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Brown

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[54] **LIGHTWEIGHT CORRUGATED PALLET**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 2,774, Jan. 14, 1970, abandoned.

[52] **U.S. Cl.** **108/51**

[51] **Int. Cl.** **B65d 19/00**

[58] **Field of Search** 108/51–58

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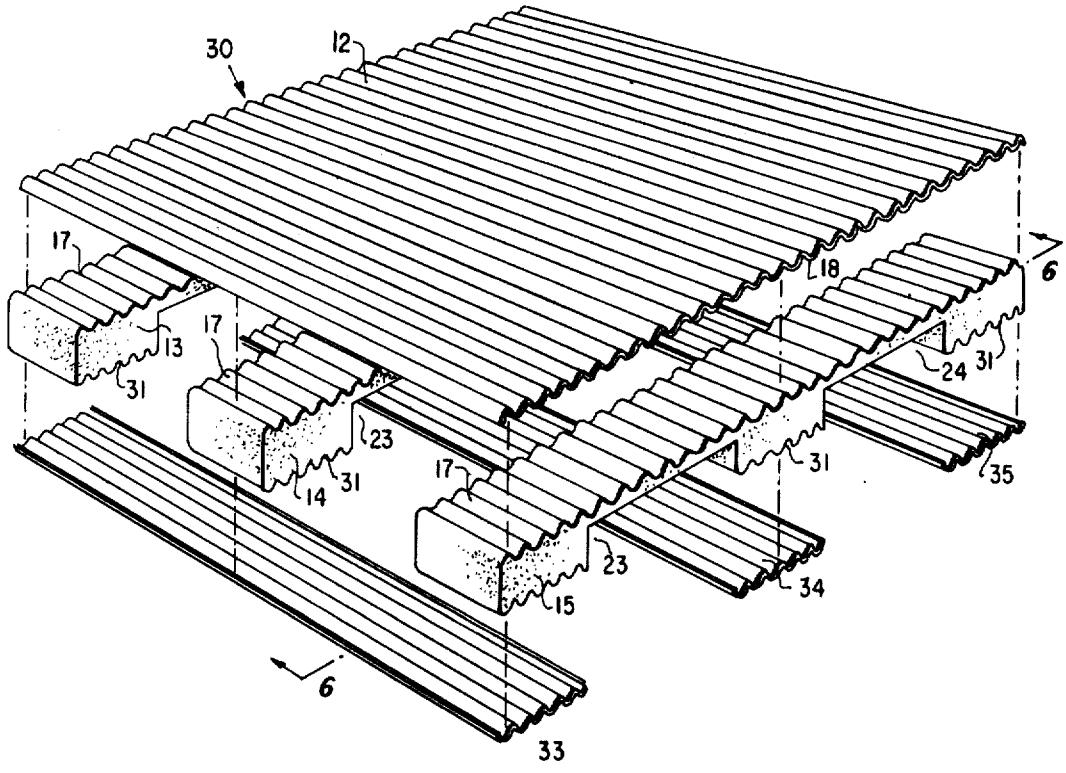
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[57] **ABSTRACT**

A pallet is disclosed in which the load is carried on a surface formed, at least partly, by a corrugated panel which may be of fiberboard or other construction. The corrugations of the panel may be partly or completely filled on one or both sides with rigid plastic foam, or other organic or inorganic compound, including the filling of strips at spaced points along the major surfaces of the panel, the strips oriented at right angles to the corrugations. Support members in the form of spaced runners or posts are provided to offset the panel, which constitutes a deck, from the surface against which the pallet is to rest, or from the bottom wall of a container. The spacing of the support members themselves, and the spacing they afford between bottom support surface and panel, is sufficient to permit four-way entry of the prongs of a pallet-lift or fork-lift truck. Rigid plastic foam extends into the corrugations of the panel at the points of fastening of the support members thereto, and if desired, in any or all of the remaining flutes of the corrugated panels as required to provide the strength needed for the particular pallet use.

