

[54] BOX END STRUCTURE

[75] Inventor: **Anthony J. Fieri**, Rolling Hills Estates, Calif.

[73] Assignee: **American Forest Products Corporation**, San Francisco, Calif.

[22] Filed: **June 28, 1972**

[21] Appl. No.: **267,059**

[52] U.S. Cl. **206/523, 217/52, 220/72**

[51] Int. Cl. **B65d 81/04, B65d 85/34**

[58] Field of Search **220/4 R, 4 F, 9 F, 72, 220/DIG. 15, 523; 217/12, 13, 42, 43, 45, 17 R, 34, 36 R, 52, 53 R; 229/2.5, 23 R, 14 C; 206/46 C, 46 FC**

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Primary Examiner—William I. Price

Assistant Examiner—Allan N. Shoap

Attorney, Agent, or Firm—Robert C. Smith; William F. Thornton

[57] ABSTRACT

A lightweight, inexpensive box end structure capable of being utilized in place of wood box ends in crates and similar boxes may be constructed utilizing an integrally formed structural plastic housing and a porous lightweight filling. The housing includes strips defining a frame structure and internal wall means reinforcing and holding the frame structure as a structural unit. The filling fills the interior of the frame structure and is exposed at the sides of the frame structure so as to provide flat surfaces on the complete box end structure. Both the frame and the filling are preferably formed of a polymer material such as a styrene composition capable of receiving fasteners such as nails without cracking.

4 Claims, 4 Drawing Figures

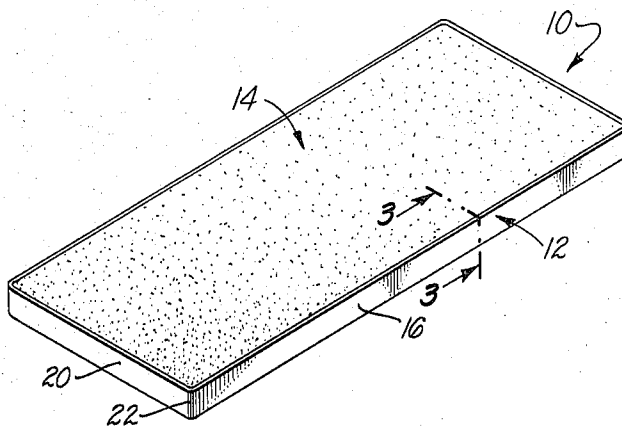


FIG. 3.

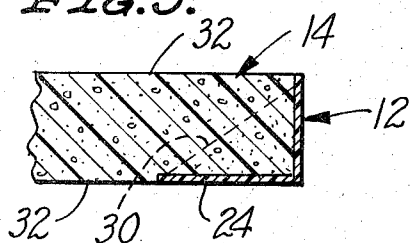


FIG. 1.

