

[54] **EDGE PROTECTION DEVICE**

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428/179

[51] **Int. Cl.**²..... **B32B 1/00**; B32B 3/00

[58] **Field of Search** 161/125, 131, 133, 130,
161/136, 137; 229/14 BE, 14 C; 206/46;
270/32, 45; 248/345.1

[56] **References Cited**

UNITED STATES PATENTS

1,821,692	9/1931	Copeland.....	229/14 C
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Primary Examiner—George F. Lesmes

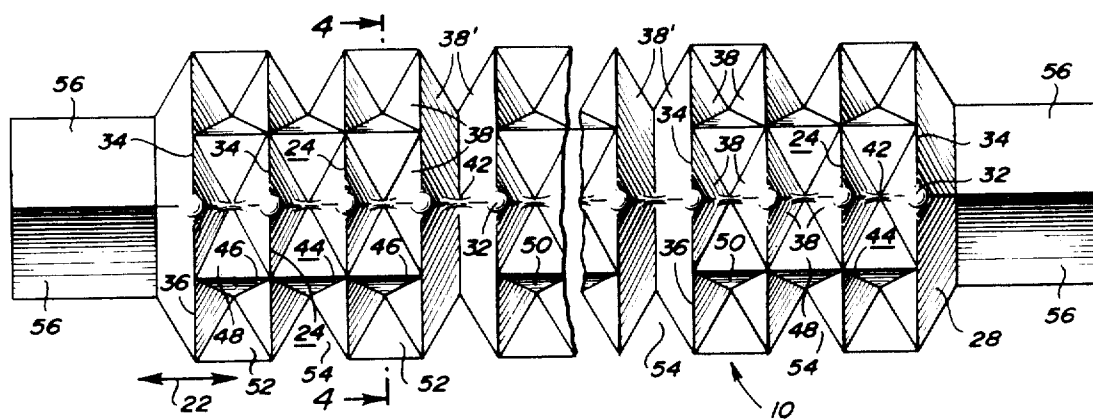
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[57] **ABSTRACT**

An edge protection device for protectively packaging articles. The edge protection device is interposed between the edges of the article and the edges of the inner walls of a shipping container. The protection device includes a set of fluted members joined to each other in a longitudinal direction. The fluted members pass in a direction substantially perpendicular to the longitudinal direction. Each fluted member is composed of a pair of rib elements formed in continuous relation to each other providing an apex at an intersection of the rib elements. The edge protector may be formed of molded plastic and is contoured to provide a multiplicity of load bearing surfaces.

