# United States Patent [19]

**Peterson et al.**

[11] **3,905,478**

[45] **Sept. 16, 1975**


[54] **CONTAINER CONSTRUCTION AND END PANEL THEREFOR**


[75] Inventors: **Dale S. Peterson; Onick M. Vartikian,** both of Fresno; **Anthony J. Fieri,** Rolling Hills Estates, all of Calif.

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



[22] Filed: **Mar. 26, 1973**

[21] Appl. No.: **344,807**

**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 267,059, June 28, 1972, Pat. No. 3,845,861.

[52] **U.S. Cl.** ..... **206/523;** 161/69; 217/52; 220/72

[51] **Int. Cl.**[2] ..... **B65D 81/04;** B65D 85/34

[58] **Field of Search** ..... 217/52, 53; 220/9 F, 72; 229/36, 14 C, 2.5; 206/523, 524



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,282,908 | 5/1942 | Thompson | 206/523 |
| 2,918,379 | 12/1959 | Lurie | 220/72 |
| 3,181,693 | 5/1965 | Freistat | 217/52 |
| 3,193,095 | 7/1965 | Martino et al. | 229/14 C |
| 3,344,973 | 10/1967 | Stoden | 229/14 C |
| 3,391,038 | 7/1968 | Whitesides | 161/69 |
| 3,487,991 | 1/1970 | Stern | 229/36 |
| 3,561,177 | 2/1971 | Agro et al. | 161/69 |
| 3,608,143 | 9/1971 | Schutz | 229/2.5 |
| 3,700,096 | 12/1972 | Reifers | 220/72 |
| 3,709,425 | 1/1973 | Stapp | 206/45.31 |



*Primary Examiner*—William I. Price
*Assistant Examiner*—Allan N. Shoap
*Attorney, Agent, or Firm*—Robert C. Smith; William F. Thornton



[57] **ABSTRACT**

A container and particularly an end panel therefor is described in which the generally rectangular end panels are formed of a molded frame of high density plastic such as polystyrene with a plurality of internal ribs and webs for stiffening the frame and for receiving and holding nails. The molded frame is filled with a low density plastic which is fused to the frame. Two embodiments are disclosed which differ slightly in configuration depending upon use. Two complete container embodiments are shown, including one wherein the top, bottom and side panels are glued to the end panels and another in which the top, bottom and sides are nailed to the end panels.