5 Claims, 10 Drawing Figures



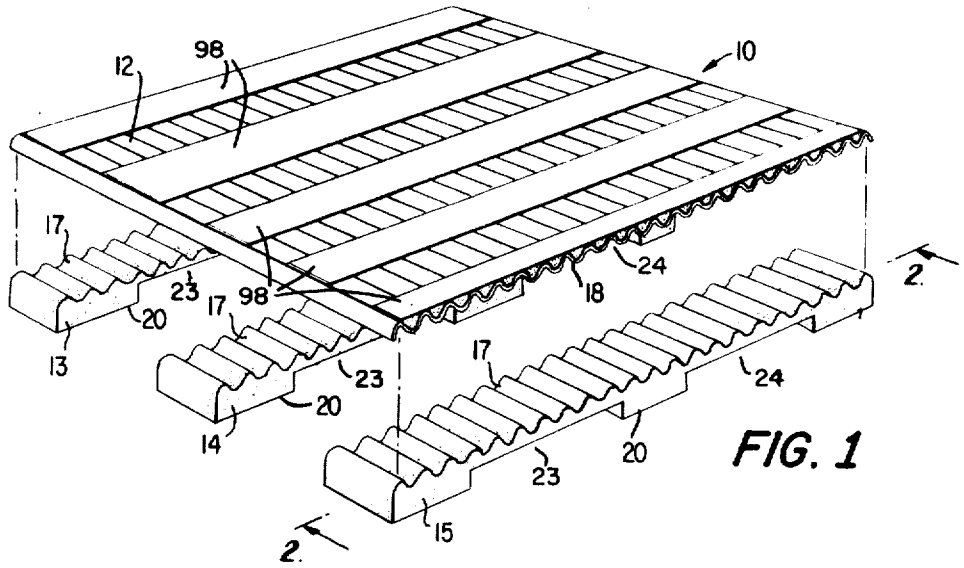


FIG. 1

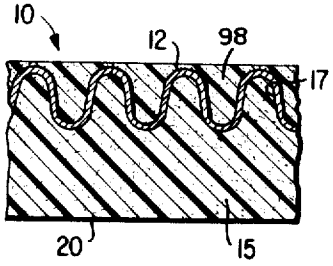


FIG. 2

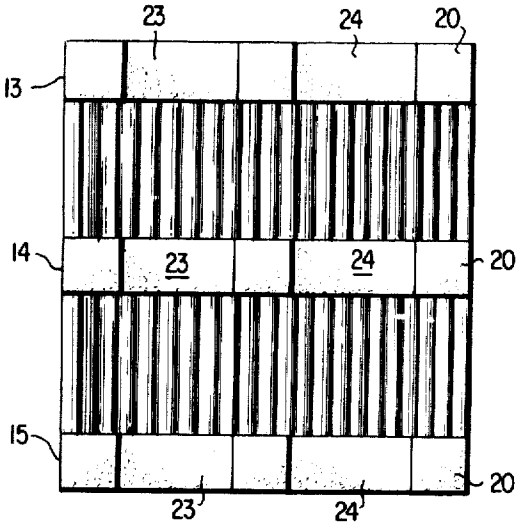
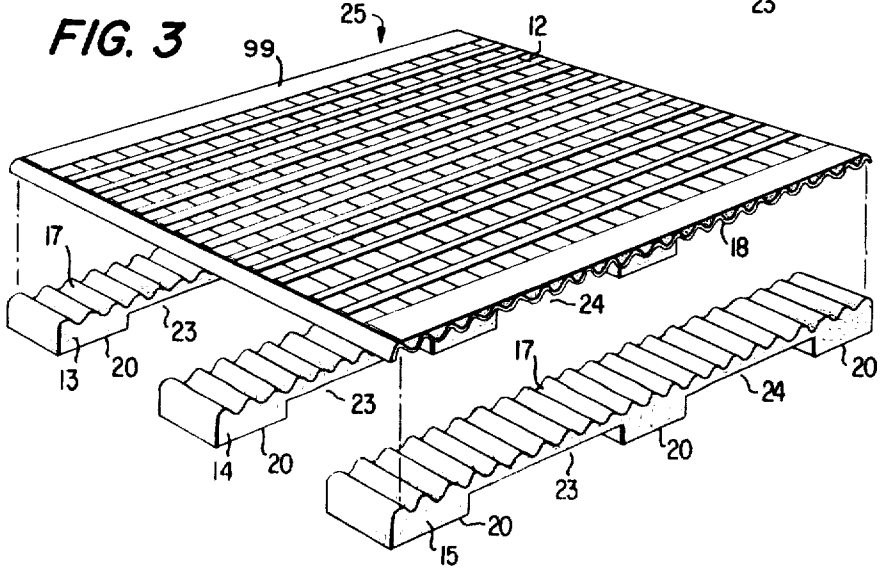