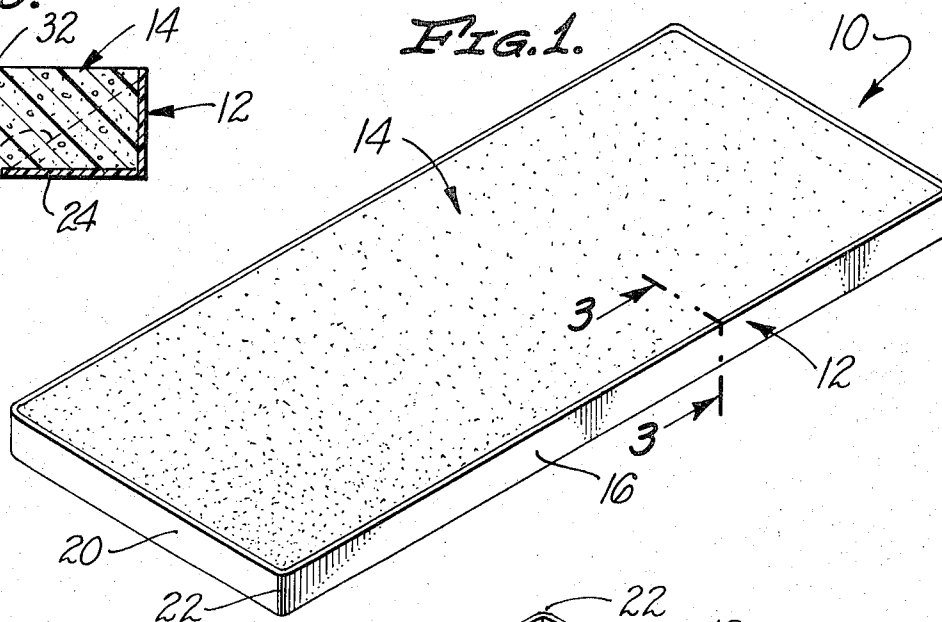


FIG. 2.