**7 Claims, 8 Drawing Figures**

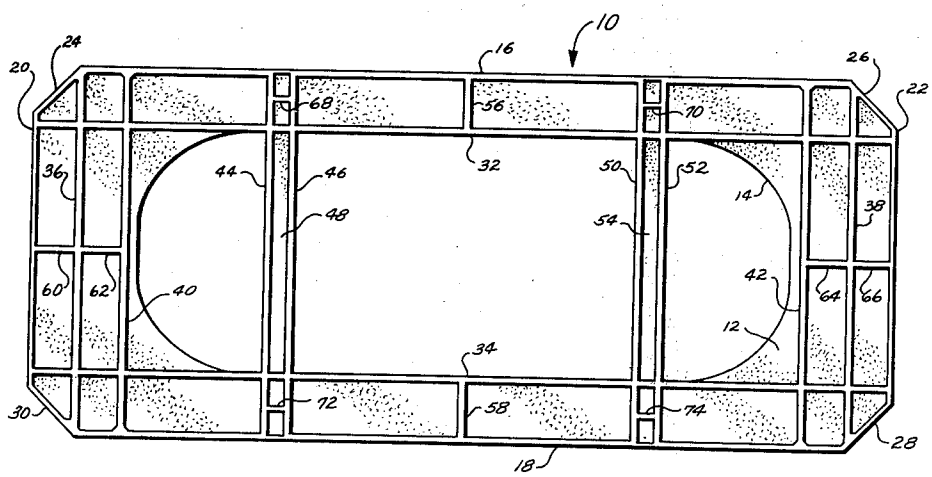


FIG. 3

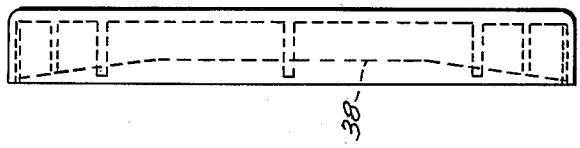



FIG. 1

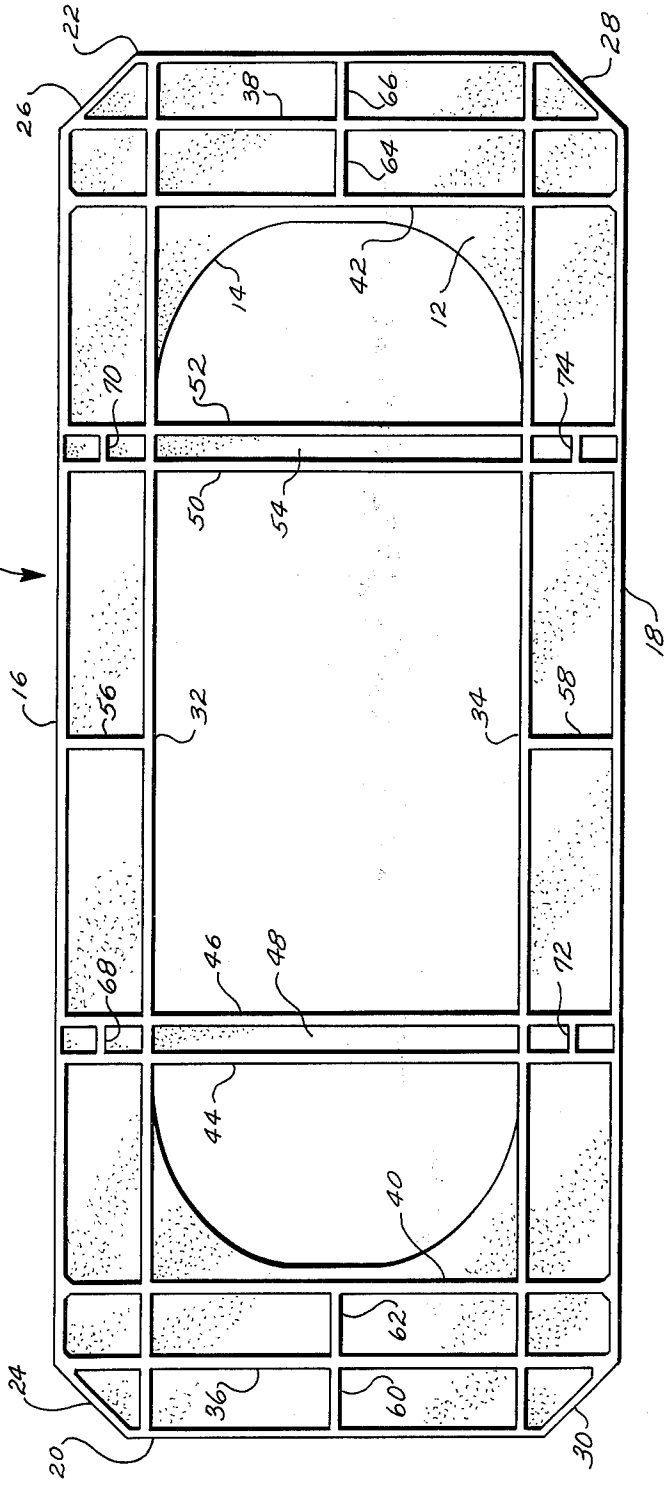



FIG. 2