FIG. 4

FIG. 3



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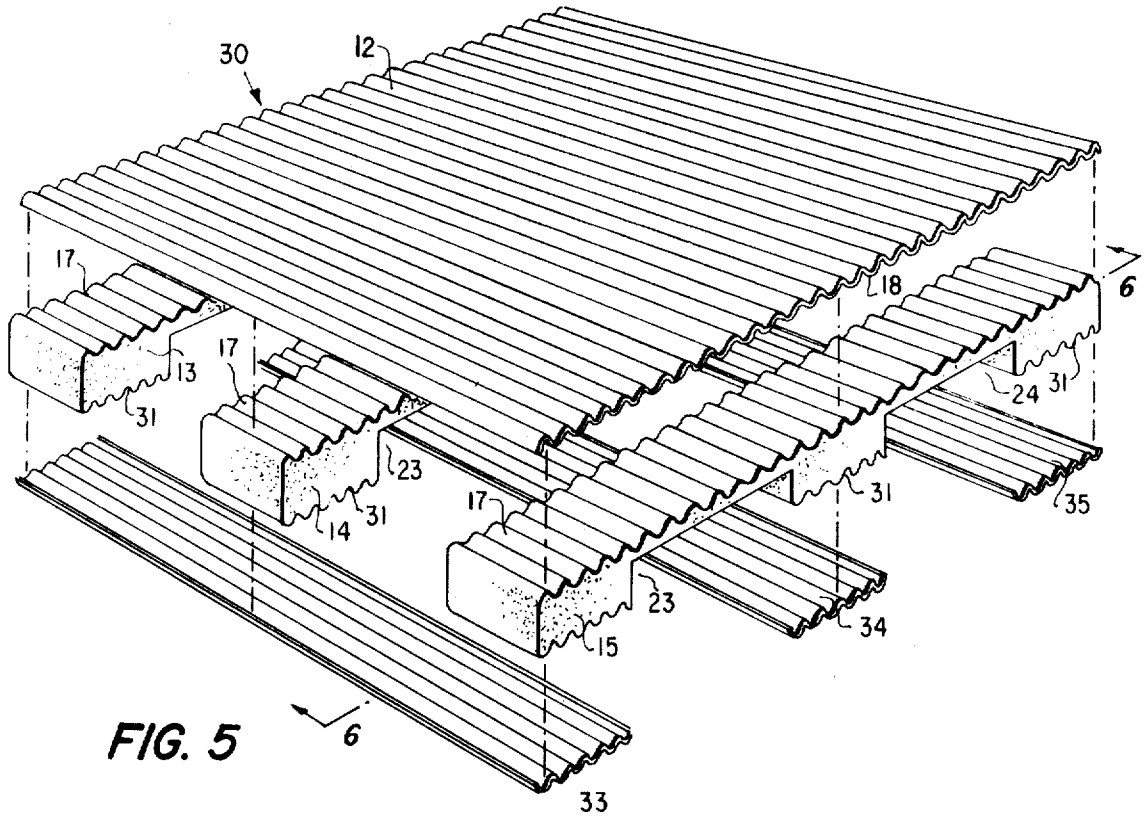


FIG. 5

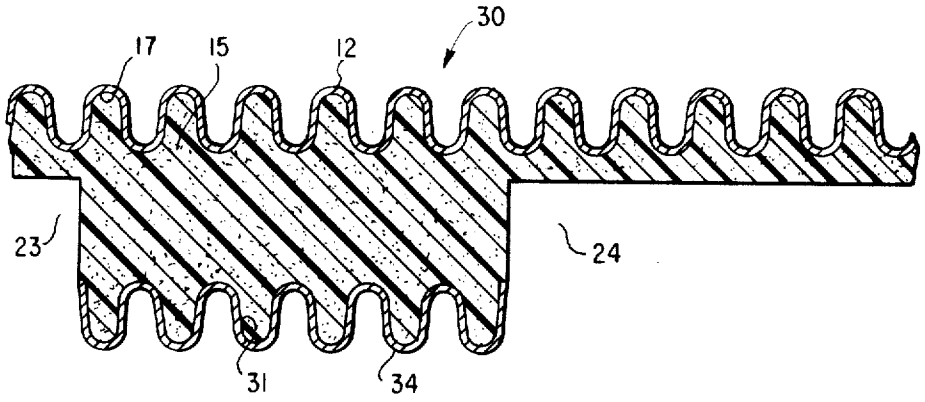


FIG. 6

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FIG. 7

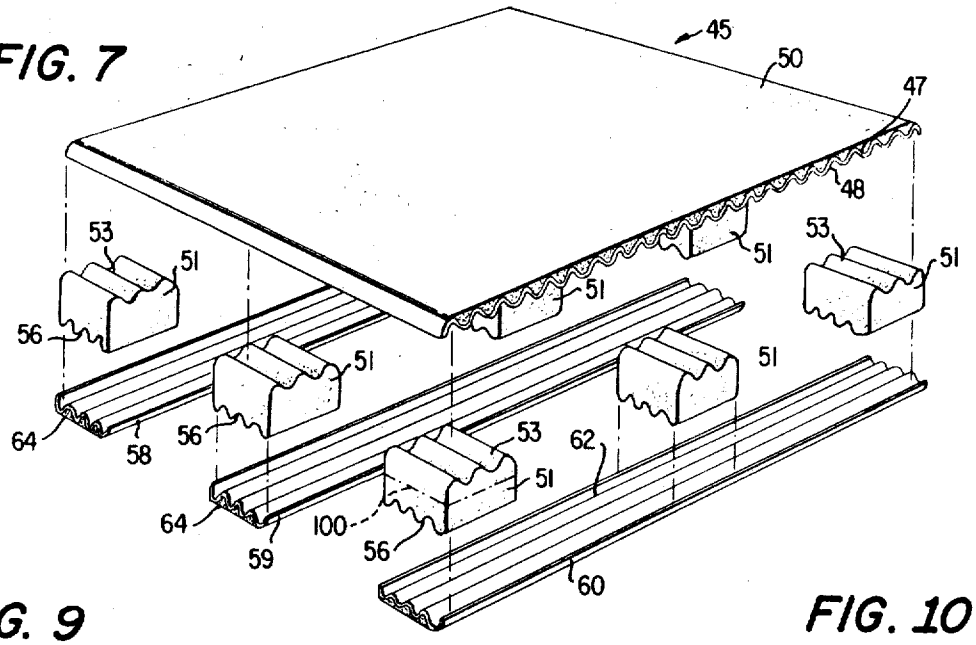


FIG. 9

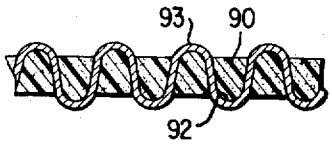
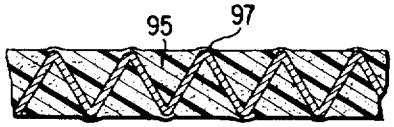