7 Claims, 5 Drawing Figures



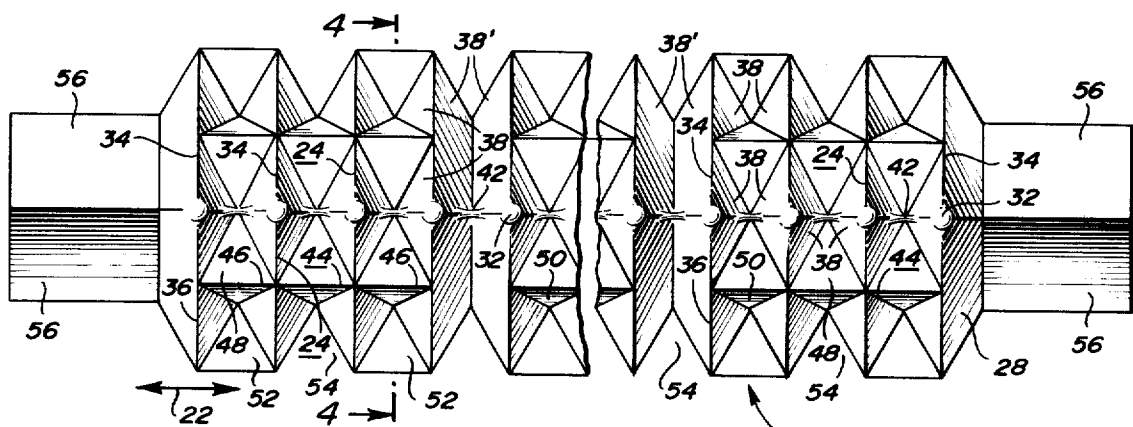


Fig. 1

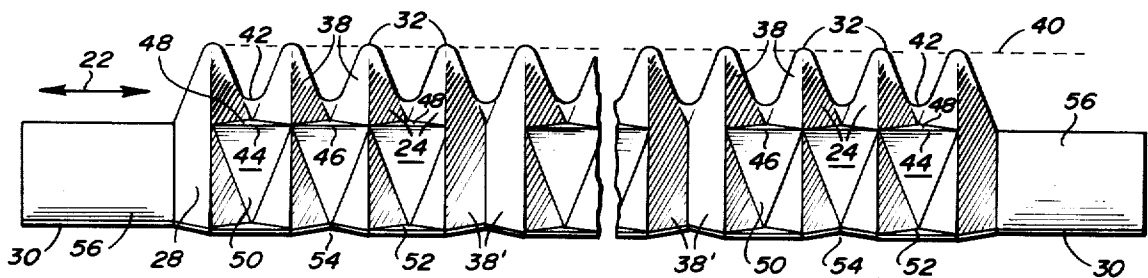


Fig. 2

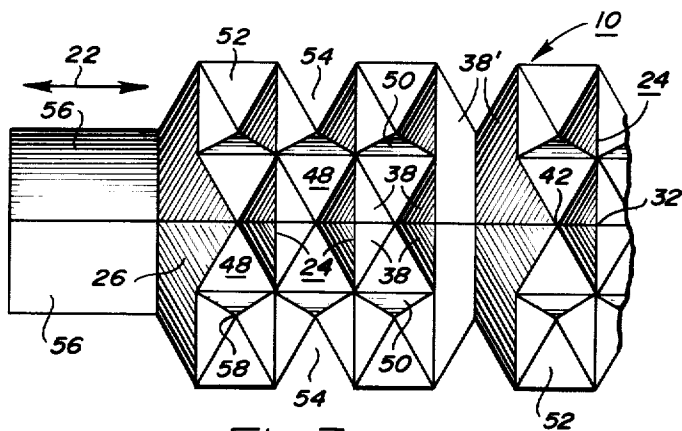


Fig. 3

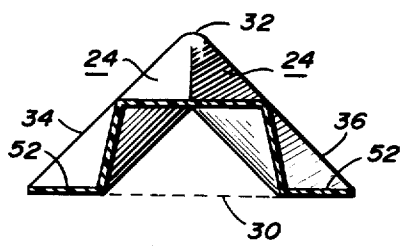


Fig. 4

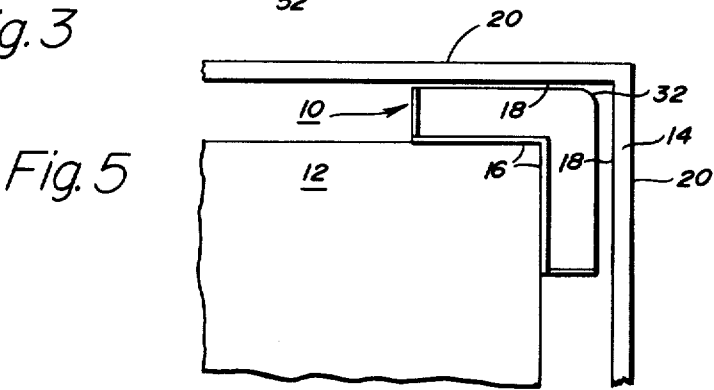


Fig. 5

EDGE PROTECTION DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of protectively packaging articles. In particular this invention pertains to the field of article edge protection devices interposed between the edges of an article and the edges of the inner walls of an enclosing container. More in particular, this invention relates to longitudinally extended devices having fluted member passing in a normal direction to the longitudinal extension.