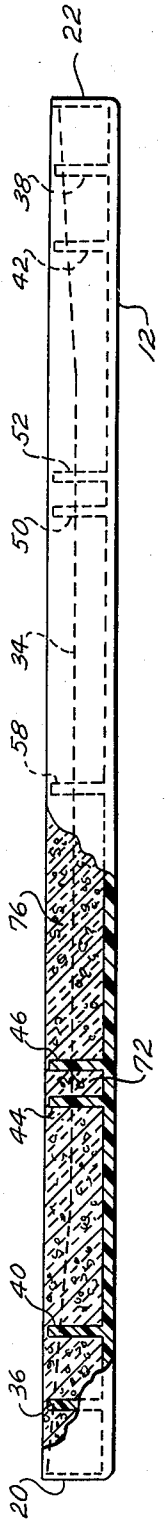


FIG. 6

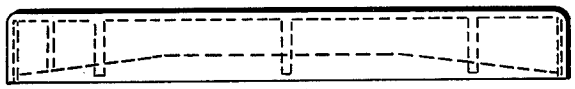


FIG. 4

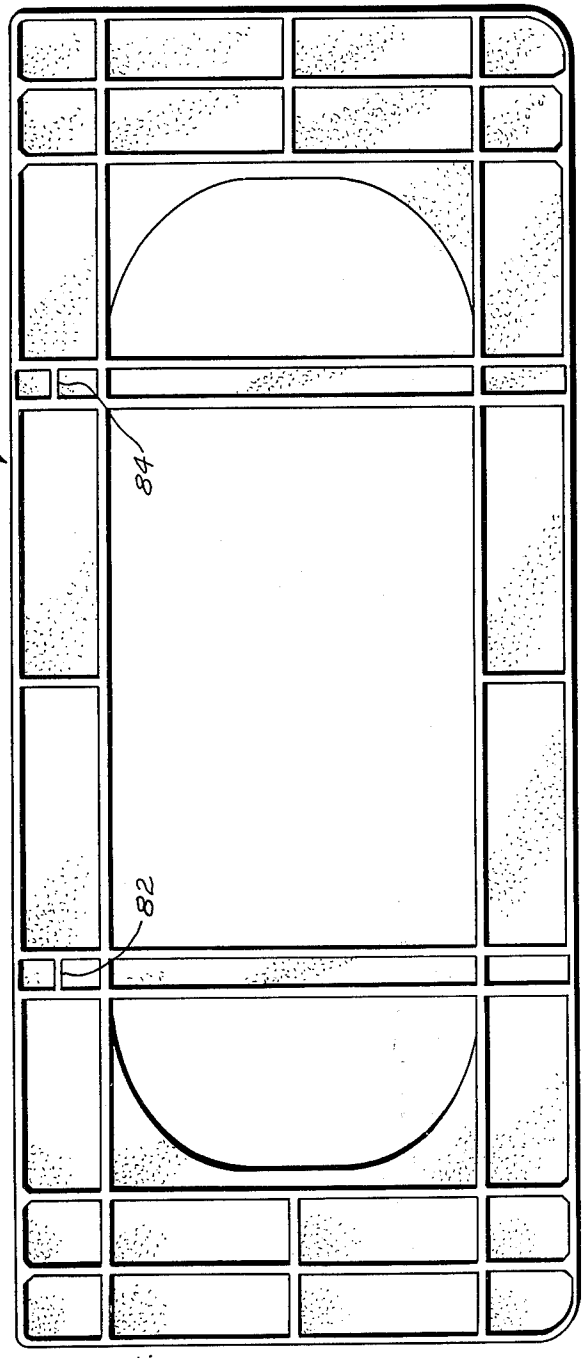



FIG. 5

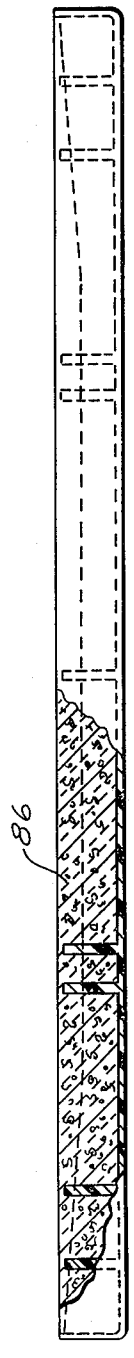