FIG. 10



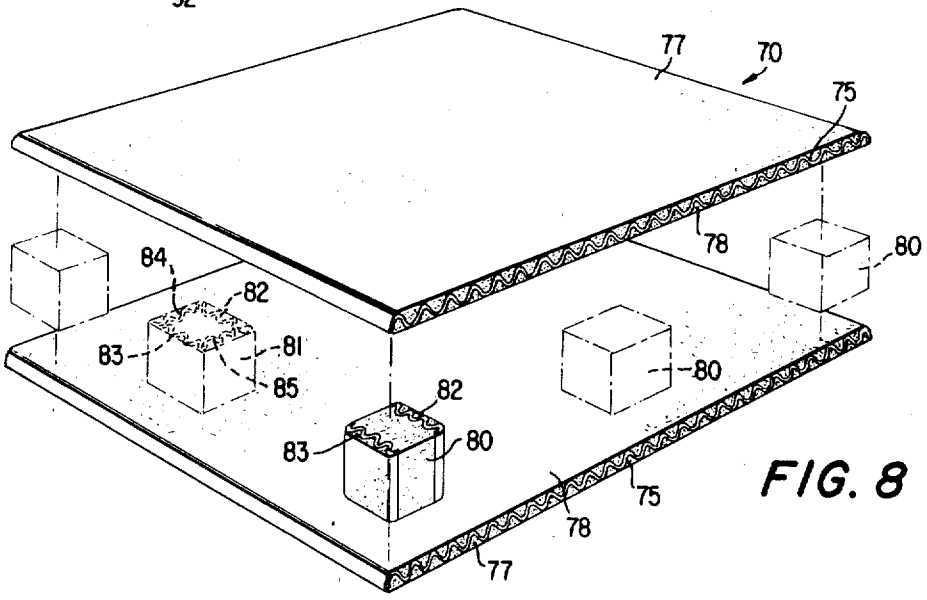


FIG. 8

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LIGHTWEIGHT CORRUGATED PALLET

CROSS REFERENCES

This application is a continuation in-part of Ser. No. 2,774 filed Jan. 14, 1970, and entitled "Lightweight Corrugated Pallet" now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to pallets for shipping and storage, and particularly to pallets comprising corrugated panels and expanded rigid plastic foam supports having a corrugated shape which mates with the corrugations of the panels.

2. Prior Art

It is known to assemble pallets from corrugated paperboard having paper facings to which blocks of rigid plastic foam have been adhesively attached. Such a pallet is disclosed, for example, in U.S. Pat. No. 3,380,403 granted Apr. 30, 1968, to M. A. Sullivan. However, various problems arise with pallets using a combination of corrugated fiberboard decking without a facing and plastic or foam supports. While plastic foam has suitable qualities for filler and reinforcement purposes, it lacks the rigidity and strength required for pallet decking. On the other hand, paperboard and fiberboard with longitudinal corrugations has substantial rigidity in the longitudinal direction but lacks rigidity in the lateral direction, i.e., at right angles to the direction of the corrugations.

Another disadvantage of prior art pallets composed of corrugated fiberboard decking without facings and conventional flat top runner or post-type supports is the difficulty of providing a secure attachment or fastening between support member and deck member because of the relatively small amount of flat surface available on the corrugated deck sheet. Accordingly, despite the conventional use of rather strong adhesives between the support posts and the corrugated deck, the posts are vulnerable to separation from the deck when struck by the lifting forks or prongs of a fork-lift truck.

It is, therefore, a principal object of the present invention to provide a new and improved combination corrugated deck and plastic foam support pallet.

It is another object of the present invention to provide a lightweight pallet comprising one or more corrugated decks having plastic foam support members attached thereto in a completely rigid and secure manner.

SUMMARY OF THE INVENTION

Briefly describing the present invention, the above and still further objects and advantages of the invention are achieved in pallets which may be of single deck or double deck design. Each deck is a corrugated panel or sheet which is preferably composed of fiberboard or hard plastic to render it of light weight in comparison to presently used pallets, such as those composed of wood. However, other materials may be utilized to produce the corrugated deck, as will be set forth in the ensuing description of preferred embodiments. According to a principal aspect of the present invention, support members which are primarily composed of rigid expanded plastic foam are shaped to conform to the corrugated deck or decks, at least at the points of proposed attachment thereto, such as by providing flutes

in the foam posts or runners to match the corrugations in the deck and thus to mate with those corrugations. By providing a matching corrugated shape on one or both of the major faces of the support posts or support runners, a positive interlocking securement is assured between post or runner, and deck. Moreover, such an arrangement assures greater transverse or lateral rigidity, that is, resistance to forces directed at right angles to the corrugations of the deck sheet, in the plane of the sheet.

