United States Patent

[11] **3,561,375**

[72] Inventors **Lowell D. Hammond**
San Marino;
Elmer H. Good, Claremont, Calif.

[21] Appl. No. **743,106**
[22] Filed **July 8, 1968**
[45] Patented **Feb. 9, 1971**
[73] Assignee **Nash-Hammond, Inc.**
Industry, Calif.
a corporation of California

[54] **PLASTIC PALLET**
13 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **108/53,** 108/58
[51] **Int. Cl.** **B65d 19/18**
[50] **Field of Search** ..... 108/51-—58; 264/310, 45, 47; 297/452—456

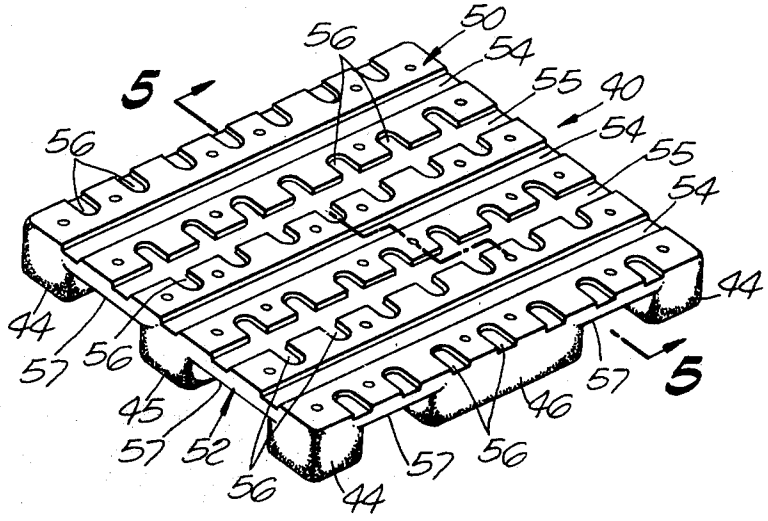
[56] **References Cited**

UNITED STATES PATENTS

3,043,627	7/1962	Torjusen	297/456
3,111,344	11/1963	Hoven et al.	297/462
3,173,175	3/1965	Lemelson	264/310X
3,187,689	6/1965	Hess	108/58
3,217,078	11/1965	Klieber	264/310
3,228,358	1/1966	Sepe et al.	108/58
3,307,504	3/1967	Cloyd et al.	108/58
3,330,228	7/1967	Donnelly	108/58
3,359,929	12/1967	Carlson	108/58
3,368,013	2/1968	Pisciotta et al.	264/310
3,449,188	6/1969	Huff	264/310

Primary Examiner—Francis K. Zugel
Assistant Examiner—Glenn O. Finch
Attorney—Sellers & Brace

ABSTRACT: A one-piece seamless nestable hollow molded plastic pallet for use in handling cargo with forklift equipment and an inexpensive mode of molding the same utilizing dual-axis rotary molding equipment. The mold features an upper mold surface having open ended drainage, ventilating and reinforcing channels and rows of bosses formed in its lower surface spaced apart to receive forklift prongs from any lateral edge. Additional reinforcing is provided by equitably distributed tubular bosses having flaring ends integral with the upper and lower pallet walls and with their reduced midportions merging adjacent the parting plane of the mold parts.



