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(54) PLATE SPRING FOR POP-UP SHEET MATERIAL DISPENSER

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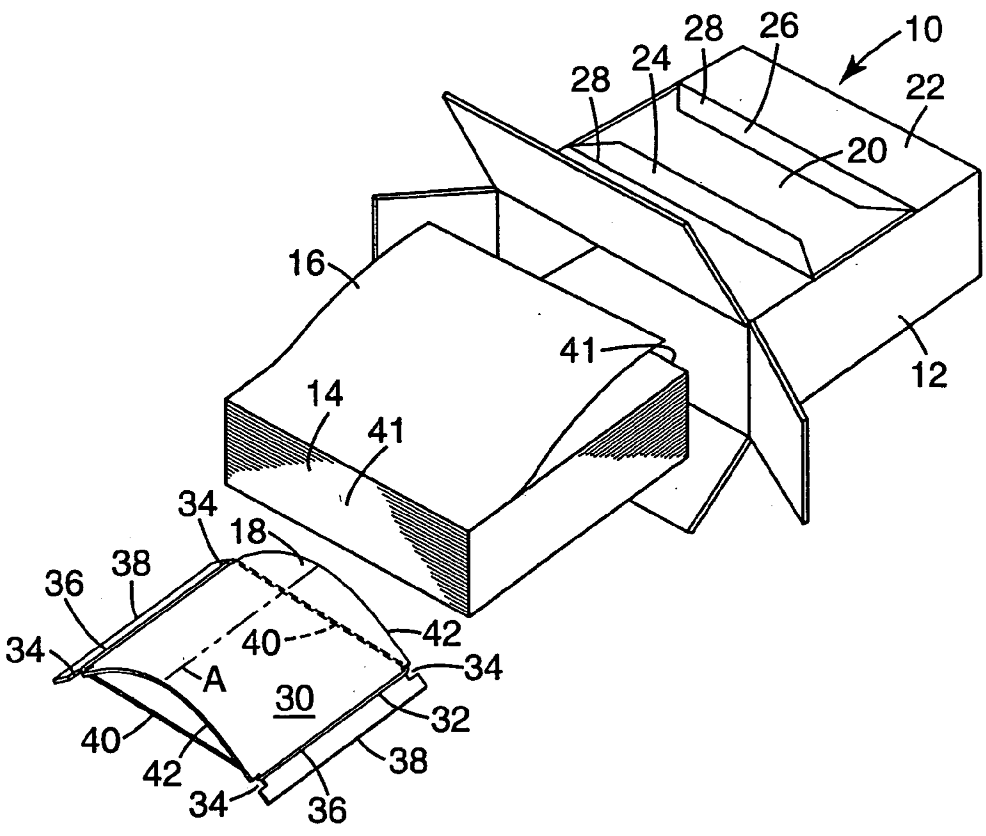
(57) ABSTRACT

A package for dispensing sheet material from a stack includes a novel biasing device for urging the stack of sheet material toward an opening in one side of the package. The biasing device is comprised of a flat sheet of material sized and shaped to be located within the package beneath the stack of sheet material. An elastomeric element having an unstressed length that is less than a diameter of the flat sheet of material is stressed and positioned between opposite edges of the flat sheet of material. As stress is relieved from the elastomeric element, the elastomeric element draws the opposite edges together and elevates a central portion of the sheet of material in the form of an arch to urge the stack toward the opening as the stack of sheet material is depleted.