According to another embodiment of the present invention, the corrugated fiberboard deck sheets are partially or completely filled with expanded rigid plastic foam, or other similarly suitable material, to provide increased rigidity, particularly in the lateral direction, and to provide a greater amount of support surface, which may be a flat surface if the corrugations have been completely filled, for improved stacking of cartons and packages on the pallet deck. Such fill-in can be achieved by any of several conventional methods such as molding or spray operations. Moreover, a complete filling-in of the corrugations to such an extent as to provide a slight coating over the peaks of the corrugation flutes accomplishes waterproofing of the fiberboard panel, which is a significant advantage in instances where the pallets may be exposed to severe weather. This is of utmost importance where the pallet is composed of materials such as paperboard or fiberboard, offering the advantages of light weight over prior pallet compositions, but incapable of retaining strength when exposed to water or extreme moisture.

A further advantage of pallets of the present invention is that the pallets may be assembled directly by the user, from molded support components and pre-cut corrugated fiberboard deck sheets supplied separately. Assembly may then be performed as the pallets are required, using adhesives or other suitable fastening means. Alternatively, the pallets may be assembled during manufacture by molding or cementing the support post directly in position, to the corrugated fiberboard deck sheet, and the assembled pallet then shipped to the user.

It is therefore a further object of the present invention to provide a light weight, inexpensive and expendable shipping and storage pallet, which combines the use of corrugated panels and rigid plastic foam support posts or support runners constructed to mate with the decks or panels at the proposed points of attachment.

Still another object of the present invention is to provide more reliable fastening of support runners or support posts of expanded plastic foam to corrugated deck sheets than has been achieved in the prior art, by use of support or runner members having flutes on one or both major surfaces (i.e., those surfaces which are to be in a horizontal orientation when the pallet is in use) to provide an interlocking fit with the corrugations of the deck sheet.

Yet another object of the present invention is to provide a strong, light weight, and waterproof pallet in which a rigid foam is utilized to fill in the corrugations of a fluted panel or sheet member.

Still another object of this invention is to provide a light weight corrugated deck pallet with provisions for plastic rigid foam fill-in of the panel corrugations on an optional, variable and diversified basis, from a standpoint of the depth of the fill-in and the panel coverage required to provide the necessary strength, rigidity,

load capacity, water resistance and smooth surface, if any, deemed essential for the intended pallet use.

BRIEF DESCRIPTION OF THE DRAWINGS

In describing the preferred embodiments of the present invention, reference will be made to the accompanying drawings, in which:

FIG. **1** is an exploded, perspective view of a single deck pallet according to the present invention, employing a corrugated panel and slotted support runners with matching flutes, assembled for four-way entry of the lifting prongs or forks of a fork-lift or pallet-lift truck, the top deck panel showing a typical partial fill-in of the upper corrugations with rigid foam;

FIG. **2** is a fragmentary, section view taken along the lines **2—2** of a complete single deck pallet of the type shown in FIG. **1**, illustrating the interlocking fit of the support runner and deck members;

FIG. **3** is an exploded, perspective view of another embodiment of a single deck pallet similar to that shown in FIGS. **1** and **2**, showing the top deck upper corrugations having another pattern of filled-in rigid plastic;

FIG. **4** is a bottom view of the assembled single deck pallet of FIG. **3**.

FIG. **5** is an exploded, perspective view of a double deck pallet embodiment similar to the single deck embodiment of FIGS. **3** and **4**, except that the support runners are provided with fluting at the second major face of each, to mate with the corrugations in a second complete bottom deck or in the bottom deck runners;

FIG. **6** is a fragmentary, section view taken along the lines **6—6** of FIG. **5**, illustrating the interlocking attachment of both decks to the support runners;

FIG. **7** is an exploded, perspective view of another double deck pallet embodiment, utilizing support posts or blocks between the corrugated decks or deck runners rather than support runners, and with the corrugations oriented at right angles to one another for the two decks;

FIG. **8** is an exploded, perspective view, partly in phantom, of still another double deck pallet embodiment utilizing support blocks, in which the corrugations in the decks have been partially or completely filled in, and in which the blocks are also composed partially of corrugated panels, with the corrugations in the blocks extending perpendicularly to the plane of each deck member;

FIG. **9** is a fragmentary, section view of a partially filled-in corrugated panel of the type used in the pallet of FIG. **8**; and

FIG. **10** is a fragmentary, section view of another form of corrugated panel with more angular corrugations than that of FIG. **9** and in which the corrugations have been completely filled in and the peaks of the corrugations coated slightly to weatherproof the deck members.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Before describing the preferred embodiments of the present invention, it is desirable to point out the wide variety of constructional materials which may be used in the fabrication of single deck and double deck pallets according to the invention. Suitable corrugated panels may be composed of fiberboard, paperboard, aluminum or other light weight metal, rigid plastic, or any other light weight material of relatively high strength. The corrugations in the panels, of course, provide additional strength and rigidity over planar decks, to support greater loading normal to the plane of the panel or parallel to the orientation of the corrugations, but offer relatively little rigidity in a lateral or transverse direction, i.e., at right angles to the orientation of the corrugations.