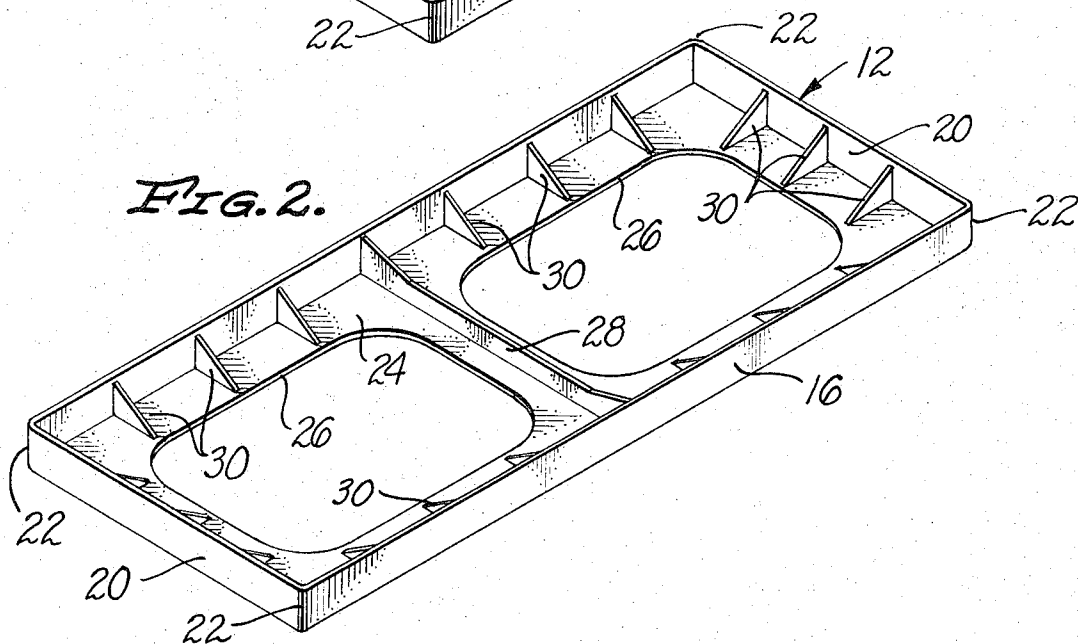
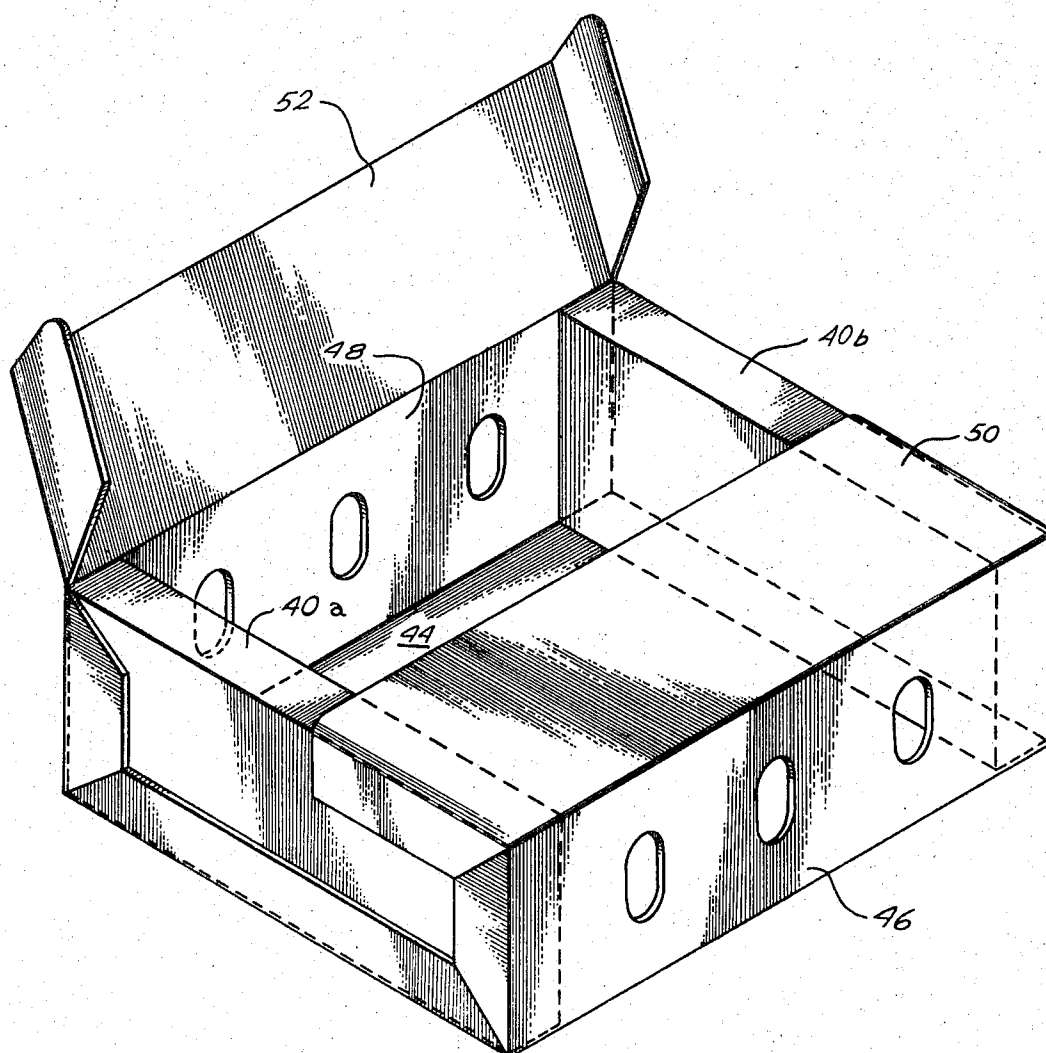


