164, 166 overlap the top sides 172, 174. The rear sides 164, 166 are bonded in place by suitable means, such as heat activated bonding agents that may be applied during the coating step. In the completed package, the front 170 overlaps the inner frame 150 at the center part 154, and the top sides 172, 174 overlap the inner frame sides 152, 156, respectively.

According to another embodiment of the present invention, a body portion and a lid portion are formed as separate blanks and then joined to complete the package. Fig. 6 is a plan view of a body portion blank 210 and Fig. 7. is a plan view of a lid portion blank 270. The blanks 210, 270 are formed from a sheet of metal material by the method as described above.

The body blank 210 includes a rear panel 212, a first side panel 214, a front panel 216, a second side panel 218 and a rear joining panel 220. An inner frame portion 230 is formed integrally as part of the body blank 210. The inner frame 230 includes a rear 232, a first side 234, a front 236, a second side 238 and a rear joining part 240. The front 236 of the inner frame 230 includes a gap portion 235 for facilitating access to the contents of the completed package. The inner frame 230 is formed in the blank 210 so that it is on a different plane than the body portion segments.

The lid portion 270 is formed with segments that become in the completed package a rear part 272, a first side part 274, a front part 276, second side part 278, and a rear joining part 280.

After the body portion 210 and the lid portion 270 are separated from the sheet, the portions are folded to form substantially rectangular tubes. The rear joining panel 220 and the rear panel 212 of the body portion 210 are overlapped and bonded, and the rear joining part 280 and the rear 272 of the lid portion 270 are overlapped and bonded. A bottom cap 250, illustrated in Fig. 8 and Fig. 9, is attached to the open bottom end of the folded body portion 210. A top cap 260, illustrated in Fig. 10 and Fig. 11 is attached to the open top end of the folded lid portion 270. The body portion 210 with the attached bottom cap 250 is illustrated in Fig. 12. The folded lid portion 270 with attached top cap 260 is illustrated in Fig. 13.

The bottom cap 250 and top cap 260 are formed in separate steps from a metal material, such as aluminum or another suitable material, by a stamping or press forming operation. Fig. 8 is a bottom plan view, and Fig. 9 is a side view, of the bottom cap 250. The bottom cap 250 includes a base portion 252 having a hollowed central area 253. Upstanding ribs 254 extend from the base portion 252 and define an inner hollow area 256 and an outer shoulder area 258. The bottom cap 250 is attached to the body portion 210 by fitting the ribs 254 inside the folded body with the end of the panels forming the front 216, sides 214, 216 and rear 212 resting on the shoulders 258. The bottom cap 250 is bonded to the body portion by any suitable means, such as heat activated adhesive.

Fig. 10 is a top plan view, and Fig. 11 is a side view, of the top cap 260. The top cap 260 includes a base portion 262, and ribs 264 that extend from the base portion to define an inner central hollow area 266 and outer shoulder 268. The top cap 260 is attached to the folded lid portion 270 by fitting the ribs 264 inside the tube formed by the lid portion, with the edges of the rear part 272, side parts 274, 278 and front part 276 resting on the shoulder 268. The top cap is bonded to the lid portion 270 by any suitable means.

The completed lid portion 270 and body portion 210, illustrated in Fig. 13 and Fig. 12, respectively, are fitted together so that the open end of the lid portion 270 fits over the recessed inner frame segments, front 236, sides 234, 238, and rear 232. The rear part 272 of the lid portion 270 is fastened to the rear panel 212 of the body portion 210 to form a hinge, similar to that illustrated in Fig. 1, to allow the lid to selectively pivot to open and closed positions. A flexible adhesive backed tape may be applied across the joint between the rear panel

212 and the rear part 272. Alternatively, an adhesive backed label may be attached to at least the rear panel 212 and the rear part 272 to form the hinge.

According to yet another embodiment of the invention, the body portion is formed from a blank into a hollow rectangular tube and, rather than a lid, a flat top cap member is provided. Fig. 14 is a plan view of a package blank 300. The blank 300 is a substantially rectangular element that is pretreated by the method described above to provide folding lines defining segments that form a rear panel 310, a first side panel 312, and front panel 314, a second side panel 316, and a joining panel 318. The blank 300 is treated and formed into a hollow, rectangular tube, with the rear panel 310 being lapped over and bonded to the joining panel 318. Corners between adjacent panels are rounded, as described above. The rear panel 310 and the joining panel 318 are bonded by any suitable means, for example, a heat activated adhesive applied to a predetermined area of at least one of the panels during a coating step.

Fig. 15 is a perspective view of a completed package 330 using the package blank 300. After the blank 300 is folded and formed into the hollow, tubular shape, a bottom cap 250 is attached to an open bottom end of the tube. The bottom cap 250 is substantially the same as the member described in Fig. 8 and Fig. 9. The bottom cap 250 closes the bottom end of the package 330 and provides structural stability to the tube.

Fig. 16 is a bottom view of a top cap 350 for the package 330. The top cap 350 is a substantially flat member having a downwardly extending rib 352 and an outer peripheral shoulder 354. In attaching the top cap 350 to the package 330, the rib 352 is inserted into an upper end of the package and the shoulder 354 abuts the end of the panels. The top cap 350 is bonded to the package 330 by any suitable means.