A suitable plastic foam for use in fabricating the support runners or support blocks is an expanded polystyrene foam, although compositions such as hollow polystyrene or plastic beads in a cementitious mass, or of loose sawdust, wood particles, etc., in a rigid cohesive composition, may alternatively be employed.

Referring now to FIG. **1**, a single deck pallet **10** according to the present invention comprises a deck member or panel **12** of corrugated construction, and a plurality of support runners, preferably three in number, designated **13, 14,** and **15,** spaced equally apart at the underside of deck member **12.** The panel **12** is composed of any of the materials described above as being suitable, and the support runners are each composed of any of the rigid foam-like materials specified above. The upper surface of each of the foam support runners, **13, 14,** and **15,** is provided with flutes or wrinkles **17** matching the corrugations in panel **12,** so that these flutes may be interlocked with the corrugations in the underside **18** of panel **12** after flutes **17** and matching portions of underside **18** have been coated with a suitable adhesive to fasten the support runners to the deck.

As shown in FIG. **1,** the top deck **12** illustrates one pattern, i.e., striped **98,** whereby rigid plastic foam is introduced into the upper corrugations of the top deck **12.** The level of fill-in may be sufficient to completely cover the flutes or may be partially below. In this manner, additional rigidity is added to the upper deck **12.**

The assembled single deck pallet in which the support runners are fastened to the underside of the deck member is shown in fragmentary, section view in FIG. **2.** The lower surface **20** of each support runner is flat, so that when the single deck pallet **10** is completely assembled, a level lower support surface is provided to permit the pallet to rest upon any flat surface, such as a loading platform or the ground, with little or no rocking. Cartons, crates, boxes, or other packages are placed on the upper surface, or load side, of panel **12,** and the spacing between the support runners and between the underside of deck member **12** and the surface on which the entire pallet rests is such that the prongs or forks of a fork-lift or pallet-lift truck are readily inserted beneath the deck member to permit lifting the palletized load from any one of the four sides of the pallet.

While support runners, each of a length corresponding to the width of deck member **12,** are utilized to support the deck in the embodiment of FIG. **1,** it is to be emphasized that block or post support members may alternatively be used as will be shown in some of the embodiments of the invention to be described presently. The use of nine support posts, each having an upper surface composed of matching corrugations to those on the underside of deck member **12,** with one post positioned at each corner of the deck member, another post at the mid-portion of each side of the deck member, and the last post positioned at the center of the deck member, will provide adequate support for materials placed on the load side of the pallet, and will

permit four-way entry of the prongs of the fork-lift truck.

The four-way entry, single deck pallet is illustrated in FIGS. 1 and 3. Referring to those figures, the overall pallet 10 is provided with a deck member or panel 12 of corrugated configuration, with or without fill-in of plastic foam in the flutes 25, and with a series of equally spaced support runners 13, 14, and 15, each having an upper surface 17 with flutes matching the corrugations 18 in the underside of panel 12. The support runners have each been interrupted with two cutouts or slots 23 and 24 in the lower surface 20 thereof, the slots extending in the same direction as the corrugations, i.e., longitudinally. When the support runners are fastened in interlocking spaced-apart relationship to the underside 18 of deck 12 by adhesive cement or other suitable fastening material, the slots 23 in each support member are aligned, as are the slots 24 in each support member, as shown more clearly in the bottom view of the assembled pallet in FIG. 3. Since the support runners are of one-piece construction, there is greater transverse rigidity and assurance of a level under-surface than would be present if several individual support blocks or posts were employed. However, it is again emphasized that support posts may be utilized rather than runners, without departing from the spirit of the invention. It will be observed with regard to FIGS. 1 and 3, that since the slots 23 and the slots 24 are aligned in the individual support runners, the prongs of the fork-lift may be inserted therein in the assembled pallet to lift the pallet and the load supported thereby, from any of the four perimeter sides of the pallet.

Referring now to FIGS. 5 and 6, a double deck pallet embodiment is shown which uses several elements similar to those utilized in the single deck embodiment in FIGS. 1 and 3. In particular, the double deck pallet 30 includes an upper deck member or panel 12 which is again of corrugated construction, with or without partial or full fill-in of plastic foam in the flutes 25, a plurality of equally spaced support runners 13, 14, and 15, again of expanded rigid plastic foam molded so as to provide an upper surface having flutes or wrinkles 17 matching the corrugations 18 in the underside of deck member 12. As in the embodiment of FIGS. 3 and 4 for a single deck pallet, slots or channels 23 and 24 are provided in spaced-apart relation in the bottom surface of each runner, oriented in the same direction as the corrugations and so arranged that when the runners are fastened to the underside 18 of deck member 12, the channels 23 and 24 permit entry of the prongs or forks of the fork-lift truck in either direction parallel to the orientation of the corrugations, in addition to entry into the channels formed between the runners themselves. Hence, four-way entry is also provided in this embodiment.