FIG. 4 PRIOR ART



BOX END STRUCTURE

BACKGROUND OF THE INVENTION

It is conventional to utilize boxes having comparatively thick, sturdy wood ends or end structures connected together by at least two box sides and a box bottom in packaging and shipping many types of agricultural products such as grapes, avocados and the like. Occasionally such boxes are referred to as crates. Normally such crates or boxes are constructed so that the members connecting the box ends are of comparatively thin, flat materials, such as wood, a corrugated, stiff cardboard-like composition or the equivalent.

The economics of the use of boxes as indicated in the preceding discussion is quite important. Normally these boxes or crates are essentially throw away items inasmuch as they are usually not reused. As a result of this factor the cost of a box as indicated is quite important. Further, because of shipping costs the weight of a box as indicated is quite significant. Because of shipping costs, it is considered that boxes as indicated should be as lightweight as is reasonably possible consistent with the strength characteristics necessary in these boxes for them to be utilized in their intended manner.

For many years boxes as indicated in the preceding have been entirely formed out of wood. Adequate and suitable lumber supplies for use in creating boxes or crates as indicated are becoming increasingly scarce. As a consequence of this the cost of wood to be utilized in these boxes has increased to a point where it is no longer desirable to utilize wood in boxes of the type indicated in the preceding employed primarily for packing and shipping agricultural products. Further, wood is somewhat disadvantageous for use in such boxes because of weight considerations.

As a result of these and various other factors it has been recognized that there is a need for improvement in the field pertaining to the structured of boxes used for purposes as indicated in the preceding discussion. It has been proposed to remedy this need through the utilization of significantly different boxes than have been employed in the past. By and large such proposals have been largely discarded for a wide variety of utilitarian and economic reasons which are unimportant to an understanding of the present invention. However, it should be noted that significant change in the field of boxes to be used in transporting agricultural products and the like has been resisted for a number of reasons.

Amongst these reasons is the reluctance of the industry as a whole to depart from essentially established ways or procedures. Another of these reasons is that there is a significant, existent investment in machines and equipment for manufacturing and handling boxes as have been conventionally used. For economic reasons it is desired that any improvement in the field of boxes of the type to which the present invention primarily pertains be of such a nature that existing equipment in this field can be utilized with any such improvement without any significant change or modification.

SUMMARY OF THE INVENTION

A primary objective of the present invention is to provide new and improved box end structures which can be directly substituted for presently utilized wooden box ends as are presently employed in boxes

such as are utilized in shipping agricultural products. From this broad objective it will be apparent that the invention is intended to provide box ends or box end structures which can be handled in the same manner as prior wood box ends in equipment for manufacturing boxes. The boxes created using box end structures in accordance with this invention are of such a nature that they can receive labels in the manner as existing boxes and they can be handled in exactly the same way as existing boxes utilizing wooden box ends.

An objective of the present invention is also to provide box end structures to be utilized as indicated which are advantageous from an economic standpoint in that they can be manufactured comparatively cheaply utilizing conventional equipment and techniques so that they are less expensive than presently utilized wooden box ends. A somewhat related objective of the invention is to provide box end structures as described which are also advantageous in that they are comparatively light in weight. This is important from the standpoint of shipping costs.

In accordance with this invention these and various related objectives of it are achieved in a box end structure to be utilized as previously described comprising an integrally formed, structural, rigid housing and a porous, lightweight filling. The housing utilized has parallel top and bottom strips located so as to be spaced from and parallel to one another and has two side strips connecting the ends of the top and bottom strips at corners into a frame structure in which the edges of all of the strips are located in two parallel planes. The housing also has wall means located within the parameter of the frame structure connecting all of the strips so as to reinforce and hold the frame structure into a structural unit.

The filling utilized is located within the interior of the housing in contact with all of the strips and the wall members so as to completely fill the interior of the frame structure. The filling is shaped so as to provide flat front and rear surfaces at the sides of the frame structure in the planes of the side edges of the strips. Preferably, both the housing and the filling are formed of a polymer composition capable of receiving and engaging common fasteners such as nails without cracking. The wall means utilized may be varied as hereinafter indicated so as to provide desired strength characteristics for the end structure to carry any intended weight load and so as to reinforce the housing against forces applied to it as fasteners are used with it in connecting an end structure into a complete box.

BRIEF DESCRIPTION OF THE DRAWING

Further details of the present invention are best indicated with reference to the accompanying drawing in which:

FIG. 1 is an isometric view of a box end structure in accordance with this invention;

FIG. 2 is an isometric view of a housing utilized in this box end structure;

FIG. 3 is a partial cross-sectional view taken at line 3—3 of FIG. 1; and

FIG. 4 is a perspective view of a typical "Bliss" type container used in shipping of fruit.