The top cap 350 includes an aperture 356 located in a corner area. The aperture 256 provides access to contents of the fully formed package 330. As shown in Fig. 15, a closure 360 is attached to the top of the top cap 350. The closure 360 covers the aperture 356, and may be selectively pealed away from the top cap 350 by pulling tab member 362 to uncover the aperture. The closure 360 has a resealable adhesive that permits it to be reattached to the top cap 350 to selectively close the aperture.

The foregoing has described the preferred principles, embodiments and modes of operation of the present invention; however, the invention should not be construed as limited to the particular embodiments discussed. Instead, the above-described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations, changes and equivalents may be made by others without departing from the scope of the present invention as defined by the following claims.

Claims

1. A method for making metal packages (10) (210) (330) comprising:

   providing a sheet (102) of metal for forming a plurality of package blanks (80) (120) (210,270) (300) ;
   defining individual package blanks on the sheet of metal with folding lines (32,34,36,38,66,68) on each blank and separating lines (82) between individual blanks;
   pretreating the sheet in narrowly confined regions around the folding lines of the blank to facilitate folding of the metal;
   separating the individual pretreated package blanks from the sheet; and
   folding the blank along the folding lines to form a hollow, substantially rectangular shaped package (10) (210) (330).

2. A method according to claim 1 further comprising bonding predetermined portions of the blank (80) (120) (210,270) (300) after folding to form the package (10)(210)(330).

3. A method according to claim 1 or 2 further comprising securing a lid (260) (350) to the formed package (210) (330).

4. A method according to any preceding claim wherein pretreating the sheet (102) to facilitate folding includes heating the sheet in the narrowly confined regions around the folding lines (32,34,36,38, 66,68).

5. A method according to claim 4 further comprising preparing the region around the folding lines (32,34,36,38,66,68) for heating by reducing light reflectance of the sheet in the region of the folding lines.

6. A method according claim 4 or 5 wherein the heating includes directing a beam (104) of laser light at the sheet (102) in the region around the folding lines (32,34,36,38,66,68) for a predetermined length of time.

7. A method according to claim 6 further comprising directing the beam (104) of laser light at the sheet so that a focus point (108) of the beam is a predetermined distance from the surface of the sheet (102) providing a predetermined width (112) beam where the light contacts the sheet (102).

8. A method according to claim 6 or 7 further comprising positioning a shield (110) between the source (100) of laser light and the sheet (102) to prevent

light reflected from the sheet from striking the source.

9. A method according to claim 4 or 5 wherein the heating includes directing light (104) from an infrared light source (100) to the region of the folding lines (32,34,36,38,66,68).

10. A method according claim 9 further comprising directing the infrared light (104) through an opening in a light shield (110) positioned a predetermined distance from the sheet (102) so that a predetermined area of the sheet is exposed to light.

11. A method according to claim 4 wherein the heating comprises positioning a heated platen (113) in contact with the sheet (102) along the narrowly confined regions for a predetermined time and simultaneously tensioning the sheet to prevent distortion.

12. A method according to claim 4 wherein the heating comprises contacting for a predetermined time a surface of the sheet with a die plate (116) carrying strip heaters (115) heated to a predetermined temperature, the strip heaters being positioned to correspond with the narrowly confined regions.

13. A method. according to claim 12 further comprising contacting a surface of the sheet (102) opposite the surface contacted with the die plate (116) with a heated plate (117), the heated plate being at a temperature below the temperature of the strip heaters (115).

14. A method according to claim 4 wherein the heating comprises positioning an inductive heat source (119) in proximity to the narrowly confined regions of the sheet (102) for a predetermined time.

15. A method according to any of claims 1 to 3 wherein pretreating the sheet (102) includes applying a mechanical stress to the region around the folding lines to facilitate folding of the metal along the folding lines.

16. A method according to any preceding claim further comprising partially folding the blank (80) (120) (210,270) (300) along the folding lines (32,34,36,38,66,68) prior to folding the blank to form the package (10) (210) (330).

17. A method according to any preceding claim further comprising applying printed matter to the sheet (102) before separating the package blanks (80) (120) (210,270) (300) from the sheet.

18. A method according to claim 17 further comprising etching and washing the sheet (102) before applying the printed matter.

19. A method according to any preceding claim further comprising applying a coating of protective material to the sheet (102) before the blank (80) (120) (210,280) (300) is separated from the sheet so that exposed edges of the blank are coated by the protective material.

20. A method according to any preceding claim further comprising applying a coating of protective material to the sheet (120) and applying an adhesive to predetermined areas on the sheet before forming package blanks (80) (120) (210,270) (300) from the sheet.

21. A method according to any preceding claim further comprising providing an inner frame (90) and attaching the inner frame to the blank (80) before the blank is folded to form the package (10).

22. A method according to any preceding claim wherein the sheet (102) of metal material provided is aluminium.

23. A method according to any preceding claim further comprising providing a bundle of cigarettes and folding the blank (80)(120)(210)(300) around the bundle to form the package.

24. A method according to any preceding claim wherein the blanks have a longitudinal direction and a lateral direction, the longitudinal direction substantially coinciding with a grain direction of the metal sheet (102) material.

25. A method according to any preceding claim wherein defining the individual package blanks (210,270) comprises:

defining a body portion blank (210) having segments which are folded to become a back panel (212), a first side panel (214), a front panel (216), a second side panel (218), and a rear joining panel (220), and creasing the panels at a first end to form an inner frame portion (230), the inner frame portion of the front panel segment being larger than the inner frame portion of the rear panel segment and having a mouth (235), the inner frame portions (234)(238) of the side panel segments (214)(218) being substantially trapezoidal shaped; and

defining a lid portion blank (270) having segments that are folded to become a rear part (272), a first side part (274), a front part (276) a second side part (278), and a rear joining part (280), the front part segment being larger than the rear part segment.