Unlike the embodiment of FIGS. 3 and 4 however, the bottom surface of each of support runners 13, 14, and 15 in the pallet of FIGS. 5 and 6 is provided with corrugations 31, preferably during the molding process for the support runners, so as to match corrugations in a similarly oriented set of deck runners 33, 34, and 35. While individual deck runners 33, 34, and 35 are shown in FIG. 5, it should be apparent that a single complete bottom deck, similar to the upper deck 12, may be provided at the under-surface of the support runners, as viewed in FIG. 5, without deviating from the spirit and scope of the present invention. Moreover, a single complete deck, if used at the bottom of the double deck pallet 30, or the separate deck runners 33, 34, and 35, may be arranged such that the corrugations extend in the lateral direction, rather than the longitudinal direction conforming to that of the corrugations on the upper deck member. Thus, for example, the individual deck runners would be turned by 90° in such an arrangement and the flutes 31 in the bottom surface of each of the support runners 13, 14, and 15 would also extend transversely to the orientation of the flutes 17 in the upper surface of those support runners.

A fragmentary portion of the completely assembled double deck pallet 30 of FIG. 5 is shown in FIG. 6, clearly indicating the interlocking fit attained between the flutes in the upper and lower surfaces of the support runners and the adjacent corrugations in the upper and lower deck members 12 and 34, respectively.

As shown in FIG. 3, another optional pattern showing use of basically a narrow band design designated as reference numeral 99 may be provided for the upper deck of the pallet according to the present invention. As before, the extent of fill-in with rigid foam plastic material may be sufficient to completely cover the corrugations or may extend to below the surface of the flute.

A double deck pallet embodiment utilizing the longitudinal and transverse alignment of corrugations in the upper and lower deck members, and illustrating still another feature of the present invention, is shown in FIG. 7. Referring to that figure, the double deck pallet 45 includes an upper deck member 47, i.e., a panel or sheet, of corrugated construction, which is to be in the uppermost position when the pallet is used in its load supporting condition. As in the previous embodiments, the upper support panel 47 has an underside 48 and a loadside, but in this example, the corrugations in the loadside are completely (or partially) filled with rigid plastic foam to provide a level support surface 50. Moreover, instead of support runners such as have been shown in the preceding embodiments, the embodiment of FIG. 7 utilizes support blocks or posts 51, having flutes in both the upper surface 53 and the lower surface 56 thereof. The support posts or blocks 51 are arranged with one at each corner, one at the central portion of each side, and one in the center of the underside of upper panel 47, the flutes 53 mating with the corrugations 48 in the upper panel. Flutes 56 in lower surface of each support block are oriented at 90° relative to the flutes 53 in the upper surface of each block to mate with corrugations in a set of deck runners 58, 59, and 60, which extend laterally to the corrugations in the upper panel 47. Each of the deck runners has the corrugations in its exposed side, here the bottom surface, filled either partially or completely with a plastic foam 64. In addition to providing additional resistance to forces exerted laterally to the orientation of the corrugations in the plane of the deck member, the filler plastic foam serves to insure a level support surface for the load, and for resting against a level loading platform or other surface on which the double deck pallet 45 is to be placed. By orienting the corrugations in the upper and lower deck members in perpendicular directions, the overall pallet achieves greater strength and rigidity than would otherwise be the case.

Referring now to the embodiment of a full double deck pallet shown in FIG. 8, a pair of deck members of identical construction are provided, each consisting of a corrugated panel 75, the valleys of which on each side

have been partially or completely filled with plastic foam to provide surfaces **77** and **78**, respectively. As in the embodiment of FIG. **7**, the corrugations of one deck member may be oriented at 90° relative to the corrugations in the other, if desired, although parallel orientation has been shown in FIG. **8** for purposes of example. The significant difference between double deck pallet **70** of FIG. **8** and the double deck pallets of the preceding embodiments is that the support blocks or posts, here designated by reference numerals **80**, while again aligned in three rows of three blocks or posts each, also include corrugated sheets **82** and **83** between which the plastic foam is sandwiched, and which may also be partially or completely filled in along the exposed side surfaces with foam. Corrugations **82** and **83** are oriented normal to the plane of each deck. As shown in phantom lines for support post **81**, the corrugated sheets may be provided at all four side surfaces of the support block, as at **82, 83, 84,** and **85**, with the sheets stapled together at the corners provided that a material such as fiberboard or paperboard is employed. The presence of corrugated sheets in the support posts supplies the overall pallet with greater compressive strength, so that double deck pallet **70**, for example, is capable of carrying heavier loads than double deck pallet **45** of FIG. **7**. As in the previous embodiments, the double deck pallet of FIG. **8** is assembled by adhesively fastening the support posts in place to each of the upper and lower deck members **75**.

It is to be emphasized that while the support posts or blocks are shown to be of rectangular cross-section, that is essentially immaterial to the practice of the present invention. For example, the post may be of cylindrical construction and, in fact, may be tubular in form with a hollow center. Other shapes, such as diamond-shaped cross-section, are also suitable.