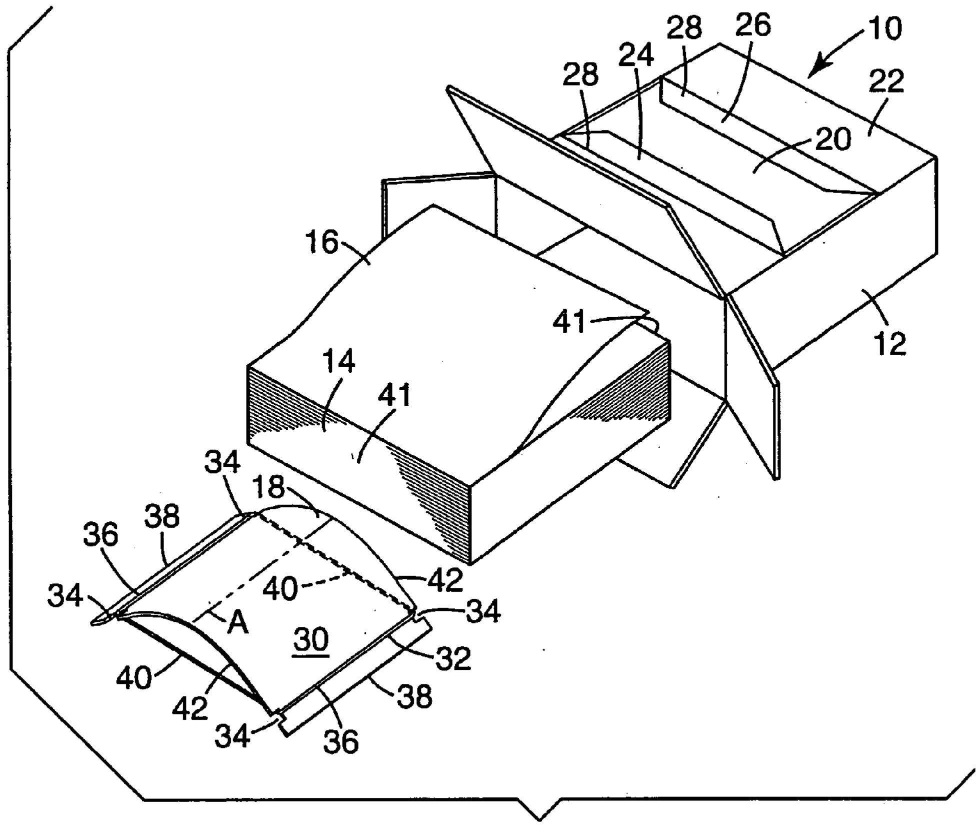

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Fig. 1

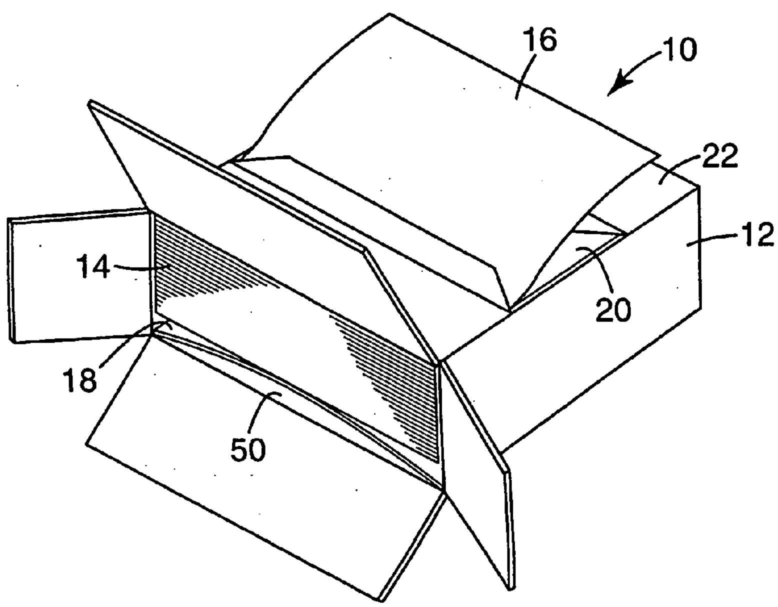
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Fig. 2

