United States Patent

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[54] **STRUCTURE**
9 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **108/51,** 108/58
[51] **Int. Cl.** **B65d 19/18**
[50] **Field of Search** ..... 108/51-—58; 229/1.5 B

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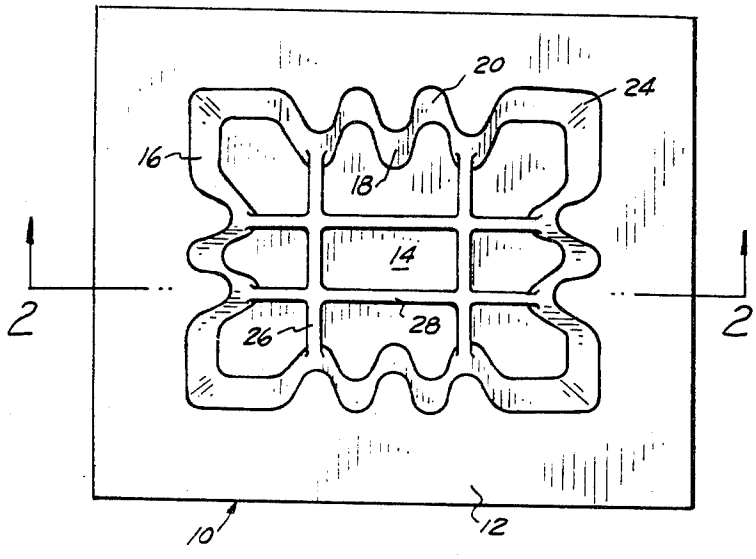
ABSTRACT: This invention relates generally to cardboard structures, and particularly those for use in industrial pallets. The cardboard structure comprises layers of corrugated cardboard with corrugations running in different directions. This allows the resultant structure to take significant amount of stress in different directions.

A pallet structure utilizing this cardboard also has feet formed from a single sheet of thin plastic material. It is free from sharp corners and stress risers and has ribs and ridges and valleys giving added strength to the resultant structure. A pallet having such feet has stringers made of a sandwich construction of corrugated cardboard covered by layers of corrugated cardboard having corrugations running in a direction perpendicular to the corrugations in the sandwich stringers.