26. A method according to claim 25 further comprising:

providing a top end cap (260), having a substantially flat rectangular top and downwardly projecting ribs (264);
providing a bottom end cap (250), having a substantially flat rectangular top and upwardly projecting ribs (254);
folding the lid portion (270) into a hollow, tubular shape, joining the rear joining part (280) to the rear part (272);
attaching the top end cap (260) to a top edge of the formed lid portion, the ribs (264) extending into and being bonded to the lid portion;
folding the body portion (210) into a hollow, tubular shape, joining the rear joining panel (220) to the rear panel (212);
attaching the bottom end cap (250) to a bottom edge of the formed body portion, the ribs (254) extending into and being bonded to the body portion; and
joining the rear part (272) of the lid portion to the rear panel (212) of the body portion to form a hinge.

27. A method according to any preceding claim wherein dividing the sheet (102) to form a package blank includes providing a body portion blank (300) having segments that are folded to become a back panel (310), a first side panel (312), a front panel (314), a second side panel (316) and a rear joining panel (318), and wherein folding the body portion into a hollow, tubular shape, includes joining the rear joining panel to the rear panel.

28. A method according to claim 27 further comprising:

providing a top end cap (350), having a substantially flat rectangular top, an opening aperture (356) and downwardly projecting ribs (352);
providing a bottom end cap (250), having a substantially flat rectangular top and upwardly projecting ribs (254);
attaching the top end cap (350) to a top edge of the formed body portion, the ribs (352) extending into and being bonded to the top edge of the body portion;
attaching the bottom end cap (250) to a bottom edge of the formed body portion, the ribs (254) extending into and being bonded to the body portion; and
attaching a resealable closure (360) to the top end cap (350) for selectively sealing the opening aperture (356).

29. A cigarette package comprising:
a blank (210) of metal material, the blank having folding lines, the blank being heated in a narrowly confined region around the folding lines to facilitate folding the metal, and being folded along the folding lines to form a substantially rectangular package, having at least a front panel (216), a rear panel (212) and opposing side panels (214,218), corners between adjoining panels having a predetermined radius of curvature.

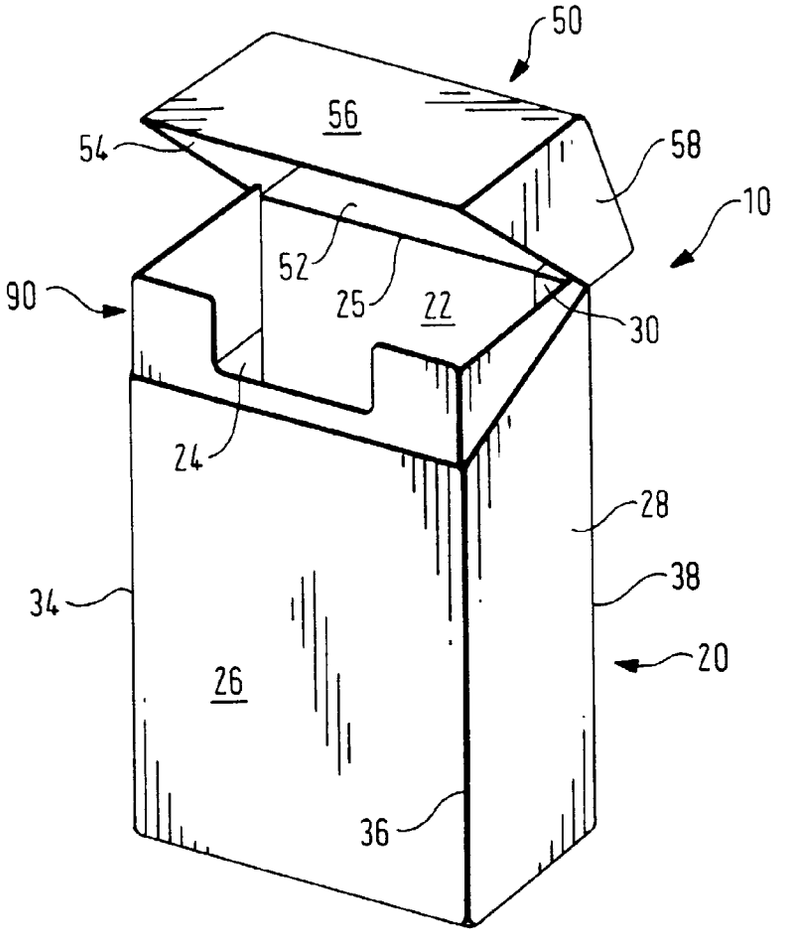
30. A package according to claim 29 further comprising a lid (270) attached to an upper end of the package at the rear panel (212), the lid having a substantially rectangular cup shape.

31. A package according to claim 29 wherein the lid (270) is attached to the package by a flexible hinge.

32. A package according to any of claims 29 to 31 further comprising an inner frame (95) (150) (230) attached at an upper end of the package to interior surfaces of the front (26) (122) (216) and side panels (24,26) (130,132) (214,218), the inner frame extending a predetermined distance from the upper end of the package.