2. Prior Art

Article edge protection devices are known in the art. Additionally, edge protectors formed of fluted members are also known in the art. However, some prior edge protectors, such as that shown and described in U.S. Pat. No. 2,905,315 are truncated in construction at the intersection of the rib elements forming the fluted members. These devices do not provide for an apex to be formed by the rib elements which lessens the ability of the prior edge protector to absorb dynamic loads applied to a container within which the article to be protected is being stored.

Further, such prior devices are composed of a two fold piece of material which allows the fluted members to separate under force loading. Such devices do not include web elements joining consecutively spaced fluted members which help prevent the rib members from separating.

Additionally, such prior devices do not provide for support rib elements joined to the fluted members. This has the effect of lowering the overall stiffness of the prior devices and lowering their capability to take impact loading. In such prior devices, where the fluted members are formed throughout the extension length of the device, the corners of the protected article is left unprotected. Such prior devices may not be inserted into the corner of the protected article and thus unnecessary voids are found where the article may be damaged by force loading.

In other prior devices, such as that shown and described in U.S. Pat. No. 1,821,692 the fluted members pass in a direction concurrent with the extension of the protective device. Such devices rely on the load damping effect of the bending of the fluted members which is generally weak. Thus such devices cannot withstand high impact loads which reduces their effectiveness in the force load protection of articles.

In other devices such as that shown and described in U.S. Pat. No. 3,542,636 fluted members are used in making corrugated board. However, such fluted members are used as padding with surfaces on opposite sides thereof for rigidity. Such devices are only formed in a single plane and cannot be mated to the orthogonal edges of an article to be protected.

SUMMARY OF THE INVENTION

An article protection device which comprises a set of fluted members. Each of the fluted members includes a first and second rib element interfacing with a next consecutively positioned fluted member. The first and second rib elements of each of the fluted members are formed in continuous relation to each other and provide an apex at an intersection of the rib elements of an associated fluted member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the edge protection device showing the device outer surface contour;

FIG. 2 is a front view of the edge protection device;

FIG. 3 is a partially cut-away plan view of the edge protection device showing the device inner surface contour;

FIG. 4 is a cross-sectional view of the device taken along the section line 4—4 of FIG. 1; and,

FIG. 5 is an elevation view of the device shown interposed between an article to be protected and a container.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1-5, there is shown article protection device or edge protector 10 to be used for protectively packaging furniture, appliances or other articles 12. In general, as shown in FIG. 5, article protection device 10 is interposed between outer shipping housing, carton, or container 14 and article 12. Protection device 10 interfaces with and is mated to article edge walls 16 throughout discrete contact points formed on an inner surface of device 10. Additionally, edge protector 10 contacts container inner walls 18 throughout discrete contact areas formed on an outer surface of device 10. Thus, the edges of article 12 do not come into contact with the walls of container 14 directly. It will be noted that article edges 16 and container inner walls 18 are shown to be formed in perpendicular fashion, however such reflects only the usual contour of container walls 18 and article edges 16 and is not restrictive to the inventive concept as will herein be detailed.

In overall concept, device 10 is inserted between article 12 and shipping container 14 in order to effectively diminish dynamic or shock load forces which may be transmitted to article 12 during the movement of housing 14. Additionally, device 10 has the ability of dissipating static loads which may be applied to the outer walls 20 of container 14 in order that the load stress applied to article 12 will be effectively reduced. Due to the unique geometrically contoured construction of edge protector 10, to be described in detail in the following paragraphs, impact forces and static loads are directed to specific pressure absorbing areas to be diffused as the result of a reinforced pleated or corrugated construction. Similarly, impact on a surface of device 10 may be transmitted to specific ridges for partially dissipating impact forces which may have a derogatory effect on article 12.

As is shown in FIGS. 1, 2, and 3, edge protector 10 is extended in a longitudinal direction as defined by directional arrow 22. Device 10 is formed of a set or plurality of fluted members 24 which provide a corrugated or undulating construction contour to protective device 10. The undulating construction contour forms a peripheral inner surface 26, shown in FIG. 3, which may be termed a mirror image of outer peripheral surface 28 shown clearly in FIGS. 1 and 2. Thus devices 10 may be inserted one within the other in a nested fashion to provide a saving in shipping volume when large quantities of protectors 10 are being transported. In effect, fluted members 24 take the form of extended tooth members rising from base line 30, shown in FIG. 4, to vertically directed apices 32.