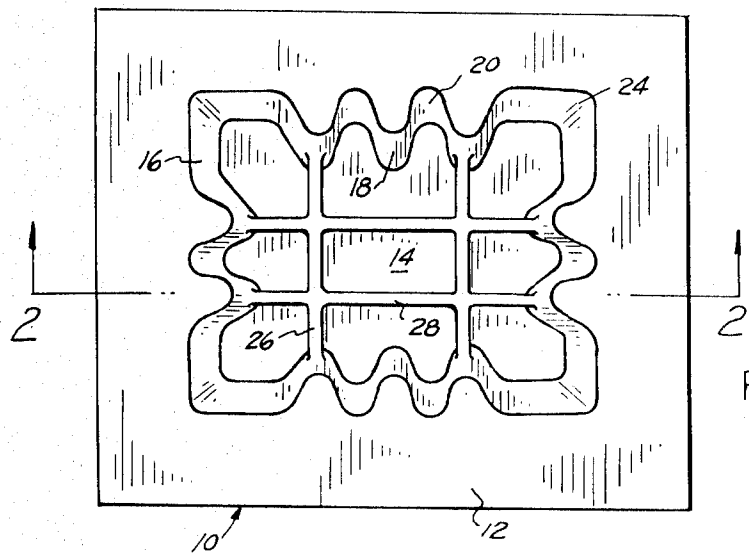


FIG. 1

FIG. 2

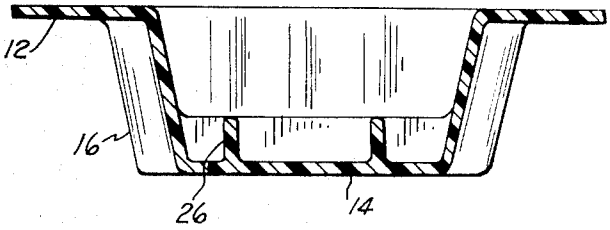


FIG. 3

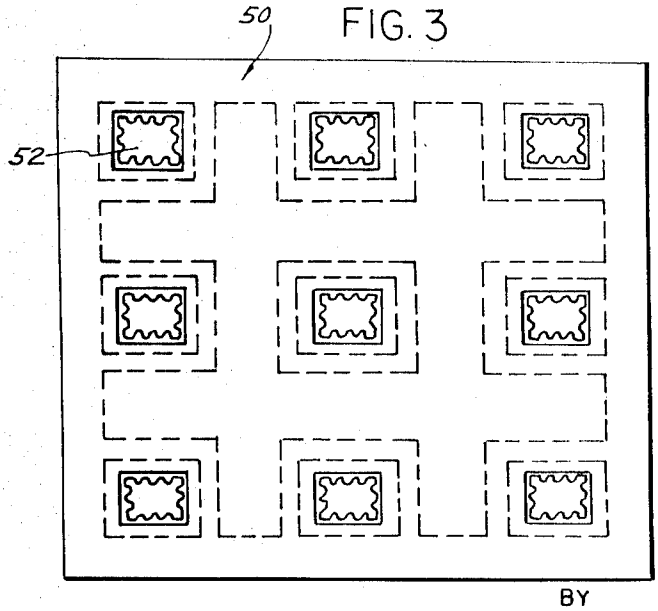


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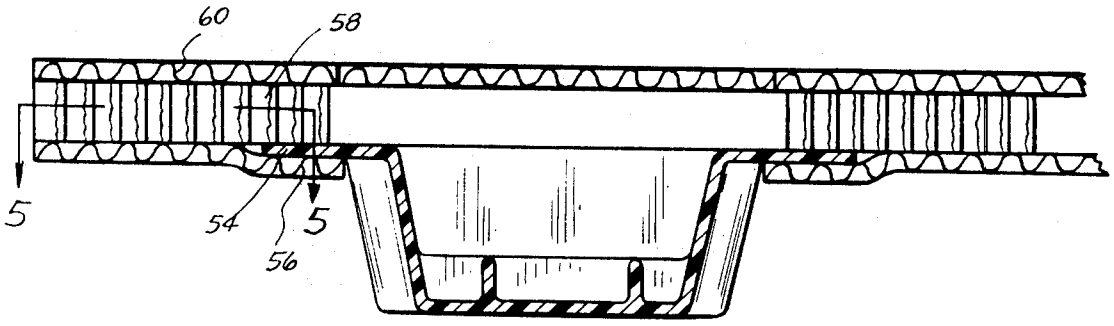
FIG. 4



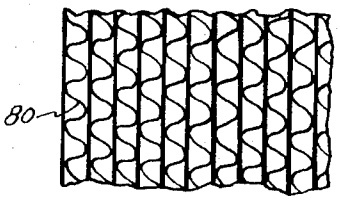


FIG. 5

FIG. 6

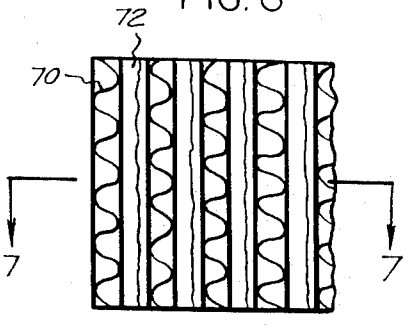
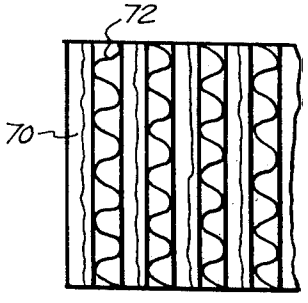


FIG. 7



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STRUCTURE

This invention relates generally to structures and portable platforms or pallets used for storage and transport of merchandise and equipment. More particularly, this invention relates to pallets having nestable oblong feet of thin sheets shaped like a flower pot and having rippled sides free of sharp interior corners. These feet are reinforced with upwardly extending ribs extending from the bottom of the feet. These pallets have stringers formed from corrugated cardboard reinforced with sandwich construction of corrugated cardboard.

Pallets used for the transport and storage of merchandise and equipment are ancient. However, pallets used in the past have not been entirely satisfactory. It is desirable that pallets should be readily nestable so that they can be stacked in large numbers in a relatively small amount of space. They should be lightweight and yet capable of carrying heavy loads to save costs in shipping. Pallets should be inexpensive to assemble and be made of inexpensive materials, A desirable feature of pallet design is that variations in size, shape and strength of the pallet be readily obtained. Also, it should be designed to withstand and resist structural failure due to rough handling. This feature is particularly important when a pallet is designed to be used for transport by a fork lift truck. Where the feet of the pallet are made from a thin sheetlike material, the form of the feet should be free from sharp interior angles to avoid concentration of stress in a small area.