33. A package according to any of claims 29 to 32 further comprising a cap (350) attached to an upper end of the package (310), the cap having an aperture (356) covered by reclosable sealing means.

FIG. 1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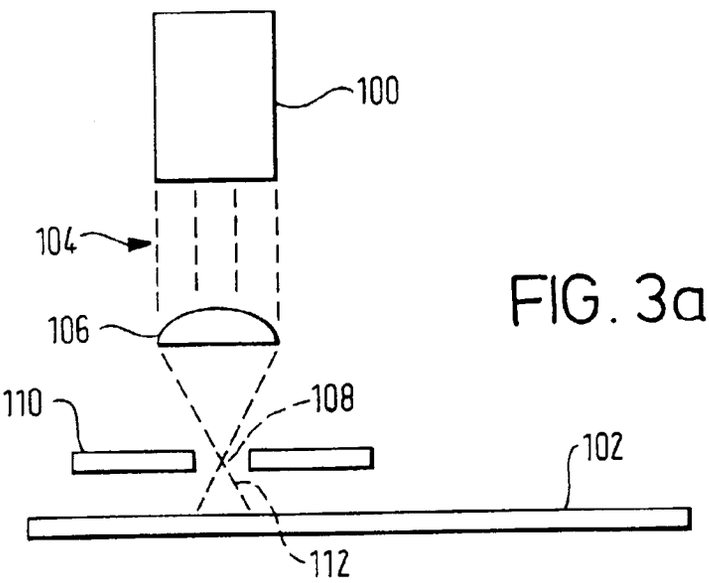
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102
112

FIG. 3a

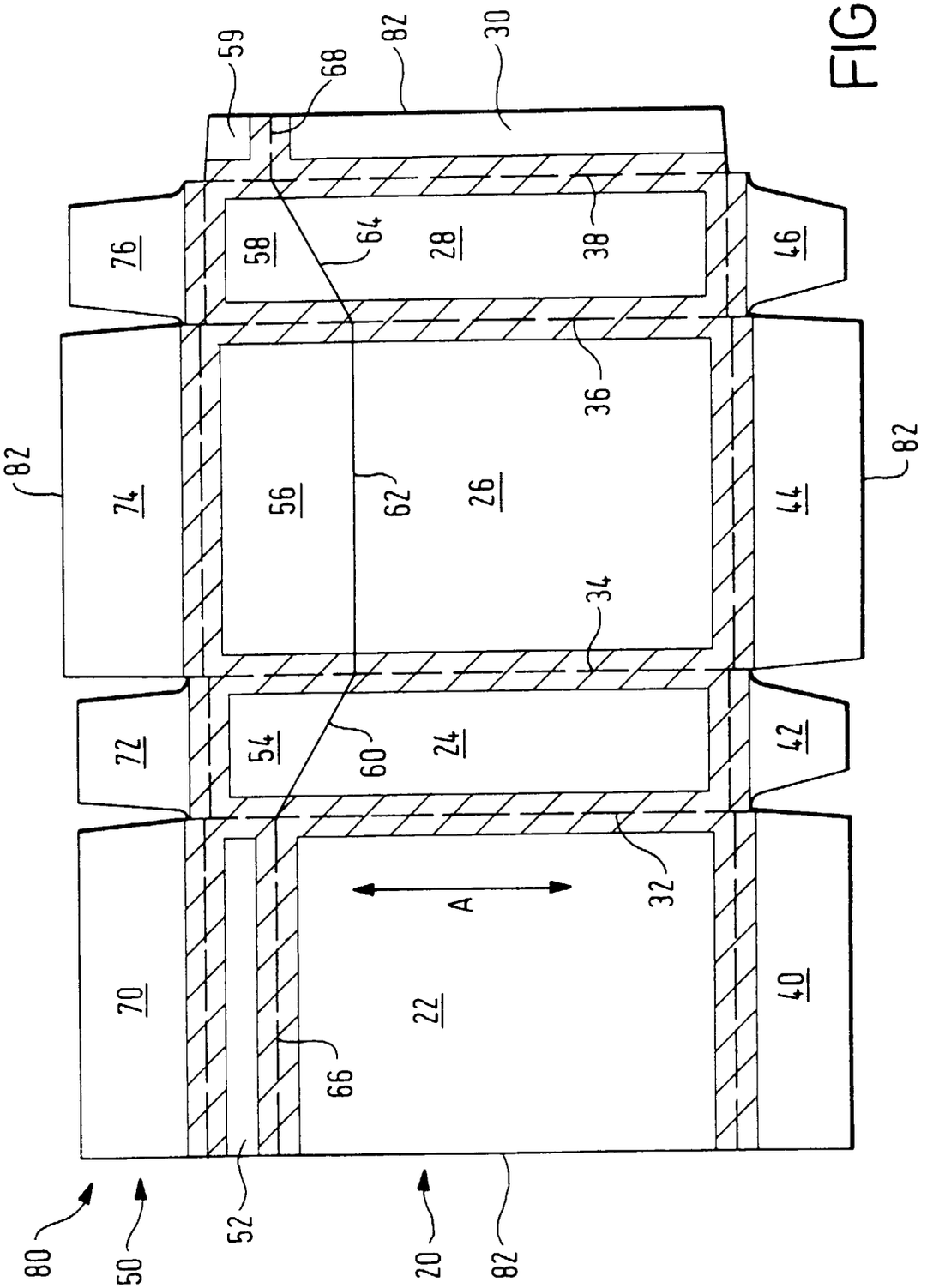
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FIG. 2