Referring now to FIGS. **9** and **10**, each of these figures is a fragmentary sectional view of a deck member taken along a plane perpendicular to the orientation of the corrugations, and respectively showing the partial and complete filling of the corrugations on both sides of the deck member with a rigid plastic foam. In FIG. **9**, the rigid foam **90** extends from the bottom **92** of the valley between corrugations to a point below the associated pair of peaks **93**. This provides greater strength and rigidity in the lateral direction. In FIG. **10** a somewhat more angular embodiment of the corrugated deck member is shown but, of course, the precise construction of the flutes or wrinkles is immaterial to the principles of the present invention, and the two different forms are shown merely by way of example. In any event, the plastic foam **95** in FIG. **10** completely fills each corrugation and extends slightly over the peaks **97**, thereby forming a waterproof or water resistant coating on the fiberboard or paperboard deck members, as well as improving its rigidity. Of course, this is not of particular concern where the deck member is composed of light weight metal or plastic, but the complete filling of the corrugations with foam will provide a relatively level surface for loading in these instances as well, and this may be of importance in some situations as where relatively small packages are to be loaded on the pallet.

Where a load is unitized or "containerized" for shipment and handling by forklift and pallet lift trucks, e.g., a number of packages or items are to be loaded and packed in a single pallet size container, such large container may have a pallet or platform type base comprising a full corrugated deck or corrugated runner members, with support posts of foam plastic attached to the bottom wall of the container. For example, with reference to FIG. **7**, the full deck member **47** or runner bottom members **60** are arranged to be placed at the bottom against the surface on which the load is to rest, with the foam blocks or posts **51** projecting upwardly from the corrugated members to which they are fastened. Each of the posts is provided with a fluted bottom surface mating with the corrugated deck or runner members and a flat top, as shown by the phantom lines **100**, to provide with the flat tops of the other posts, a level surface against which the bottom wall of the unitized container may rest. These flat surfaces are attached to that wall and the corrugated deck or runner members, by use of adhesives or other means. The single unitized load may thereafter be lifted and transported by a fork-lift or pallet lift truck, by insertion of the prongs into any of the four entry-ways between the corrugated deck or runner members and the bottom of the container.

It should be observed that in none of the preceding embodiments of the invention in which plastic foam filler is used between corrugations, is it necessary to provide a complete fill-in. For example, thin strips of plastic foam may be applied at relatively uniform intervals along the corrugated panel, at an angle to the ribs or flutes (e.g., perpendicular). I have found that such plastic foam strips, spaced at from four to six inch intervals, provide almost the lateral strength and planar rigidity (as well as level surface character) of the completely filled-in panels, although they do not serve the overall waterproofing function of the complete fill-in. Where the corrugated deck sheet is molded from plastic or other moldable compounds, such spacedapart cross flute fill-in may be molded integral with the corrugated panel deck, in lieu of incorporating later by other means. Where the spaced-apart cross flute fill-in is added to an existing corrugated deck sheet, such fill-in may comprise strategically located spot fill-in or individual fill-in strips extending the width of the deck sheet at a right angle to the direction of the deck corrugations. Such longitudinal strips are fluted on the bottom surface for mating with the deck corrugations and have a flat top surface that extends just above the top edge of the flutes of the corrugated deck. Such strips are preferably formed and attached to the corrugated deck by spraying, or the strips may be molded and attached to the deck corrugations by use of adhesives or other means.

Preferably, in each embodiment of the present invention the distance between adjacent peaks of the corrugations is one-half inch to 1 inch, although this is not essential to the practice of the invention.

While I have disclosed several preferred embodiments of my invention, it will be apparent to those skilled in the art to which my invention pertains that many variations and modifications are possible without departing from the spirit and scope of the invention, as defined in the following claims.

I claim as my invention:

1. A four-way entry pallet comprising:

a. at least one corrugated upper deck member having a top side and an underside;

b. rigid plastic foam filler filling in at least a portion of each of the flutes of said top side corrugations

to provide added strength and rigidity to said upper deck;

c. A plurality of spaced rigid plastic support members adhesively fastened to the underside corrugations of said upper deck, each of said supports having at least the top surface corrugated to mate with the respective corrugations of said underside corrugations of said upper deck;

d. each of said plastic supports being elongated members having an upper portion extending the length thereof, leg portions depending from said elongated upper portion spaced apart to form slots between said depending legs to permit entry of prongs of a forklift truck therethrough.

2. The pallet of claim **1** wherein said support leg portions include corrugations at their bottom surface, a bottom deck spaced from said top deck having a top side and an underside, the top side having corrugations to mate with said support leg bottom surface, said support legs being adhesively secured to said bottom deck upper surface.

3. The pallet of claim **1** further including a plurality of spaced elongated strips adhesively secured to the bottom surfaces of a plurality of support legs.

4. The pallet of claim **2** wherein said bottom deck includes rigid plastic foam filler in at least a portion of each of the flutes of said corrugations to provide added strength and rigidity to said lower deck.

5. The pallet of claim **1** wherein the deck and support members are separately provided in a kit with adhesive for on-the-site assembly.

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