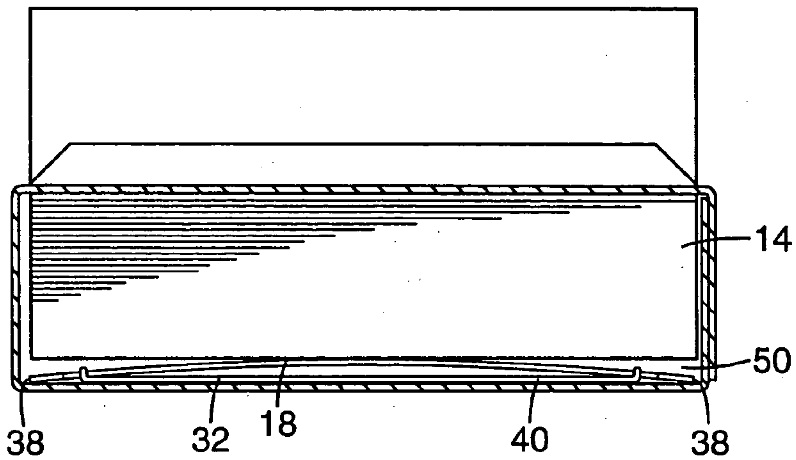

Fig. 2A

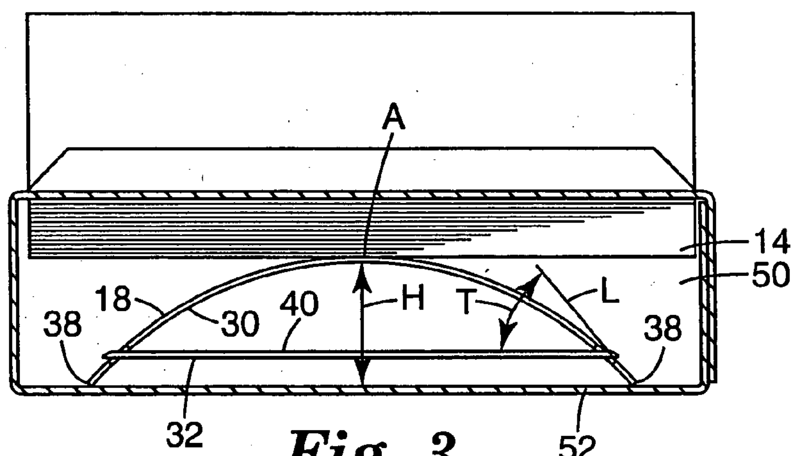

Fig. 3

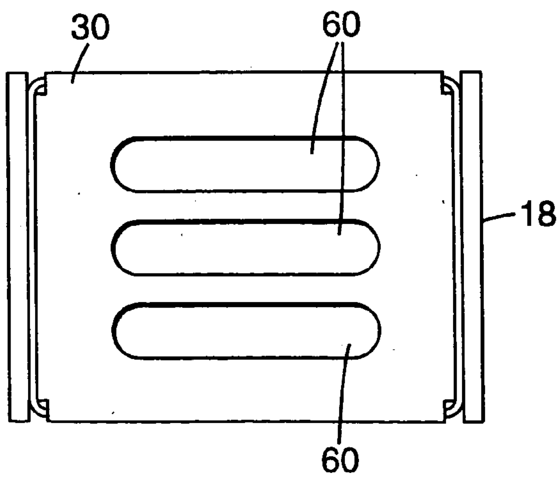

Fig. 4

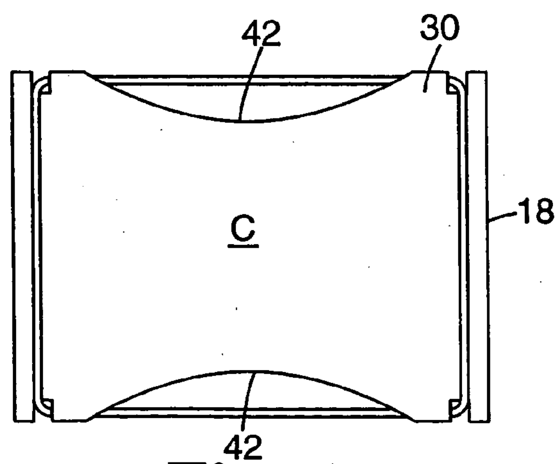

Fig. 5

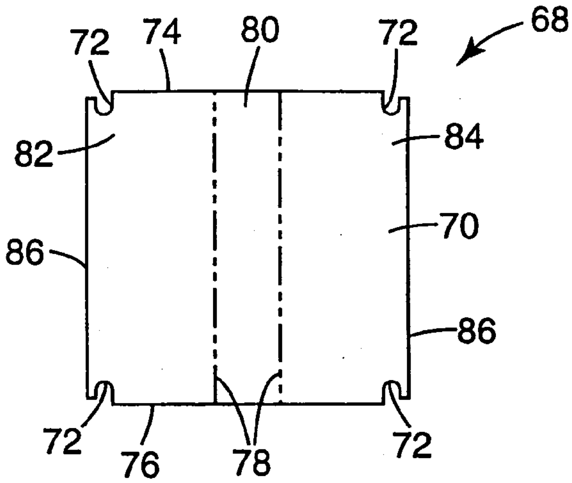

Fig. 6

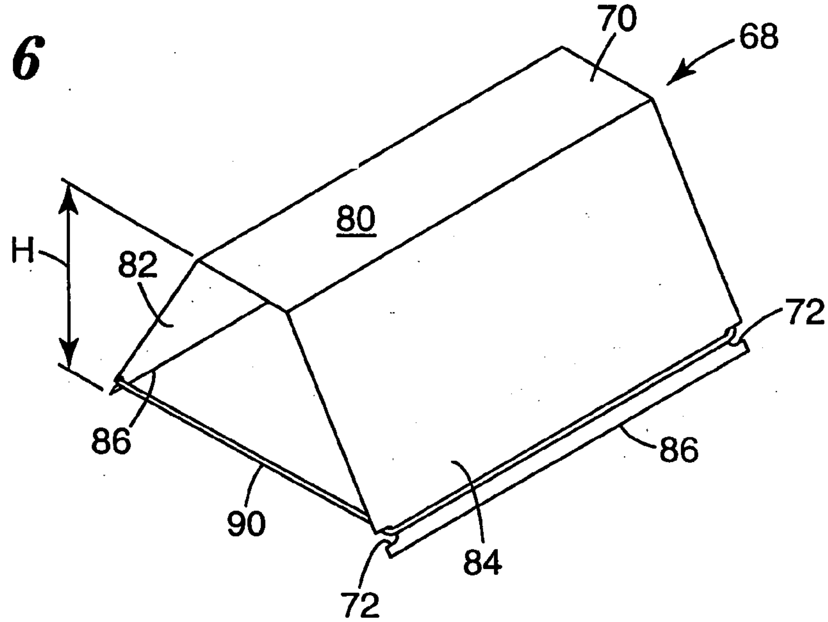

Fig. 7

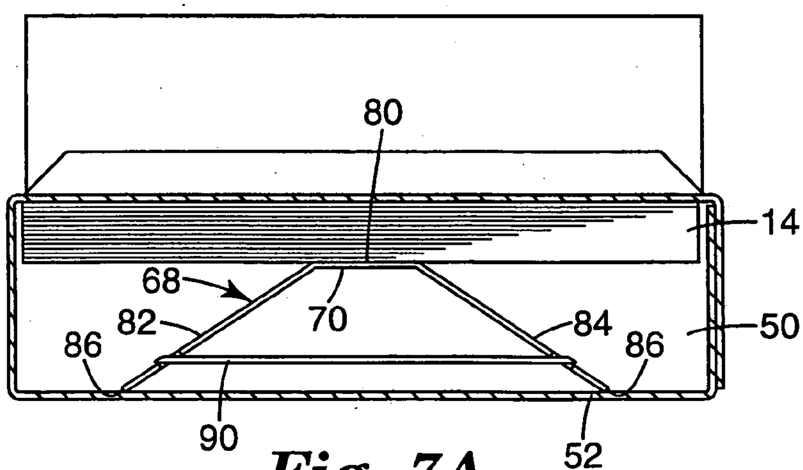

Fig. 7A

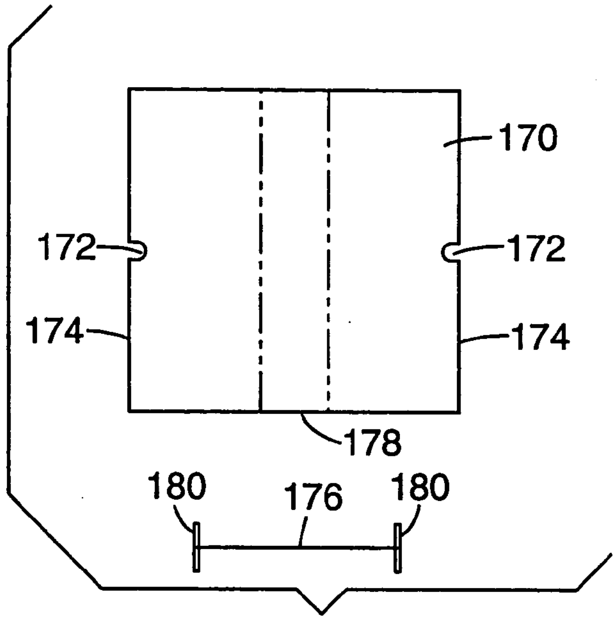

Fig. 8

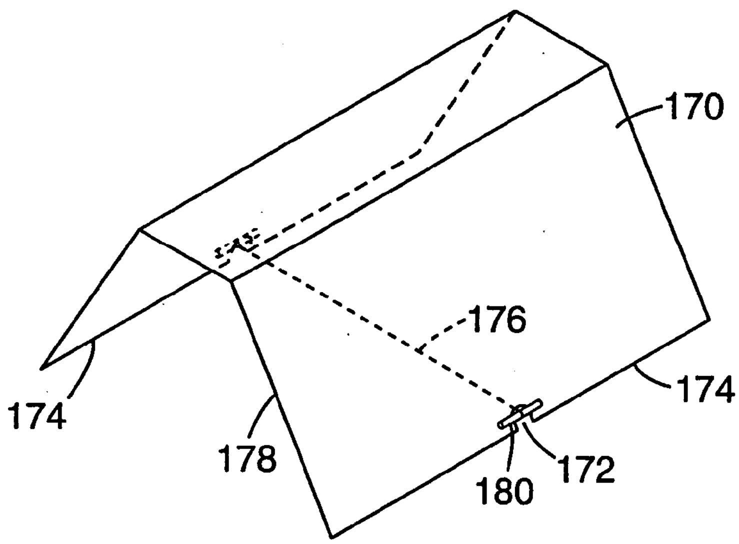

Fig. 9

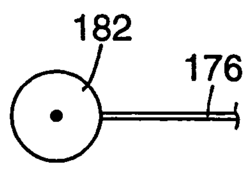

Fig. 10

PLATE SPRING FOR POP-UP SHEET MATERIAL DISPENSER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an improved package for dispensing individual sheets of material from a stack. In particular the present invention relates to an improvement in biasing devices for urging a stack of sheet material toward an opening of the package.

[0002] Packaging previously has been developed to hold a stack of sheet material and permit dispensing of individual sheets of the material one at a time. The packaging characteristics depend on the manner in which the stack of sheet material is formed. For example, where the successive sheets of material in a stack are connected to one another along alternating opposing edges by a peelable adhesive (e.g., in a Z-fold manner), packaging has included a six-sided container with an opening in one side for removing individual sheets from the stack.

