United States Patent

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[54] **CORNER POST WITH CORRUGATED STEEL INSERT**

9 Claims, 3 Drawing Figs.

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[51] Int. Cl. B65d 57/00
[50] Field of Search ..... 161/121, 123, 133–137, (Corr. Digest), 220; 229/140, 49

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ABSTRACT: Packing supports, such as L-shaped corner posts are provided with corrugated steel foil cores.

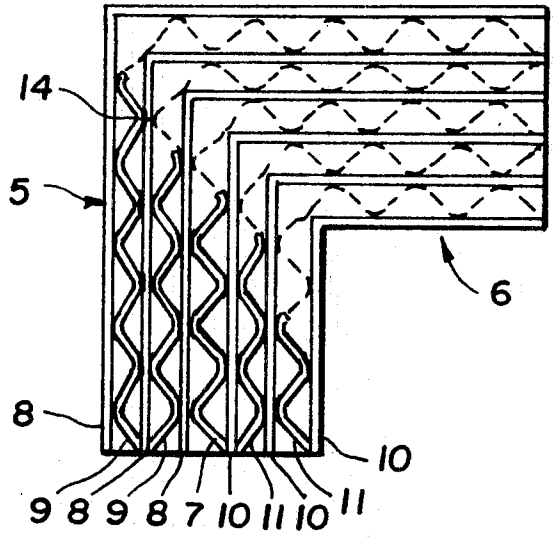


Fig. 1.

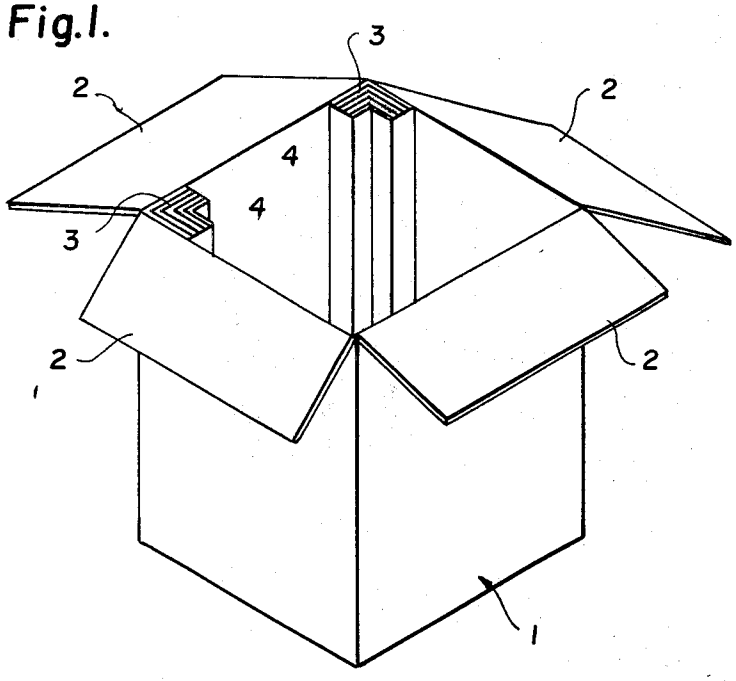


Fig. 2.

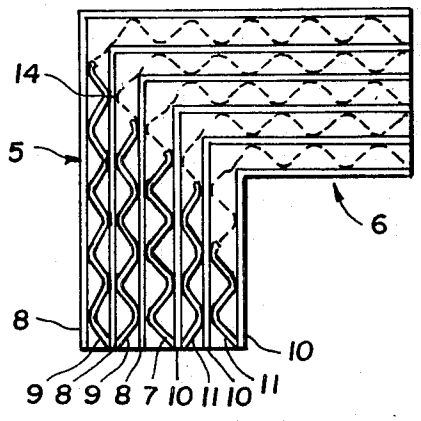
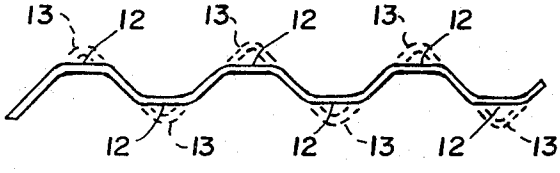


Fig. 3.