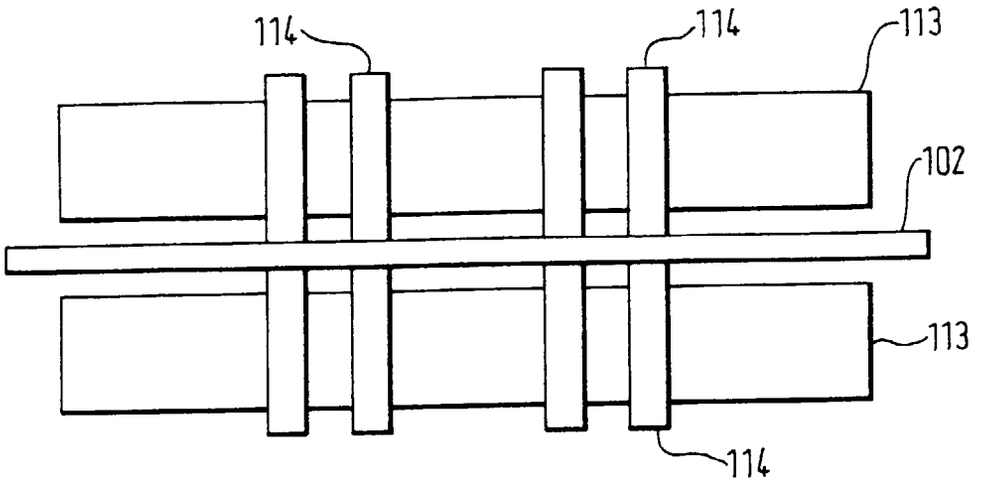

FIG. 3b

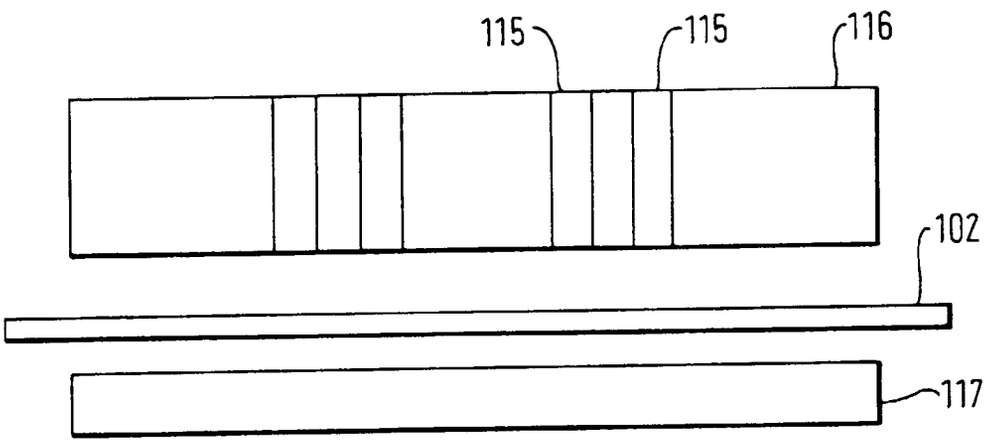

FIG. 3c

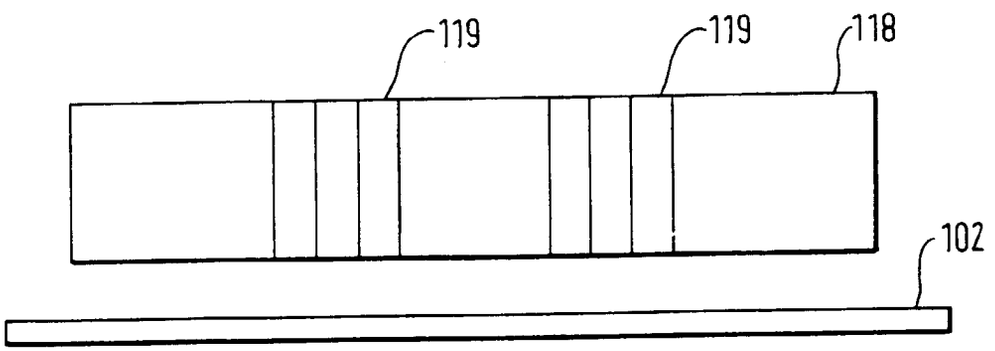

FIG. 3d

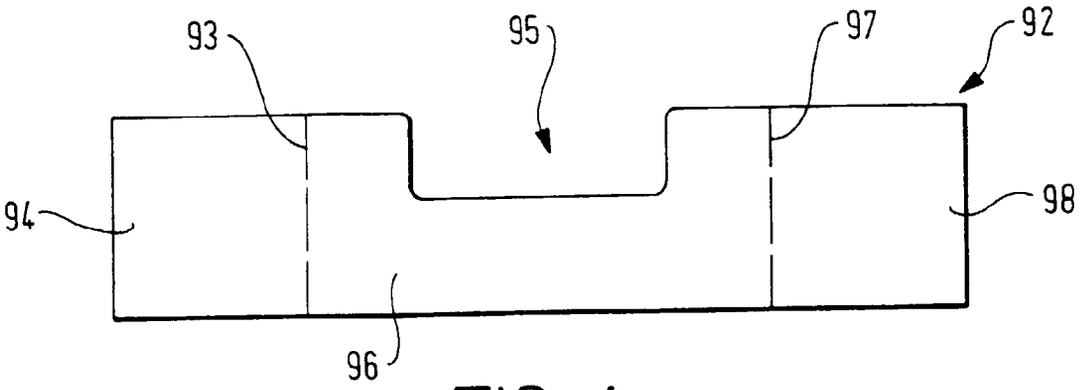
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FIG. 4