[0003] Successful single sheet dispensing from such package requires that the stack be urged toward the opening, even as the sheets in the stack are being depleted. Various ways of urging the stack toward the opening have been proposed.

[0004] In U.S. Pat. No. 4,586,631, which is owned by a common assignee with the present application, a piece of foam material is compressed and placed in the packaging behind the bottom of the stack. The foam material provides a force to urge the stack toward the opening as individual sheets are removed from the packaging.

[0005] In U.S. Pat. No. 4,653,666, also owned by a common assignee with the present invention, a spiral wire spring compressed and placed between the stack and the base of the packaging provides the force necessary to lift the stack as individual sheets are dispensed.

[0006] The present invention constitutes an improvement over prior biasing devices for dispensing individual sheets from a Z-folded stack of sheet material from a container.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention provides an improved means for biasing a stack of sheet material within a dispensing package, wherein the stack of sheet material comprises a plurality of vertically aligned sheets of material which are releasably adhered to each other along opposite edges of successive sheets by a narrow band of pressure-sensitive adhesive, and wherein the dispensing package comprises a bottom, side walls and a top, the top defining an opening that extends between opposing side walls. The inventive biasing device comprises a sheet of material sized to fit within the dispensing package between the stack of sheet material and the bottom of the dispensing package. An elastomeric element, having an unstressed length that is less than a length of one edge of the sheet of material, is positioned between opposing first and second edges of the sheet, and secured to opposing sections of the sheet. The elastomeric element thereby draws the first and second edges of the sheet toward one another and elevates a central portion of the sheet of material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] **FIG. 1** is an exploded perspective view of the sheet dispenser package of the present invention.

[0009] **FIG. 2** is a perspective view of the assembled sheet dispenser package of **FIG. 1**.

[0010] **FIG. 2*a*** is an end view of the assembled sheet dispenser package of **FIG. 2**.

[0011] **FIG. 3** is a cross-sectional view of the assembled sheet dispenser package of **FIG. 2** with a partially depleted stack of sheet material.

[0012] **FIG. 4** is a top view of a first alternative embodiment of the biasing device of FIGS. **1-3** of the present invention.

[0013] **FIG. 5** is a top view of a second alternative embodiment of the biasing device of FIGS. **1-3** of the present invention.

[0014] **FIG. 6** is a top view of a third embodiment of a biasing device for the sheet dispenser package of the present invention.

[0015] **FIG. 7** is a perspective view of the biasing device of **FIG. 6** assembled with an elastomeric band.

[0016] **FIG. 7*a*** is a cross-sectional view of an assembled sheet dispenser package with the biasing device of **FIG. 7**.

[0017] **FIG. 8** is a top view of a fourth embodiment of a biasing device for the sheet dispenser package of the present invention.

[0018] **FIG. 9** is a perspective view of the biasing device of **FIG. 8** in an assembled condition.

[0019] **FIG. 10** is an enlarged end view of an alternative embodiment of the elastomeric element used with the biasing device of FIGS. **8-9**.

[0020] While the above-identified drawing figures set forth preferred embodiments of the invention, other embodiments are also contemplated, as noted in the discussion. In all cases, this disclosure presents the present invention by way of representation and not limitation. It should be understood that numerous other modifications and embodiments can be devised by those skilled in the art which fall within the scope and spirit of the principles of this invention. It should be specifically noted that the figures have not been drawn to scale as it has been necessary to enlarge certain portions for clarity.

DETAILED DESCRIPTION

[0021] The present invention is directed to an improved package for dispensing sheets of material which are joined together along one edge thereof such that the sheets are joined along alternately opposite edges of successive sheets in such a manner that they may be separated by a peeling force applied against the edge of the successive sheets. The sheets may be preferably adhered together by a narrow band of pressure-sensitive adhesive or by another substance which has greater shear strength than peel strength such that pulling on one sheet to draw the same through the opening of the dispenser will cause the next adjacent sheet to buckle and the adjacent end to be drawn from the stack through the exit opening with the dispensed sheet. The dispensed sheet then applies a peel force against the edges of the sheets to separate them.

[0022] **FIG. 1** shows an exploded perspective view of the components of a package-dispenser **10** according to the present invention. The dispenser **10** comprises a box-like container **12** in which is placed a stack **14** of sheets **16** of a corresponding size and shape, and a biasing device **18**. The container **12** includes an opening **20** in the top **22**, through which individual sheets **16** can pass. Located on either side of opening **20** are flaps **24** and **26**. Score lines **28** in the top **22** allow flaps **24** and **26** to bend somewhat to allow the top-most sheet **16** to project above the package.