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CORNER POST WITH CORRUGATED STEEL INSERT

This invention relates generally to packing supports having corrugated steel foil cores, particularly where the supports comprise packing corner posts.

In packing relatively heavy articles in paperboard cartons, various types of packing supports, including corner posts, are used. These supports typically are formed of corrugated board and in the case of corner posts generally have an L-shaped cross section so as to fit within the corners of a carton and receive the corners of the article packed therein. Packing supports must be able to absorb any shock imparted to the carton so as to prevent damage to the article packed therein, and corner posts must, in addition, be able to support overlying cartons since the cartons are oftentimes stacked.

According to the present invention, packing supports meeting the requirements of packers are formed from two web units of packing material, such as corrugated board, and a corrugated steel foil core. In a particular application, corrugated steel foil cores are used in conjunction with corner posts provided within packing cartons to protect articles packed therein from both transverse and longitudinal crushing forces.

Generally, the corrugated steel foil core is bonded to adjacent web units by an adhesive, and I have found that the extent of the bonding area significantly affects the strength of the packing support. Thus, supports formed from steel foil cores bonded to web units by an adhesive placed continuously along the steel foil corrugation peaks or flutes have greater compressive strengths than similar supports where the adhesive is only spotted along the steel foil flutes. Similarly, supports constructed with steel foil cores having flattened corrugation peaks are of greater compressive strength than supports constructed of steel foil cores having normal or rounded corrugation peaks. I have also found that a packing support with a corrugated steel foil core after failing initially due to the application of a compressive force continues to support for an indefinite period a load only slightly less than its maximum capacity.

It is an object of this invention to provide packing supports having corrugated steel foil cores. Another object of the invention is to provide such supports in the form of L-shaped corner supports. Yet another object is to provide such supports where the cores are bonded to adjacent web units by means of an adhesive placed continuously along each of the steel foil corrugation peaks. Another object of the invention is to provide such supports where the steel foil corrugation peaks are somewhat flattened. Still another object of the invention is to provide L-shaped corner posts having a corrugated steel foil core bonded on each side to paperboard web units.

These and other objects and advantages of the invention will become apparent from the following description of an embodiment thereof with reference to the accompanying drawing in which:

FIG. 1 is a top perspective view of a carton having in two corners thereof corner posts formed with corrugated steel foil cores in accordance with the present invention.

FIG. 2 is an end view of a corner post formed in accordance with this invention, the thicknesses of the laminae forming the post being somewhat enlarged for purposes of clarity.

FIG. 3 is an enlarged end view of a corrugated steel foil core of modified construction wherein the peaks of the corrugations are flattened, the phantom lines indicating more rounded or normal corrugation peaks or flutes.

Referring to the drawing in detail, FIG. 1 illustrates a cardboard carton generally referred to by the numeral 1 and having flaps 2–2 for closing of the carton top. Positioned in each of the corners of the carton 1 are L-shaped packing supports or corner posts 3–3, only two being shown for ease of illustration. The article packed within the carton is placed therein so that its corners are received within the channels 4–4 of the corner posts. The posts thus provide resistance to transverse crushing forces applied to the carton. In addition, the corner posts because they extend from the bottom to the top of the carton 1 provide resistance to longitudinal crushing forces applied to the carton, as when a number of the packed cartons are stacked together.

As best seen in FIG. 2, the corner posts include an outside web unit 5, an inside web unit 6 and an intermediate corrugated steel foil core 7. The steel foil employed is from .002 inch to .006 inch thick and is in most instances in a hardened state, *i.e.*, the steel foil will not have been annealed after being rolled to final gauge. Web unit 5 includes a five-layered structure comprising alternating plain and corrugated paperboard webs 8–8 and 9–9, respectively. Web unit 6 is similarly formed of alternating plain and corrugated paperboard webs 10–10 and 11–11, respectively. The corrugations or flutes of the corrugated paperboard webs 9–9 and 11–11 and the steel foil core 7 extend longitudinally of the corner posts as they are positioned within the packing carton.