It is an object of this invention to provide for pallet structure having these desirable features.

In the art of constructing and using corrugated cardboard structures, it has become desirable to provide the strength of such structures in substantial measure in more than one direction. For example, for increased nestability, where it is desirable to have relatively thin stringers in pallets, it is necessary to have strength of stringers not only to resist compressive vertical loads, but also to resist side thrusts due to rough handling and transport by forklift trucks.

Also, where corrugated structures are used in making boxes for industrial and consumer goods packaging, a box having strength in one direction for one application cannot be used for another application. This is due to the geometry of a box being oriented differently for different types of loading. In top loading, it is frequently desirable to have a box that has substantial strength to resist loads in directions perpendicular to the sides of the box. Thus, for top loading, corrugations in the sides run up and down or in a vertical direction.

However, in horizontal loading, forces are applied to the box that are both parallel and perpendicular to the sides of the box. In this application, boxes are frequently made with corrugations running in a direction parallel with the bottom of the box. This is often done at a sacrifice of strength in the vertical direction.

It is an object of this invention to provide multiple layers of corrugated structure wherein the corrugations run in opposite directions for each succeeding layer.

It is another object of this invention to provide sandwich construction of corrugated material wherein the corrugations vary in their direction from one layer of the sandwich to another.

Other objects of this invention will appear in the following description and appended claims, referring to the accompanying drawings forming a part of the specification.

ON THE DRAWINGS

FIG. 1 is a top plan view of a foot used in the preferred embodiment of this invention;

FIG. 2 is a transverse sectional view of the foot shown in FIG. 1;

FIG. 3 is a top plan view of the preferred embodiment of this invention;

FIG. 4 is a partial transverse sectional view of the apparatus shown in FIG. 3;

FIG. 5 is a partial sectional view of the apparatus shown in FIGS. 3 and 4;

FIG. 6 is a partial plan view of sandwich construction of corrugated material wherein the corrugations run in opposite directions in different layers;

and, FIG. 7 is a partial sectional view of a wall of multiple layer corrugated structure wherein corrugations run in different directions from one layer to another.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application as to details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced carried out in various ways. . Also, it is to be understood that the phraseology and terminology is for the purpose of description and not limitation.

AS SHOWN ON THE DRAWINGS

In FIG. 1, there is shown a foot used in the preferred embodiment of this invention. This foot is made of a thin sheet of material. The preferred material is a plastic such as polyethylene. The sheet of material is formed into a shape resembling a casserole dish or oblong flower pot **10**. The foot has a flange **12** having a flat surface and being at the top of the foot. The bottom portion **14** of the foot is generally flat and is free from holes, apertures or openings. The sides **16** of the foot are slanted. The sides **16** have ripples or ridges **18** and valleys **20**. The sides of the foot are free from any sharp interior angles. The ridges **18** and valleys **20** form a continuous smooth rounded side. The flange **12** and the bottom portion **14** meet the sides **16** of the foot in rounds having a relatively smaller arc than the ridges **18** and the valleys **20**. However, the flange **12** and the bottom **14** do not meet the sides **16** with any sharp interior angles or corners. The sides or walls **16** that meet in places such as the sector **24** do so with rounds having arcs that are smaller than the ridges **18** and valleys **20**. However, these arcs are not so small as to constitute sharp corners or sharp interior angles. The ridges **18**, valleys **20** and sectors **24** form a continuous wall of the foot free of sharp corners and geometry that could cause stress concentrations.

The foot **10** is reinforced by ribs **26** and **28** that intersect one another and join the walls or sides **16** of the foot. These ribs extend in an upward vertical direction from the bottom or floor portion **14** of the foot. The height of these ribs is of the same order of magnitude as the thickness of stringers of the pallet to which the foot is attached. In this manner a significant increase in the structural strength and load-carrying capacity of the foot is achieved without reducing or inhibiting or preventing a nestable character of a pallet using this foot.

As shown in FIG. 1, the preferred embodiment of this foot has the foot shaped in an oblong or parallel pipedlike configuration. With this shape, maximum structural load-carrying capacity can be achieved in a minimum amount of space when the pallet is designed to be used for transport by a forklift truck.

In FIG. 3 there is a pallet construction in the preferred embodiment of this invention. The pallet **50** comprises feet **52** of the type shown in FIG. 1. Nine of these feet are shown in a 3×3 configuration. They are spaced a uniform distance apart.