[0023] Positioned within dispenser **10** beneath the stack **14** is one embodiment of an improved biasing device **18** for urging the stack **14** toward the top **22** as the sheets in the stack are removed. Biasing device **18** is comprised of a sheet **30** of polymeric material having a size and shape that generally corresponds to a footprint of the stack of material. As shown, sheet **30** is urged into a curved or arched state by means of an elastomeric band **32**. Elastomeric band **32** has an unstressed circumference which is smaller than a circumference of sheet **30**. By stressing elastomeric band **32** and positioning it within recesses **34** near each corner of sheet **30**, sheet **30** assumes the curved or arched state. The distance between recesses **34** along edges **38** is selected to be less than the distance between recesses **34** along edges **42** to ensure that sheet **30** curves toward stack **14**. In the embodiment shown in **FIG. 1**, portions **36** of elastomeric band **32** serve to hold elastomeric band **32** relative to sheet **30**. Portions **40** of elastomeric band locate below sheet **30**. Owing to the smaller unstressed circumference of elastomeric band **32**, portions **40** have an unstressed length that is less than the length of edges **42** of sheet **30**. Thus, with band **32** positioned in recesses **34** opposing edges **38** of sheet **30** are drawn toward one another, causing sheet **30** to flex in an upward direction, as shown in **FIG. 1**. Sheet **30** is oriented between container **12** and stack **14** with the apex of sheet **30**, shown by line A, extending between opposing edges **41** of stack **14**.

[0024] **FIGS. 2 and 2*a*** show the package-dispenser **10** in an assembled condition, with stack **14** within container **12** and a top sheet **16** extending through opening **20** in top **22**. Biasing device **18** is positioned between the base of container **12** and stack **14** to provide an upward force to stack **14** and thereby keep stack **14** in contact with the inner surface of top **22** of container **12**. When stack **14** is at its initial size, stack **14** consumes a substantial amount of internal space of container **12**, leaving only a small initial gap **50** between the base of container **12** and the bottom of stack **14**. Biasing device **18** assumes a low initial profile to fill gap **50** by flattening sheet **30** and thereby stressing portions **40** of elastomeric band **32**.

[0025] **FIG. 3** is a cross-sectional view of package-dispenser **10**, to show the operation of biasing device **18** as sheets are depleted from the stack **14**. As shown in **FIG. 3**, the stress on portions **40** of elastomeric band **32** is gradually relieved as gap **50** increases due to depletion of sheets from stack **14**. As gap **50** increases, portions **40** of elastomeric band **32** contract and draw opposing edges **38** of sheet **30** toward one another thereby increasing the vertical distance H between the apex A of sheet **30** and base **52** of container **12**.

[0026] In one exemplary embodiment, sheet **30** is comprised of a flexible polymeric material, such as polypropylene or polyethylene, having a thickness of about 0.020 inches. A sheet of such material formed in a 3 inch square and utilizing a rubber band having a lay flat length of 3.5 inches positioned on the sheet as previously described assumes a flat profile of about 0.0625 inches when sheet **30** is flattened and portions **40** of elastomeric band **32** are stressed. In other words, the distance between apex A of sheet **30** and base **52** of container **12** is about one sixteenth of an inch. With respect to the exemplary embodiment, when portions **40** of elastomeric band **32** are fully contracted, the apex A of sheet **30** is approximately 0.94 inches from a plane defined by edges **38** of sheet **30**. To provide adequate force on stack **14**, the maximum height of apex A is chosen to be greater than the distance from base **52** to top **22**.

[0027] A preferred material for elastomeric band **32** is a thermoplastic rubber, such as Ethylene Propylene Diene Monomer (EPDM).

[0028] **FIGS. 4 and 5** are top views of alternative embodiments of biasing device **18**. To increase flexibility and biasing force, sheet **30** can be formed with a pattern of slots or holes **60**, as shown in **FIG. 4**. By forming sheet **30** in this manner, the amount of material needed to form sheet **30** is reduced. As shown in **FIG. 5**, alternatively edges **38** can be formed to curve toward the center C of sheet **30**, thus reducing the width of sheet **30** and giving sheet **30** an hourglass-like shape. Other patterns for sheet **30** will be readily apparent to those of skill in the art.

[0029] The biasing device **18** of the present invention provides a unique benefit of a nearly constant normal force created over about 0.40 inches of travel (i.e., the value of H as shown in **FIG. 3**). This is the result of the plate geometry and the opposing forces from the elastomeric band and the plate bending force. The elastomeric force is greatest when sheet **30** is nearly flat whereas the bending force from sheet **30** is near its minimum. This force combination along with a small transmission angle (defined in **FIG. 3** by elastomeric band portion **40** and an imaginary tangent line L at recess **34** of sheet **30**) results in a reduced normal force. As biasing device **18** is allowed to relax (i.e., the number of sheets in the stack decreases) the elastomeric force decreases, the bending force increases and the transmission angle increases with a net result of a nearly constant normal force. The force profile can easily be adjusted by changing properties of sheet **30**. Using a more flexible material increases the normal force but also changes the force curve from a constant to a decreasing profile. The flexibility of sheet **30** can also be varied by changing the thickness, material, or by adding flutes in the bending direction. The elastomeric force of portions **40** of band **32** can be adjusted by varying the length, width or thickness of the band, or by varying the material forming band **32**. In addition, an individual section of elastomeric material can be utilized to form section **40** in lieu of a band of elastomeric material. Such an individual section of elastomeric material will of course have an unstressed length less than that of one of edges **42** of sheet **30** and will be connected to sheet **30** between opposing edges **38**. The proposed biasing device **18** is a simple, dependable, low cost method for creating normal forces for urging a stack of sheet material toward the top of a dispensing container.