The drawing is primarily intended to illustrate for explanatory purposes certain structures coming within the scope of the intangible concepts of the invention set forth and defined in the appended claims. These con-

cepts can be utilized in many differently dimensioned and differently appearing structures in accordance with routine engineering practice.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 of the drawing there is shown a box end structure 10 in accordance with this invention which is capable of being used as a replacement for existing wooden box ends. This end structure 10 includes an integrally formed structural, rigid housing 12 and an internal filling 14 of a porous, solid, lightweight material. This housing 12 includes parallel top and bottom strips 16 and 18 located so as to be spaced from and parallel to one another. The ends of these strips 16 and 18 are connected by side strips 20 at the corners 22 into what may be regarded as a frame structure. Preferably the corners 22 are rounded slightly so as to minimize stresses and strains which might cause breakage. If desired, however, these corners 22 may be rounded to a significant extent or beveled depending upon the particular desires of a box manufacturer.

The housing 12 also includes a web-like cross-wall 24 located perpendicular to all of the edges of the strips 16, 18 and 20 which are located in the same plane at one side of the housing 12 so as to connect all of these edges. In order to achieve economy of material this wall 24 is preferably provided with at least one and preferably several internal openings 26 of a curved character. When shaped in this manner the wall 24 will serve to connect all of the strips 16, 18 and 20 so as to reinforce and hold these strips into a structural unit which will not twist in generally the plane or direction of these strips.

The housing 12 also preferably includes at least one and preferably more internal walls or beams 28 extending perpendicular to and between the strips 16 and 18 so as to be attached to these strips and to the wall 24. The housing 12 also preferably includes a plurality of triangular walls or gussets 30 extending perpendicular to and between and attached to the strips 16, 18 and 20 and the wall 24. All of these various walls described serve to reinforce the housing 12 so as to prevent it twisting in the direction of its narrowest dimension and so as to make it into what may be regarded as a strong structural unit.

The wall 28 can be regarded as a structural rib or beam which serves to transmit forces between the strips 16 and 18 during the use of the end structure 10. The numbers of these ribs or walls 28 and the gussets 30 used for any particular application will be determined normally with reference to the strength characteristics desired in a particular box. Similarly, the location of these parts will be determined in the same manner in accordance with routine engineering skill.

The filling 14 utilized completely fills the interior of the housing 12 so as to provide in the end structure 10, flat front and rear end surfaces 32, either of which may be considered as a front or a rear surface. These surfaces 32 lie in planes which are the same as the planes in which the edges of the strips 16, 18 and 20 are located. This filling 14 is designed to provide these surfaces 32 in such a manner as to lend a degree of stability to the housing 12. These surfaces 32 are, also, of the flat configuration so that the complete end structure 10 may be readily handled in the same manner as a conventional box end. Thus, the complete end structure 10

may be used with existent labels such as are commonly applied to boxes of the type to which this invention pertains. Further, because the surfaces 32 are flat, there is no danger of agricultural products or anything else getting caught within the interior of the end structure 10 during packaging, handling or the like.

Preferably, both the frame 12 and the filling 14 are formed out of a polymer composition or material capable of receiving conventional fasteners such as are utilized in the box industry, such as nails, staples and the like without cracking in such a manner that such fasteners can be used to securely hold conventional box sides, bottoms and tops to an end structure 10 as described. Conventional adhesives can be used in lieu of or in addition to such fasteners. Also, preferably the housing 12 and the filling 14 are both formed of an inexpensively molded or formed polymer material.

It will be recognized that certain of such polymer materials are relatively brittle and that they are therefore not suitable for use with the present invention. It is presently preferred to form the housing 12 out of a high-impact styrene composition since this material has been found to be satisfactory in an end structure as described and is comparatively inexpensive. It is also presently preferred to form the filling 14 out of an expanded or exfoliated porous styrene composition such as is commonly utilized in packing various goods. Such a composition is sometimes referred to by the trademark "STYROFOAM," and is relatively inexpensive, is light in weight and serves adequately in an end structure such as the structure 10. Other suitable compositions for use in the structure 10 can easily be determined on the basis of price and routine experimentation as to physical characteristics.