Each of the corrugated paperboard webs and the corrugated steel foil core element are bonded to adjacent plain webs by means of an adhesive 14 placed along the peaks of the corrugations. As already noted, the posts are able to resist a greater longitudinal crushing force before failure if the adhesive is applied in a continuous length along each of the corrugation peaks rather than being spotted along said peaks. The latter type of posts when subjected to longitudinal compression fail by folding of the steel foil between the points of adhesive contact.

Set out in table I are the results of tests carried out on posts both where the steel foil core is bonded to the web units by a continuous length of adhesive along each of its corrugation peaks and where the steel foil core is bonded to the web units by spot adhesive contact along each of its corrugation peaks. The posts tested were 45½ inches long and had either a .002 inch steel foil, A-flute core, a .002 inch steel foil, B-flute core, or a .003 inch steel foil, B-flute core. A-flute material has an approximate flute height of 0.187 inch at 36 flutes per foot, and B-flute material has an approximate flute height of .097 inch at 50 or 51 flutes per foot. The compressive load values represent the longitudinal crushing loads at which the posts initially failed.

TABLE I

Post Type	Compressive Load, pounds: Spot adhesive contact	Compressive Load, pounds: Continuous length adhesive contact
.00″ steel foil:		
A-flute	740	810
B-flute	810	910
.003″ steel foil, B-flute	950	990

Since the method of adhesive application determines in part the compressive strength of the posts, a good bond between the steel foil core and the web units is required. This can be accomplished by resistance heating of the steel foil core using an electrical power supply after the corner post is formed. Upon heating of the steel foil, the hot melt adhesive remelts, insuring a good distribution of the adhesive between the steel foil core and the web units.

Referring to FIG. 3, the phantom lines illustrate a corrugated steel foil core profile with normal or rounded peaks, and the solid lines illustrate a corrugated steel foil core profile with peaks that are somewhat flattened. It can be seen that the flattened peaks 12–12 provide a greater surface area for contact to the web units than the normal or rounded peaks 13–13. The use of a core having flattened peaks results in posts of improved compressive strengths.

To compare the relative strengths of posts having cores with flattened peaks and rounded peaks, five corner posts 46½ inches long with .006 inch steel foil cores were constructed. Three of the posts had steel foil cores with rounded or normal corrugation profiles, while two of the posts had flattened peaks of the type shown in FIG. 3. The compression load each of the posts was able to support before initial failure is set out

in table II Posts 1, 2 and 3 had a normal profile steel foil core, and posts 4 and 5 had a flattened profile steel core.

TABLE II

Post Number	Compression load (pounds)	Profile
1	1,755	Rounded.
2	1,775	Do.
3	1,725	Do.
4	1,790	Flattened.
5	1,965	Do.

A significant property exhibited by corner posts having corrugated steel foil cores is the ability of the posts to support a load of between zero and 100 pounds below the maximum supportable load for an indefinite period after initial failure. That is, the posts after failing initially under some maximum compressive force will continue to sustain a load between zero and 100 pounds less than that maximum. This is in contrast to conventional posts having wood veneer cores for which the compressive strength falls rapidly after the wood first cracks.

Also, posts with corrugated steel foil cores have more consistant maximum compressive strengths than do posts with wood veneer cores. The compressive strengths for the former vary within a range of about 120 pounds while the compressive strengths of the latter posts vary within a range of about 1,000 pounds.

I claim:

1. A packing support comprising first and second paperboard web units and a corrugated steel foil core between said units bonded thereto, each web unit including at least two plain paperboard webs and a corrugated paperboard web therebetween.

2. The support of claim 1 wherein the corrugations in said steel foil core are substantially flattened.

3. The support of claim 1 wherein said support has an L-shaped configuration.

4. The support of claim 3 wherein said steel foil core is secured to said web units by means of an adhesive placed along the entire length of each of the corrugation peaks in the steel foil core.

5. The support of claim 4 wherein the corrugations in said steel foil core are substantially flattened.

6. The support of claim 4 wherein the steel foil is in a hardened state.

7. The support of claim 4 wherein each of said web units is a five-layered structure comprising alternating plain and corrugated webs, the webs in contact with the steel foil core element being plain webs.

8. The support of claim 7 wherein the steel foil is in a hardened state.

9. The support of claim 8 wherein the steel foil is .006 inch thick.