[0030] **FIG. 6** shows a top view of yet another embodiment of a biasing device of the present invention. As shown in **FIG. 6, a** biasing device **68** is formed from a sheet **70** of a fibrous material, such as a single side or double side clay coated card stock material, in a size and shape generally corresponding to biasing device **18** shown in **FIG. 1**. Sheet **70** includes recesses **72** near each corner of sheet **70** along opposing edges **74** and **76** of sheet **70**. Recesses **72** aid in retaining an elastomeric band (shown in **FIG. 7**) in the manner described relative to biasing device **18**. A pair of centrally located and spaced fold lines **78** are provided in sheet **70** to form a central section **80** and a pair of flanking sections **82** and **84**. In one exemplary embodiment, sheet **70** is a 3 inch square of card stock material with fold lines **78** spaced approximately 1.125 inches from outer edges **86**. Fold lines **78** are oriented in a direction corresponding to the fiber direction of the card stock material forming sheet **70**. Fold lines allow sections **82** and **84** to bend at an angle relative to top **80**.

[**0031**] **FIG. 7** shows a perspective view of sheet **70** with an elastomeric band **90** positioned in recesses **72**. Elastomeric band **90** has an unstressed circumference less than the circumference of sheet **70**. As a result, when elastomeric band **90** is positioned in recesses **72** in the manner previously described, sections **82** and **84** of sheet **70** are drawn inward and thereby increase the distance H between section **80** and a horizontal plane defined by opposing edges **86**. Elastomeric band **90** can be stressed and sheet **70** can be flattened to assume a low profile and oriented for insertion into a container beneath a stack of sheet material, in the manner described relative to biasing device **18** of **FIG. 2**. As shown in **FIG. 7***a*, as the stack of sheet material is depleted, elastomeric band **90** contracts to elevate section **80** above the base of the container and thereby urge the remaining sheets in the stack toward the top of the container. A biasing device **68** formed in the manner described provides yet another alternative, low cost means of reliably biasing a stack of sheet material in a dispenser-container. While a pair of fold lines **78** are disclosed to form sheet **70**, an alternative embodiment can include a single centrally located fold line that bisects sheet **70** into two equal halves.

[**0032**] **FIG. 8** is a top view of another embodiment of the present invention to demonstrate an alternative manner of urging a sheet of material into an arched biasing device. In particular, the biasing device of **FIG. 8** is comprised of a sheet **170** which is configured similarly to sheet **70** of **FIG. 6**. Unlike the embodiment of **FIG. 6**, however, sheet **170** employs a pair of recesses **172** associated with opposing outer edges **174**. Recesses **172** serve to retain elastomeric element **176** in a manner to be described. As shown in **FIG. 8**, elastomeric element **176** has an unstressed length that is less than the length of edge **178** of sheet **170**. Fixed at opposite ends of elastomeric element **176** are retaining pins **180**.

[**0033**] **FIG. 9** is a perspective view of the biasing device of **FIG. 8** with elastomeric element **176** connected to sheet **170**. As shown in **FIG. 9**, pins **180** of elastomeric element **176** are positioned in the respective recesses **172** of sheet **170**. Pins **180** have a length greater than the gap forming recesses **172**, and accordingly elastomeric element **176** is retained between opposing edges **174**. Pins **180** may also be substituted by discs **182**, as shown in the enlarged end view of elastomeric element **176** in **FIG. 10**. Pins **180** and/or discs **182** may be formed from a metal or any material with sufficient rigidity to hold elastomeric element **176** relative to opposite portions of sheet **170**. Because elastomeric element **176** has an unstressed length less than the length of edge **178**, sheet **170** is urged into an arched shape. The biasing device defined by Sheet **170** and elastomeric element **176** functions in the manner described relative to FIGS. **6**-**7**A, albeit with only a single section of an elastomeric element.

[**0034**] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. For example, in lieu of recesses **34**, **72** or **172**, other means of securing an elastomeric band **32**, or individual section(s) of elastomeric material, to a sheet of material are contemplated. Recesses may be replaced by small protrusions or extensions of the respective sheet edges. Also, recesses or the aforementioned protrusions can be spaced relative to the corners of the sheet of material.

[**0035**] Consistent with the present teachings, other means of urging the sheet into a curved or arched state, such as forming the sheet of material with a shape memory material, will be evident to those skilled in the art.