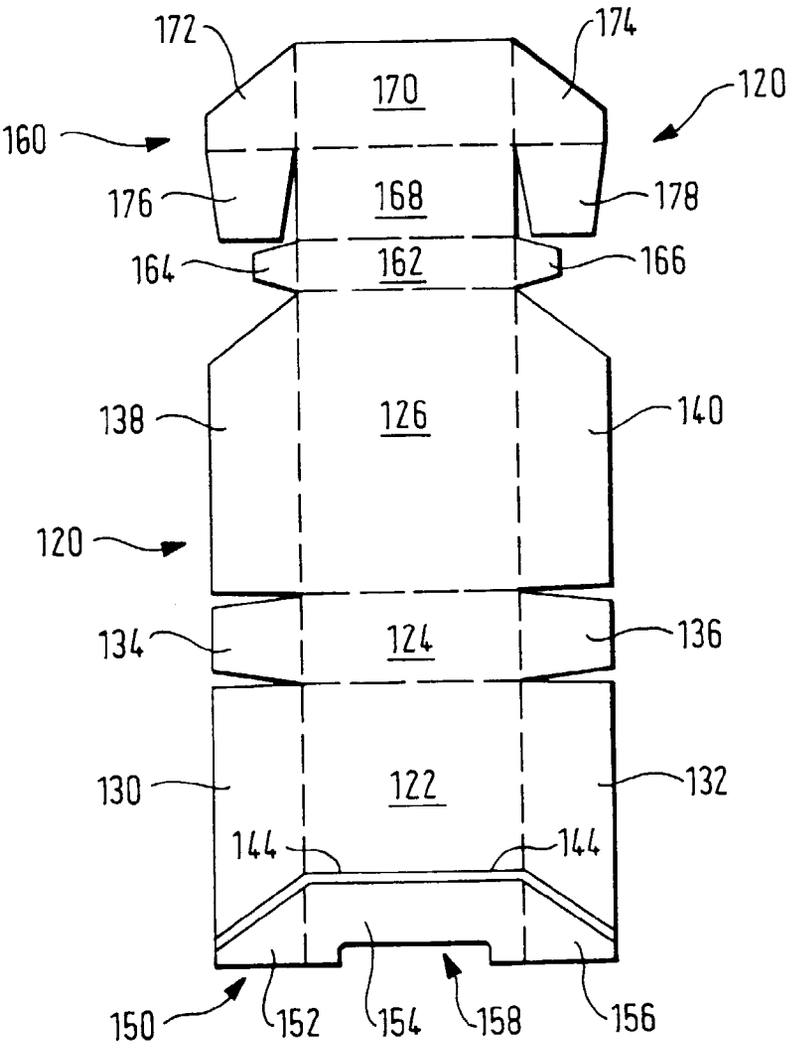
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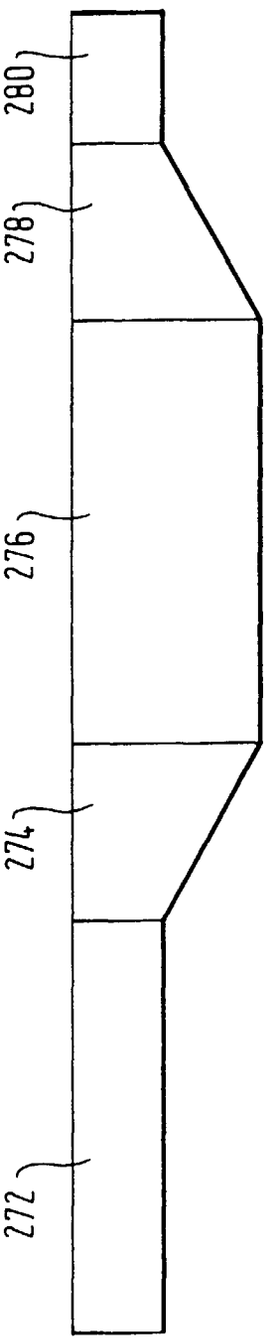
FIG. 5