Each of fluted members 24 is formed of a first rib 34 and a second rib 36 which extend upwardly from base plane 30 to apex 32 at an intersection of elements 34 and 36 as is clearly shown in FIG. 4. Each of rib elements 34 and 36 corresponding to a particular member 24 includes opposing sidewalls 38 which interface with the sidewalls 38 of a next consecutively spaced fluted member 24. As is seen, each of fluted members 24 are joined to a next consecutively spaced member 24 in longitudinal direction 22. In this manner, as is seen in FIG. 2, apices 32 form line envelope contour 40 extending in longitudinal direction 22.

Crests or apices 32 are dimensionally of equal height above base plane 30. Further, apex 32 of one fluted member 24 is joined in one piece formation to an apex 32 of a next consecutively spaced fluted member 24 as is shown in FIG. 2. This construction provides for valleys 42 to be formed between successively spaced fluted members 24 when taken in longitudinal direction 22. Thus, the formation and joining of fluted members 24 in this manner provides for an undulating surface in longitudinal direction 22. In this way apices 32 contact container inner walls 18 while not permitting continuous contact surface areas throughout the longitudinal extension of device 10.

In overall geometric concept, first and second rib elements 34 and 36 of each fluted member 24 are positionally located in a plane substantially perpendicular or normal to longitudinal direction 22. Thus the transverse extension, to the longitudinal direction, of each fluted member 24 is substantially parallel to all other members 24 forming device 10. Additionally, each of rib elements 34 and 36 intersect the other substantially in a perpendicular manner making the interface between article 12 and container 14 generally a mating contact. However, rib elements 34 and 36 may intersect each other at an angle other than 90° dependent upon the specific contour of the article 12 to be protected as well as the contour of the enclosing housing 14. Further, in FIGS. 4 and 5 it is shown that rib elements 34 and 36 are substantially of equal length. Such equal length dimensions may in general be preferred due to the ease of packing devices 10 when they are being shipped or otherwise transported. However, it will be understood that first and second rib elements 34 and 36 may be formed in unequal lengths responsive to a particular shipping criteria and that such will not adversely affect the load bearing capability of device 10.

In order to increase the overall stiffness of device 10, support rib or structural member 44 is joined in integral fashion to consecutively spaced fluted members 24 and passing in longitudinal direction 22. Support ribs 44 extend in a direction normal to the plane in which fluted members 24 pass. Each of structural members or support ribs 44 have an inverted V-shape when viewed in cross-section in longitudinal direction 22. Thus, support ribs 44 include a longitudinally extended apex 46 as well as upper surface 48 and lower surface 50 connected in one piece formation to an adjacent sidewall 38 of a respective fluted member 24. As is seen in FIGS. 1, 2, and 3, support rib upper and lower surfaces 48 and 50 respectively are formed in an inclined manner with respect to base plane 30. Thus, in a top view of device 10, surfaces 48 and 50 take the geometric contour of triangles where the base is support rib apex 46.

It will be noted, as clearly shown in FIG. 1, that support ribs 44 are formed between a set of four consecutively positioned fluted members 24. This provides structural rigidity for device 10. However, in order to achieve some flexibility of movement in a transverse direction with respect to longitudinal direction 22, support rib 44 is not formed between sidewalls 38' of the associated fluted members 24 shown in FIGS. 1 and 2. Thus, support rib 44 passes in longitudinal direction in discontinuous fashion through the extended length of device 10. However, it will be understood that support rib 44 may be joined to each of fluted members 24 in continuous fashion if more rigidity were required of device 10.