FIG. 7

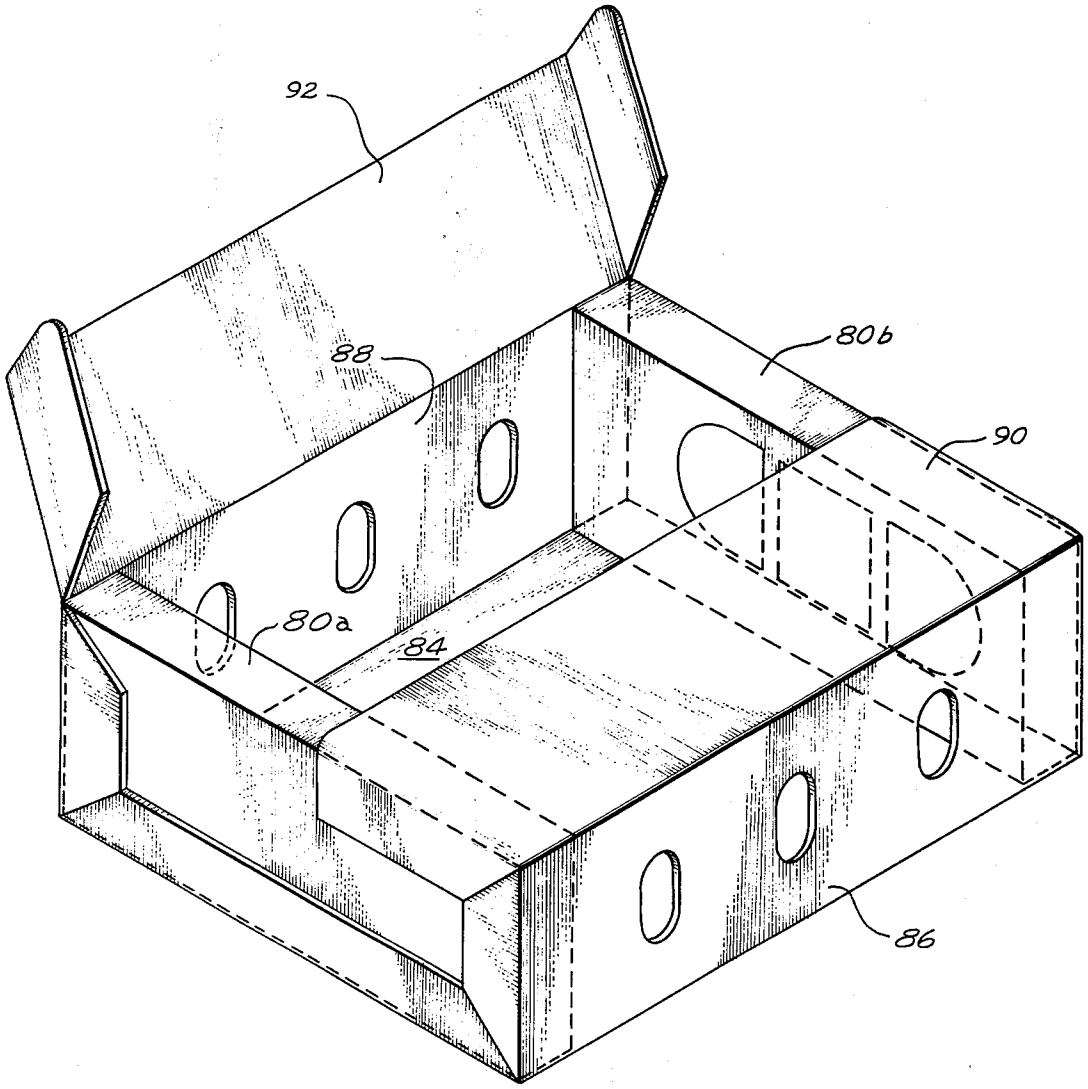
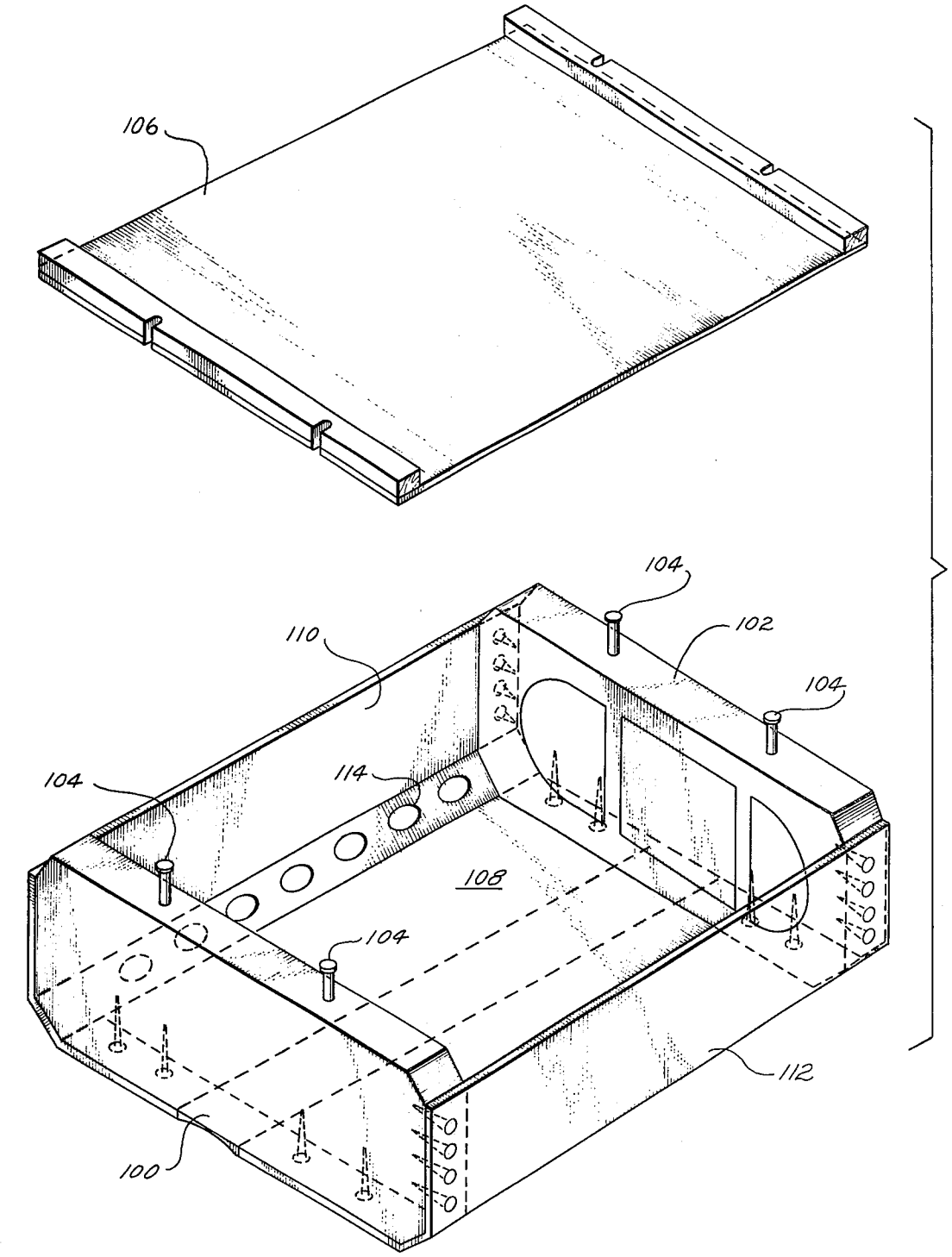


FIG. 8



# CONTAINER CONSTRUCTION AND END PANEL THEREFOR

## CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of the co-pending Application Ser. No. 267,059 filed June 28, 1972, by Anthony J. Fieri, entitled "BOX END STRUCTURE" and now U.S. Pat. No. 3,845,861, issued Nov. 5, 1974.