FIG. 7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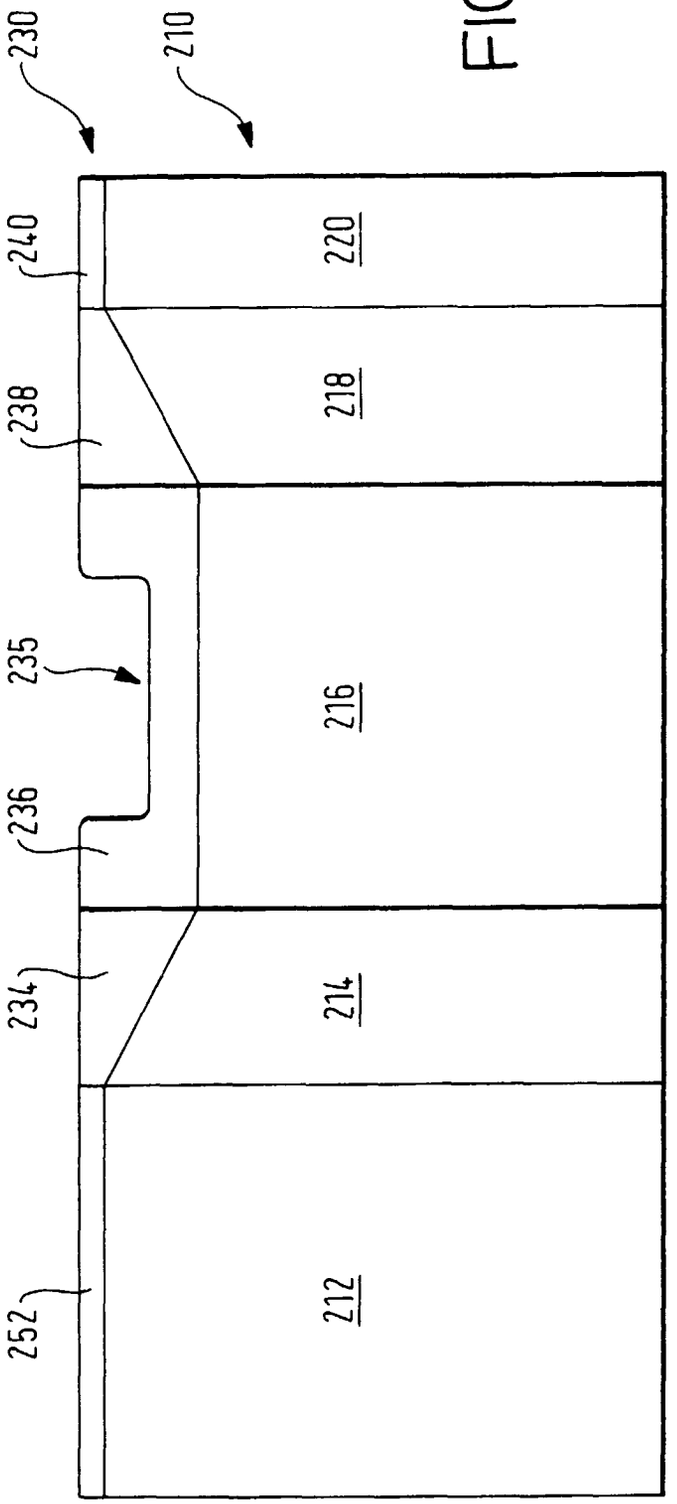
272

FIG. 6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252
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218
216
214
212