Additionally, device 10 further includes a plurality of base or web elements 52 connected in one piece formation to adjacently positioned sidewalls 38 of consecutively spaced fluted members 24. The web elements 52 are formed at a lower portion of fluted members 24 and their respective rib elements 34 and 36. Base elements 52 are formed in a plane extending substantially parallel to longitudinal direction 22 and further lying substantially in the plane of base plane 30. Webs 52 are alternately formed between consecutive fluted members 24 in order to achieve resiliency and flexibility of device 10 in a displacement transverse to longitudinal direction 22. Openings 54 thus permit flexibility of movement of device 10 in the transverse direction whereas web members 52 help prevent fluted members 24 from separating when an impact load is applied.

Referring now to FIG. 3, there is shown a bottom plan view of device 10 detailing inner surface 26 which in operation is interfaced with edge walls 16 of article 12. It will be noted in FIGS. 2 and 3 that each of fluted members 24 is divided by support rib 44 into an upper portion or section and a lower portion with respect to base plane 30. The section above support rib 44 provides for an internal surface contour defining a four sided pyramid having a centroidally positioned apex 32 and composed of the four inclined sidewalls 38 of associated fluted members 24.

In the lower portion between consecutively spaced fluted members 24, an internally directed four sided pyramid is formed. There are a plurality of such pyramids formed in longitudinal direction 22 which are composed of inclined surfaces 38, 50, and 52 to provide internally directed pyramid apices 58. Apices 58 provide discrete contact points or areas for interfacing with article 12 edge walls 16.

As shown in FIGS. 1, 2, and 3 opposing ends of edge protector 10 may include cuff elements 56 having an inverted V-shape similar to the main impact load absorbing portion of protector 10, however cuff elements 56 are devoid of fluted members 24. Such cuff elements 56 permit placement of device 10 in a manner so that it is positioned at the corner of container 14 without leaving unnecessary voids or unprotected areas for article 12.

In general, protection device 10 may be formed of a thermoplastic material with flex such as linear polyethylene, conventional polyethylene, polypropylene, acetate vinyl, or some like material. In construction, protection device 10 may be formed in a one-piece unitary structure through a number of conventional well known forming and molding techniques such as injection molding, blow molding, rotational molding, pressure forming, thermo forming, or some like technique.

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Thus through the use of the aforementioned materials, device 10 may not only be used on the straight edges of articles 12, but be mated to complex curve edges when the wall thicknesses are formed thin enough to provide flexibility.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention may be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. A thermoplastic article protection device being formed in a one piece unitary construction for being interposed between inner walls of a container and an edge of an article to be protected and comprising:
a set of fluted members joined each to the other in a longitudinal direction,
each of said fluted members having a first rib element and a second rib element,
each of said first and second rib elements of each of said fluted members including opposing sidewalls which interface with the corresponding sidewalls of a next consecutively spaced fluted member being positionally located in a plane substantially normal to said longitudinal direction, and extending in continuous relation each to the other from a base plane to form an apex at the intersection of said first rib elements with said second rib element,
each apex of each of said fluted members being joined to a next consecutive fluted member in continuous relation to form an undulating line envelop contour extending in a longitudinal direction, and
a structural member integrally formed with at least

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two consecutively positioned fluted members and passing in said longitudinal direction in a discontinuous fashion along the edge of the article being protected,

5 said structural member including an upper surface, a lower surface and a longitudinally extending apex, each of said upper and lower surfaces being connected to an adjacent sidewall of each of said consecutively positioned fluted members, being triangularly contoured and being formed in an inclined manner with respect to said base plane.

2. The article protection device as recited in claim 1 wherein said fluted members have an integral surface contour defining a four-sided pyramid.

3. The article protection device as recited in claim 1 where said first and second rib elements extend in a direction substantially perpendicular to each other.

4. The article protection device as recited in claim 1 where said first and second rib elements of each of said fluted members are substantially equal in length.

5. The article protection device as recited in claim 1 including a web element connected in one piece formation to adjacently positioned sidewalls of at least two of said consecutively spaced fluted members.

6. The article protection device as recited in claim 5 where said web element is formed at a lower portion of said fluted members, said web element forming a plane extending substantially parallel to said longitudinal direction.

7. The article protection device as recited in claim 6 where said web element is positionally located at a lowermost section of said protection device, said web element being extended substantially in a base plane of said protection device.

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