## BACKGROUND OF THE INVENTION

Shipping containers for the packaging of fruit must incorporate greater than normal resistance to crushing since they are expected to withstand being stacked many containers high and, in the case of such produce as grapes, must also withstand storage in a very high humidity environment for several months. The traditional box used for this purpose has been made of wood with ends of substantial thickness which, of course, do resist crushing. Because of the expense of using wood, another type which as been used for this purpose is a fiberboard container having its ends formed with a plurality of layers of corrugated paper such that although top, bottom and sides are a single layer thick, the end panels may be two or three layers thick. As is well known by those skilled in the art, such an end panel does have considerable resistance to crushing so long as its remains dry. Another design which has been used in corrugated paperboard boxes to resist crushing includes folded columns of paperboard in the corners. Despite various measures to impregnate the paperboard with waxes or other materials, none of these types of containers have proved entirely satisfactory for storing grapes and tree fruit, etc., since such measures are expensive and even multiple-layered paperboard boxes deform under compressive loads when subjected to very high humidity.

## SUMMARY OF THE INVENTION

A type of container which has been used extensively in connection with packing and storing fruit is a fiberboard container with side panels formed with flaps which are folded over and glued to the end panels, commonly known as a "Bliss" type container. This design is well adapted to mass production and permits some flexibility in the choice of end panels. Applicant has devised a container and an end panel therefor which is uniquely suited to resisting heavy compressive loads in a high humidity environment. The end panel is formed of a unitary member wherein a thin walled frame of high density plastic such as polystyrene including a face plate with a rim and a plurality of reinforcing rib members and webs is filled with and bonded to a low density expanded plastic material. The resulting end panel structure has good resistance to crushing, will not absorb moisture as does paper, and will hold nails so that side, top and bottom members may be nailed to it. It also accepts glue readily so that it is adapted to the use of the "Bliss" type container.

Other advantages are that this type of end panel construction will not retain any significant amount of heat (speeds up the cooling of the produce), has shock absorbing qualities, provides a very clean appearance, and it is dimensionally very precise and stable as compared with the usual wood or corrugated box end. These advantages are achieved at a manufacturing cost which is currently competitive with box ends of wood and, as compared with wood, a saving of approximately 1 pound per box in weight is achieved which results in appreciable savings in shipping costs. Modifications in design for particular applications are easily effected through variations in the mold for the frame as exemplified by the embodiments shown herein.



## DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of a frame for a box end made according to our invention;

FIG. **2** is a side view, partly in section, of the frame of FIG. **1**, as filled with expandable low density plastic material.

FIG. **3** is an end view of the structure of FIGS. **1** and **2**:

FIG. **4** is a plan view of a frame for another embodiment of our invention;

FIG. **5** is a side view, partly in section, of the frame of FIG. **4** as filled with expandable low density plastic material.

FIG. **6** is an end view of the embodiment of FIGS. **4** and **5**.

FIG. **7** is a perspective view of a "Bliss" type container using box ends made according to our invention.

FIG. **8** is a perspective view of a conventional container with sides, top and bottom nailed to box ends according to our invention.

Referring now to FIG. **1**, a plan view is shown of a frame of high density plastic material which forms a portion of a box end made according to our invention. This frame consists of a unitary molded member **10** normally of polystyrene material, parts of which include a face panel **12** which is cut out in the center to form an opening **14**, a plurality of rim sections fastened to the outside edges of face panel **12** including top and bottom sections **16** and **18**, and end sections **20** and **22**. There may also be included a plurality of diagonal rim sections **24, 26, 28** and **30** joining the top and side sections where the corners are tapered as shown in FIG. **1**.