FIG. 4 shows a perspective view of a typical "Bliss" container used in the shipping of fruit. End panels 40a and 40b in this prior art embodiment may be replaced with panels like those of FIGS. 1, 2 and 3. In this case, the face panel is preferably positioned to the inside to provide greater strength. The top, bottom and side panels are formed of folded corrugated paper although they could be formed of a moisture-resistance paper covered wood veneer of a type well known in the art. In such case the wood core is omitted at the edges to permit folding where desired. Each of the bottom panels 44, side panels 46 and 48 and the top panels 50 and 52 are formed with flaps at each end which are folded over the ends of the container and glued to the outside face of each of members 40a and 40b.

Box end structures as herein described may be easily and conveniently manufactured at a comparatively nominal cost by initially molding housings as indicated using known injection molding techniques. Any such so molded housing will normally then be located in an enclosed mold with a composition capable of being expanded and such a composition will then be exfoliated or expanded in accordance with conventional practice so as to create a complete end structure as described.

When a structure as indicated is formed in this manner the filling created will be in direct intimate contact with the entire interior of the housing used and will normally stay in place in this housing without the use of special adhesives or the like. This is particularly the case when both the housing and the filling used employ the polymer styrene. Where the same polymer is used in forming both of these parts, the filling will form a

bond with the housing at the temperatures used in expanding the styrene (or other polymers used for both parts) which aids in their adhesion to one another.

It is also possible to manufacture box end structures as herein indicated in other manners. Thus, for example, the frames and fillings in such structures may be separately manufactured using known techniques, and then can be secured together as, for example, through the use of an adhesive, sonic welding or the like. In all cases, however, it is desired that the filling fit closely within the interior of an entire frame so that it can contribute as much as possible to rigidity and strength.

From a consideration of the foregoing it will be realized that box end structures as herein described are highly advantageous from an economic standpoint. One important feature relative to these structures will not be normally apparent from the foregoing. This feature is that these structures are much more stable than prior wood structures. Normally they will not change dimensionally to any significant degree with changes in humidity. Normally, they will not absorb like wood to any significant degree. This is considered significant in case fruit in contact with one of these end structures should tend to rot or decompose. Also, there is no danger of wood derivatives leaching from these end structures in use.

I claim:

1. A box end structure to be utilized in boxes in which two of said end structures are secured together so as to be spaced from and located parallel to one another by at least two box sides and a box bottom, in which the improvement comprises:

said end structure including an integrally formed, structurally rigid housing and a solid, porous, lightweight filling,

said housing being formed of a high impact strength styrene polymer and having parallel top and bottom strips located so as to be spaced from and parallel to one another and having two side strips connecting the ends of said top and bottom strips at corners into a frame structure in which the edges of all of said strips are located in two parallel planes, said housing also having wall means located within the perimeter of said frame structure connecting all of said strips to reinforce and hold said frame structure into a structural unit, said wall means including a web-like cross wall extending between said strips, and internal wall means connected to said web-like cross wall and said strips,

said filling being formed of an expanded styrene polymer composition and located within the interior of said housing in contact with all of said strips and said wall means so as to completely engage and fill the interior of said frame structure so that said filling is held within said housing, said filling serving to provide flat front and rear surfaces at the sides of said frame structure in said planes.

2. A box end structure as claimed in claim 1 wherein: said housing and said filling are formed of materials capable of receiving fasteners driven through said strips without significant cracking.

3. A box end structure as claimed in claim 1 wherein: said internal wall means comprises at least one internal beam extending between two of said parallel strips.

4. A box end structure as claimed in claim 1 wherein: said wall means includes gussets extending through said cross-wall and said strips, said cross-wall includes at least one internal opening located in the center region thereof.

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