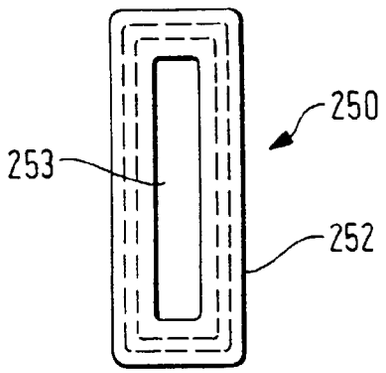

FIG. 8

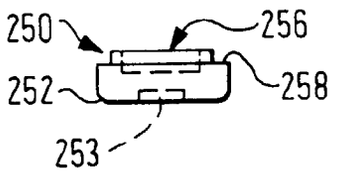

FIG. 9

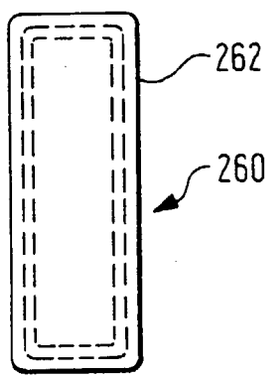

FIG. 10

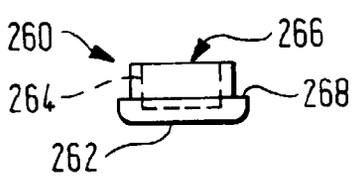

FIG. 11

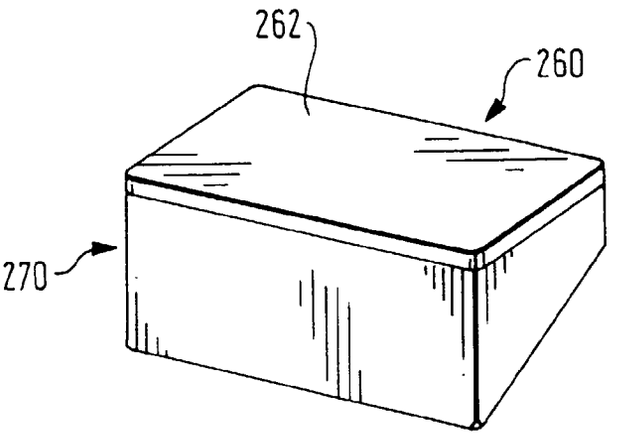

FIG. 13

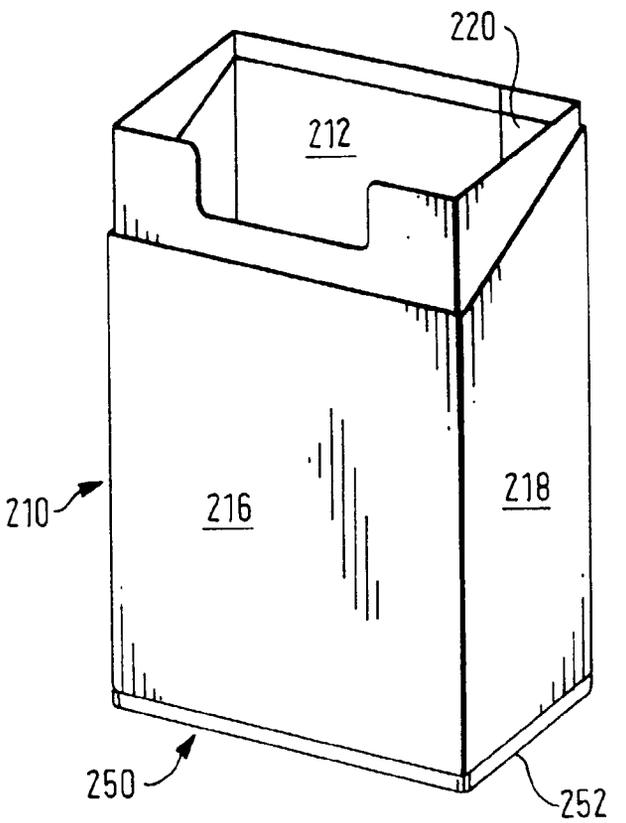

FIG. 12

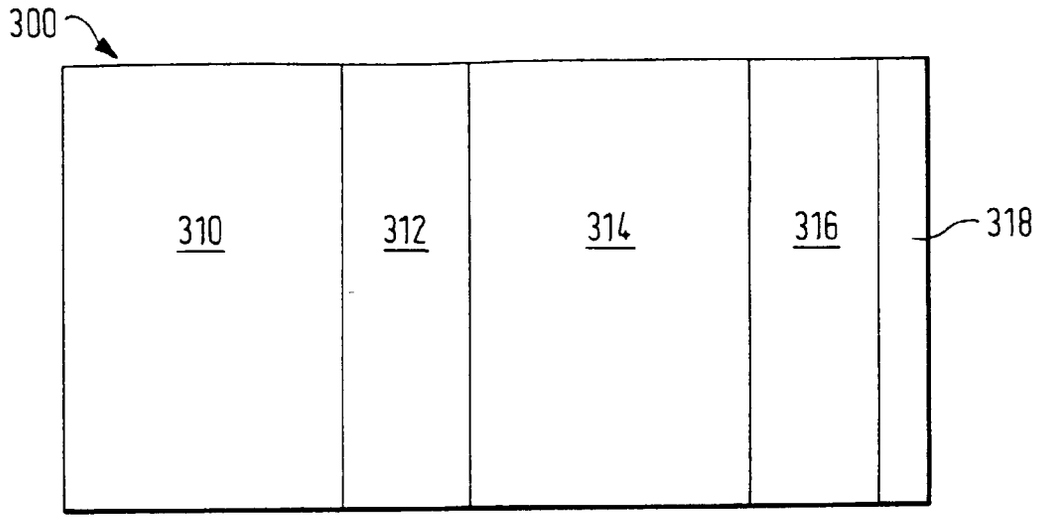

FIG. 14

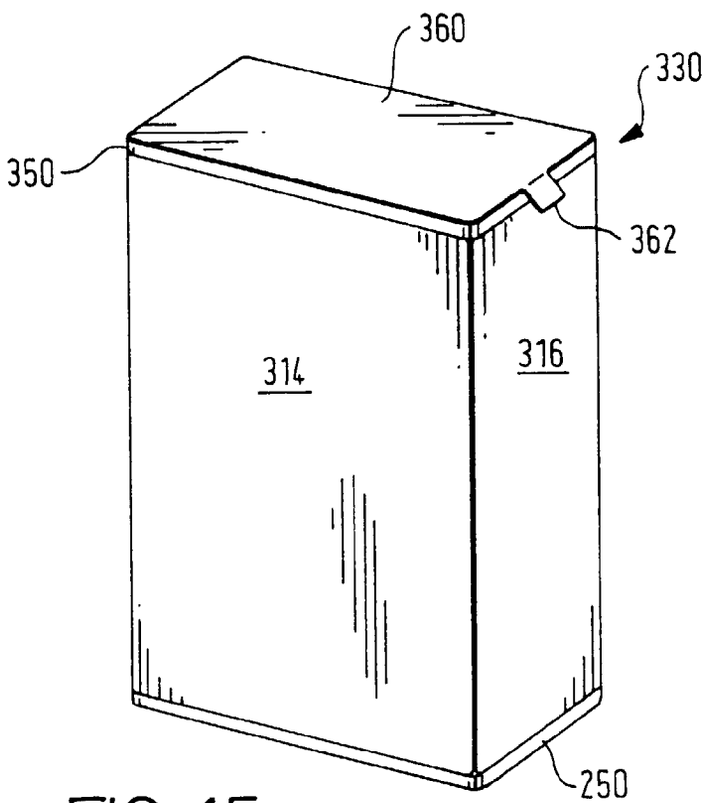

FIG. 15

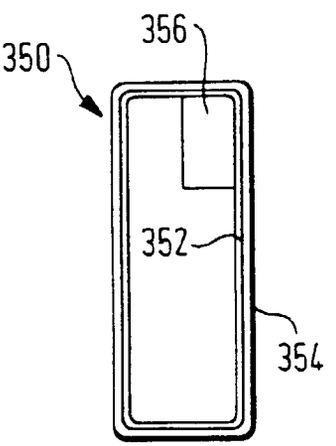

FIG. 16