Positioned within and parallel to the rim sections are a plurality of reinforcing ribs **32, 34, 36** and **38** spaced inwardly from the rim section and positioned to afford further stiffness to the structure. The rim sections and rib sections are integrally formed and attached to the face member **12**, and the rib sections provide additional stiffness to the structure. A pair of reinforcing cross members **44** and **46** cooperate with a flat section **48** actually forming part of the face member **12** to provide a stiffening structure of channel-shaped cross section extending from the top to the bottom rim sections. A similar structure consisting of reinforcing cross members **50** and **52** joined by means of strip **54** extends between the top and bottom rim sections at the opposite side of the frame member **10**. The numbers, locations and dimensions of such reinforcing cross members will be controlled by the dimensions of the frame structure and the forces which it is designed to resist, as will be recognized by those skilled in the art.

It will be observed that the reinforcing cross members located as shown, substantially reduce the length of span of rim sections **16** and **18** and rib sections **32** and **34** which are unsupported by cross members. Additional support is provided by short cross members **56** and **58** which bridge between members **16** and **32** and members **18** and **34**, respectively.

A similar bridging structure is provided by webs **60** and **62** with respect to side rim section **20** and reinforcing ribs **36** and **40**; and webs **64** and **68** with respect to side rim member **22** and reinforcing ribs **38** and **42** respectively.

The structure thus far described, although formed of high density polystyrene plastic material is of such thin walled construction that comparatively little material is required to produce it. It is very light, and yet has substantial resistance to crushing or twisting forces. Because of the inherent holding power of the polystyrene plastic material, conventional box nails can be driven into the rim sections and where they also intersect internal supporting ribs, they will be held securely by two layers of this material. In order to provide a special anchor for nails, a plurality of small ribs **68, 70, 72** and **74** have been incorporated between the reinforcing cross members **44** and **46** and between **50** and **52** as shown, which may be used to attach the top and bottom of the box to the frame structure **10.** Thus a conventional box nail driven through the rim section **16,** and rib **68** will be held securely by at least these two layers of high density plastic material and may also penetrate rib **32.** Nails driven from the side into rim sections **20** or **22** will normally penetrate at least ribs **36** and **38,** such that they are also held by at least two thin walls of the plastic material.

FIG. **2** shows a side view of the structure of FIG. **1,** partly in section, wherein portions are shown in phantom to illustrate the configuration of the internal ribs. In this view a portion of the rim section **18** is broken away to shown, in section, internal cross ribs **40, 44** and **46,** and a portion of rib **36.** Structure **10** is shown filled with low density, expanded filler material **76** of polystyrene which, in combination with the internal ribs and the external rims described results in a very strong and rigid rib structure for a box end. It will be observed that the internal rib **34** although just short of the height of the side rim sections at its point of attachment thereto, tapers to a lower height and this lower height is retained across the substantial proportion of the length of the frame structure. This lower height has been found to be structurally sufficient and aids in assuring that the expanded filler material **76** completely fills the frame member **10.** Reference to the end section, FIG. **3** shows that the reinforcing rib **38,** shown in phantom, also has a lowered center section to facilitate the distribution of the expanded plastic material into the many separate compartments formed by the rib members. Reinforcing ribs **36, 40** and **42** are preferably of the same configuration as rib **38,** as are the cross members **44, 46, 50** and **52.**

FIG. **4** shows a molded frame structure similar to that of FIG. **1** but modified in certain respects for a particular application. The frame structure **80** is intended for a box end for many produce items and does not have the tapered corners of the configuration in FIG. **1,** but has rounded corners at the bottom and substantially square corners at the top. Since this configuration is asymetrical, the top side is established by the square corners and is designed to receive nails into the top edge only wherein short rib sections **82** and **84** are included. One particular application for which this structure is adapted, is the reception of key nails which permit notched covers to be slipped on and off as desired. Ordinarily, the remainder of the container may be attached to the box end structure as described below.