1. A device for biasing a stack of sheet material within a dispensing package, wherein the stack of sheet material comprises a plurality of vertically aligned sheets of material which are releasably adhered to each other along opposite edges of successive sheets by a narrow band of pressure-sensitive adhesive, and wherein the dispensing package comprises a bottom, side walls and a top, the top defining an opening that extends between opposing side walls, the device comprising:

a sheet of material sized to fit within the dispensing package between the stack of sheet material and the bottom of the dispensing package, the sheet of material having a top surface, a bottom surface, opposing first and second edges, opposing third and fourth edges, and a circumference;

an elastomeric member positioned between the first and second edges of the sheet and secured to opposite sections of the sheet, the elastomeric member having an unstressed length that is less than a length of one of the third and fourth edges of the sheet of material, the elastomeric member thereby drawing the first and second edges of the sheet toward one another.

2. The device of claim 1 wherein the device comprises first and second elastomeric members, the first and second elastomeric members positioned proximate the third and fourth edges, respectively.

3. The device of claim 2 wherein the first and second elastomeric members comprise first and second portions of a band of elastomeric material, the band of elastomeric material having a circumference less than the circumference of the sheet of material.

4. The device of claim 3 wherein sheet of material comprises a first pair of spaced recesses associated with the third edge and a second pair of spaced recesses associated with the fourth edge, and wherein the band of elastomeric material is positioned in the first and second pair of recesses.

5. The device of claim 1 wherein the sheet of material is a polymer material.

6. The device of claim 5 wherein the first and second edges of the sheet generally are parallel to one another, and wherein the third and fourth edges are formed to define a radially tapered width of the sheet.

7. The device of claim 5 wherein the sheet of material is formed to define one or more openings through the sheet, the openings generally being spaced from the first, second, third and fourth edges.

8. The device of claim 1 wherein the sheet of material is a card stock material.

9. The device of claim 8 wherein the card stock material includes at least one crease, the at least one crease generally being parallel to and spaced from the first and second edges.

10. A dispenser package for sheet material comprising:

a container having a bottom, side walls and a top, the top defining an opening extending between opposing side walls;

a stack of sheet material positioned within the container, the stack comprised of a plurality of vertically aligned sheets of material which are releasably adhered to each other along opposite edges of successive sheets by a narrow band of pressure-sensitive adhesive, a first sheet of material capable of passing through the opening in the top of the container; and

means between the stack of sheet material and the bottom of the container for biasing the stack toward the top of the container.

11. The dispenser package of claim 10 wherein the biasing means comprises:

a flat sheet of flexible material having a top surface in contact with the stack of sheet material, a bottom surface, a first pair of opposing edges and a second pair of opposing edges; and

resilient means engaging the flexible material for flexing the sheet of flexible material in a direction toward the stack.

12. The dispenser package of claim 11 wherein the resilient means comprises an elastomeric element, the elastomeric element having an unstressed length that is less than a length of one edge of the first pair of opposing edges of the flat sheet of flexible material.

13. The dispenser package of claim 8 wherein the resilient means comprises first and second portions of an elastomeric material, the first and second portions having an unstressed length less than a length of one edge of the first pair of edges.

14. The dispenser package of claim 10 wherein the biasing means comprises:

a flat sheet of material having a top surface in contact with the stack of sheet material, a bottom surface, a first pair of opposing edges and a second pair of opposing edges, the flat sheet of material including a pair of creases, the pair of creases spaced from and generally parallel to the first pair of opposing edges; and

resilient means engaging the sheet of material for bending the sheet of flexible material along the pair of creases in a direction away from the stack.

15. The dispenser package of claim 14 wherein the resilient means comprises an elastomeric element, the elastomeric element having an unstressed length that is less than a length of one edge of the first pair of opposing edges of the flat sheet of material.

16. The dispenser package of claim 14 wherein the resilient means comprises first and second portions of an elastomeric material, the first and second portions having an unstressed length less than a length of one edge of the first pair of edges.

17. In a dispenser package for sheet material comprising a container having a base, a cover and side walls which define an interior space, the interior space containing a stack of sheet material, an opening in the cover to permit removal of individual sheets from the stack, and means for biasing the stack of sheet material toward the cover, the improvement comprising:

a flexible plate sized to fit in the interior space of the container between the stack of sheet material and the base of the container, the flexible plate having a top surface, a bottom surface, first and second opposing edges, third and fourth opposing edges, and a circumference;

an elastomeric band having an unstressed circumference that is smaller than the circumference of the flexible plate, the elastomeric band being positioned over the top surface of the flexible plate such that first and second portions of the elastomeric band are near the first and second opposing edges of the flexible plate, and third and fourth portions of the elastomeric band are positioned below the bottom surface of the flexible plate near the third and fourth opposing edges, the third and fourth portions of the elastomeric band having an unstressed length less than a length of the third and fourth edges of the flexible plate.

* * * * *