The flanges **54** of each of the feet are inserted to rest on top of a bottom corrugated sheet **56**. This insertion can be secured by glue or by rivets or by other appropriate means. It is possible to relay simply on the pressure of insertion of this flange above this cardboard sheet or cover without additional securing means such as glue or rivets.

Placed on top of the flanges and extending between the feet are stringers **58** of sandwich material. These stringers are preferably made of a corrugated sandwich structure in which the corrugations run in a vertical direction. In an alternative embodiment of this invention, wood or other appropriate load-carrying means can be substituted for corrugated cardboard material. However, because of its light weight and load-

carrying properties, corrugated sandwich construction is preferred for the stringers.

On top of the corrugated sandwich construction is placed a cover 60 also made of corrugated cardboard material, being a single layer in the preferred embodiment. In an alternative embodiment of this invention, a multilayered structure of corrugated covers, where the corrugations run in opposite directions, can be used. This type of construction is shown in FIG. 7.

In its preferred embodiment, this invention shows flexibility in the design of pallets by the ability to vary the amount of strength needed in the pallet. This can be done readily by varying the amount of sandwich corrugated cardboard material used as stringers. For a relatively inexpensive pallet and for lesser weight, where a great deal of strength is not required, a minimum amount of corrugated sandwich material can be used to form a framelike structure with rather narrow widths of sandwich material. For heavier construction requiring greater load-carrying capacity, a plan view of a transverse section of the pallet would show sandwich construction throughout the pallet with the exception of the areas penetrated by the dish portion of the feet. For extremely light pallets with very little weight being placed upon them, the sandwich construction can be eliminated and reliance can be made on stringers composed entirely of multiple layers of cover sheets of corrugated cardboard where corrugations run in opposite directions. This form of construction is shown in FIG. 7.

In an alternative embodiment of this invention, corrugated cardboard structures can be provided with substantial strength in several directions by using sandwich construction of corrugated cardboard where corrugations run in different directions, as shown in FIG. 6.

In a further alternative embodiment of this invention, corrugated cardboard structures can be constructed that will withstand forces from several directions by using stringers composed of multiple layers of cover sheets wherein the corrugations run in opposite directions.

Another embodiment of this invention lies in a form for a corrugated cardboard box. This form has several layers of corrugated cardboard. The corrugations in different layers run in different directions.

From the foregoing description it can be appreciated that a novel construction of pallets and corrugated cardboard structures has been provided to withstand and carry structural loads varying from the light to the heavy with considerable saving in weight and cost.

I claim:

1. In a pallet, the improvements comprising:

Feet of thin sheetlike material shaped into load supporting structure;

said feet having downwardly sloping sides forming one continuous rippled wall;

said feet having sides and a bottom free of apertures and forming one continuous interior surface and one continuous exterior surface where both such surfaces are free of sharp interior angles and free of sharp interior corners and free of arcs having a radius of an order of magnitude less than the order of magnitude of the thickness of said sides and bottom;

said feet having a flange surrounding and attached to and integral with said continuous wall;

whereby said continuous wall has both interior and exterior surfaces that are both free of stress-rising, discontinuous and sharp shapes between the ridges and valleys thereof and between said walls and said bottom and said flanges.

2. The apparatus of claim 1 wherein said feet have flanges that are pressed between layers of corrugated cardboard stringers;

said flange being substantially parallel to said layers.

3. The apparatus of claim 1 wherein said feet have flanges that are secured to a cover sheet of corrugated cardboard in the stringers;

said flange being substantially parallel to said cover sheet.

4. The apparatus of claim 1 wherein each of said feet are surrounded by a flange integral with its sides, said flange being free of apertures.

5. The apparatus of claim 1 and stringers of corrugated cardboard.

6. In the apparatus of claim 1:

stringers of corrugated cardboard;

and additional stringers having material chosen from the group consisting of wood, metal, and plastic.

7. The apparatus of claim 5 wherein said stringers are reinforced by sandwich construction of corrugated cardboard in the stringers;

said sandwich construction comprising a pair of contiguous layers of corrugated cardboard with cover sheets therebetween;

the corrugations of one of said layers being substantially perpendicular to the corrugations in the other of said layers;

wherein loads are applied on the pallet in a direction parallel to the direction of corrugations in said first-mentioned layer.

8. In the apparatus of claim 1, ribs upwardly extending from said bottom;

said ribs being contiguous and substantially perpendicular to said bottom;

whereby said feet have substantially greater rigidity and strength in supporting loads on the pallet.

9. The apparatus of claim 8 wherein said ribs have a height having the same order of magnitude as the thickness of the stringers of said pallet.