FIGS. **5** and **6** are side and end views respectively, of the frame of FIG. **4** with the expanded filler material included. A portion of the side of FIG. **5** is shown broken away to show the internal structure in section, the lightweight expanded plastic portion being shown at numeral **86.** Here again, it will be observed that the internal reinforcing ribs are all of a tapered configuration to a lowered center section to aid in the distribution of the expanded lightweight plastic material as it is forced into the frame structure. FIG. **4** has a large center opening similar to opening **14** of FIG. **1** and, in each case, the expanded material fills in to take up the thickness of the face panel so that the combined box end is smooth across both front and back faces.

FIG. **7** shows a perspective view of a typical "Bliss" container used in the shipping of fruit. In this particular application each of the end panels **80***a* and **80***b* are essentially the same as that described with respect to FIGS. **4, 5** and **6.** 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 **84,** side panels **86** and **88** and the top panels **90** and **92** 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 **80***a* and **80***b*.

FIG. **8** is a view similar to FIG. **7** of a shipping container of a conventional type wherein the top, bottom and side panels are nailed to end panels **100** and **102.** A plurality of key nails **104** are driven only partially into the top of members **100** and **102** to permit the notched cover section **106** to be easily slipped on and off as desired. In this embodiment the bottom **108** and sides **110** and **112** are of the paper covered wood veneer material referred to above. The wood core material is eliminated at the bottom corners to provide a means for folding across the bevelled corners of the end panels **100, 102** and to provide openings **114** for ventilation.

While only two embodiments of our end panel have been shown and described herein, other configurations will occur to those skilled in the art. Thus, while the panels shown are rectangular they could be made square with proper attention to the direction, size and arrangement of reinforcing cross members. Trapezoidal shapes may be desired for certain decorative effects and would naturally give rise to even more of the triangle-shaped chambers similar to that defined by diagonal rim section **24** and ribs **32** and **36** of FIG. **1,** thus providing a very rigid panel. And while polystyrene has been described herein as a preferred material, other plastics such as polypropylene are also useful in this application.

We claim:

**1.** In a container having top, bottom and side panels; a pair of end panels each comprising a molded frame of high density plastic material, said frame including a face panel and top, bottom and side rim sections attached around the periphery of said face panel and of a depth equal to the desired thickness of said end panel;

a reinforcing rib member spaced inwardly from each of said top, bottom and side rim sections and attached to said face panel, each of said rib members

being at a depth of at least over half the thickness of said end panel;

at least one reinforcing cross member of a depth substantially equal to the thickness of said end panel extending between said top and bottom rim sections and spaced a significant distance from said rim sections; the depth of said reinforcing rib members which are parallel to said top and bottom rim sections is less than the depth of said rim sections over at least a substantial portion of their length;

and a layer of low density, expanded plastic filler material fused to said frame and filling said frame substantially to the depth of said rim sections.

**2.** End panels for a container as set forth in claim **1** wherein said face panel has an opening constituting a substantial portion of its area and wherein two reinforcing cross members are included bridging across said opening.

**3.** End panels for a container as set forth in claim **2** wherein said reinforcing cross member includes a channel section over at least a portion of its length.

**4.** End panels for a container as set forth in claim **3** including a plurality of closely spaced webs extending across the channel sections of said reinforcing cross members substantially parallel to and in close proximity to at least one of said top and bottom rim sections.

**5.** End panels for a container as set forth in claim **4** wherein said webs are positioned between said top rim section and the reinforcing rib members spaced therefrom.

**6.** End panels for a container as set forth in claim **1** including a second reinforcing rib member spaced inwardly from each of said side rim sections.

**7.** End panels for a container as set forth in claim **1** wherein said panel includes a plurality of webs extending substantially perpendicularly between said rim sections and said reinforcing rib members.

* * * * *