PATENTED FEB 9 1971

3,561,375

SHEET 1 OF 2

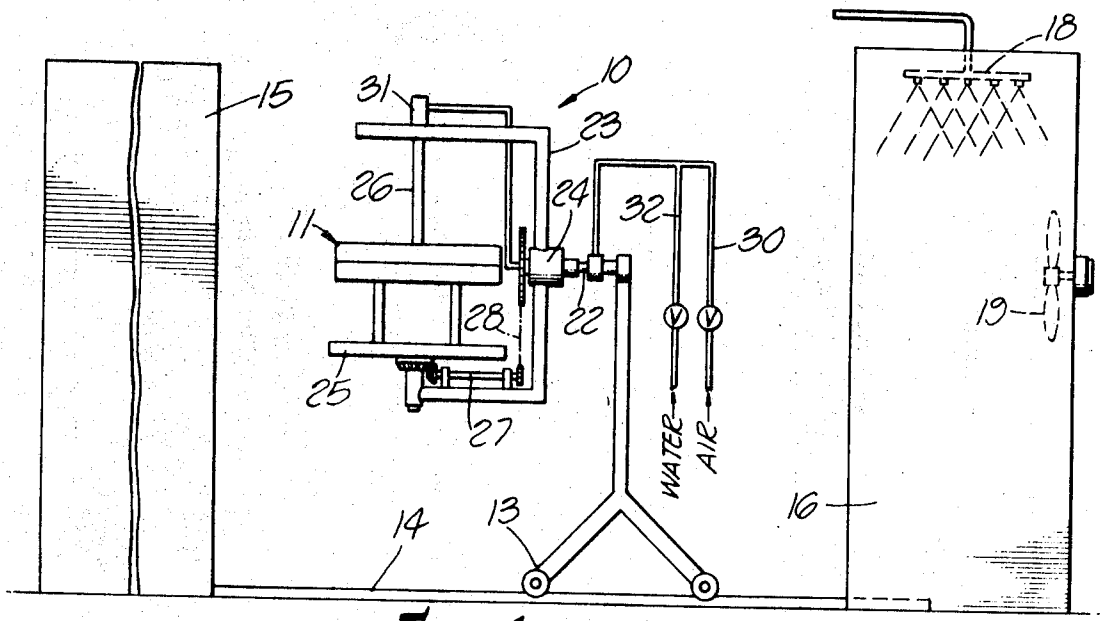


FIG. 1.

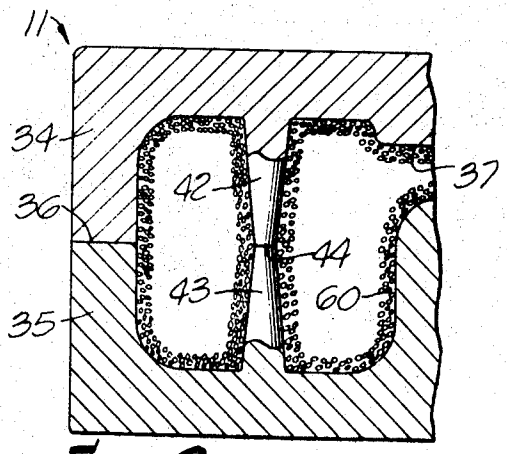


FIG. 2.

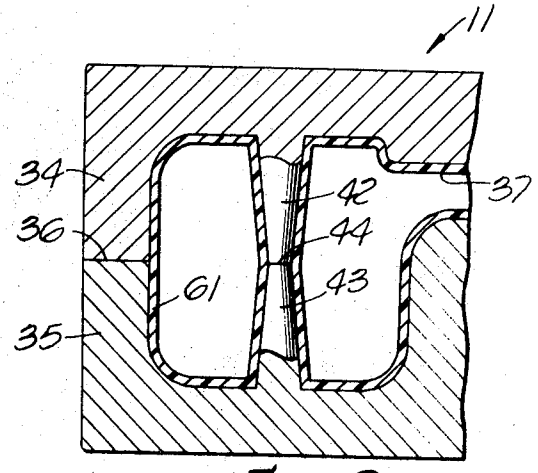


FIG. 3.

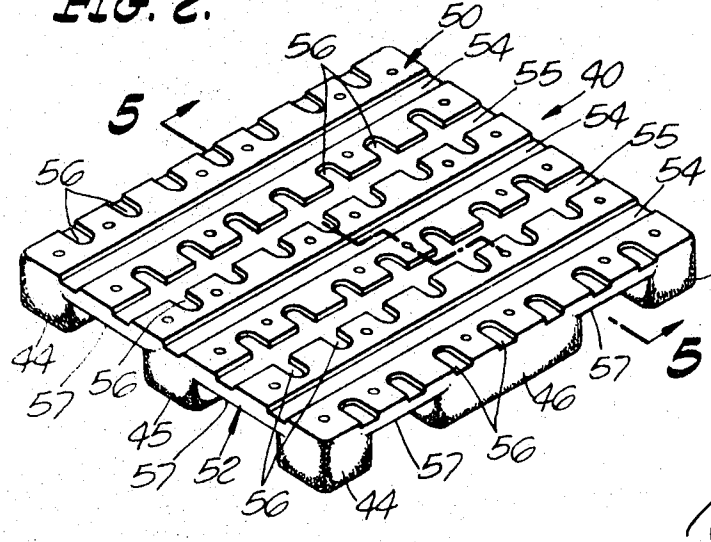


FIG. 4.

INVENTORS.
LOWELL D. HAMMOND
ELMER H. GOOD
BY
ATTORNEYS

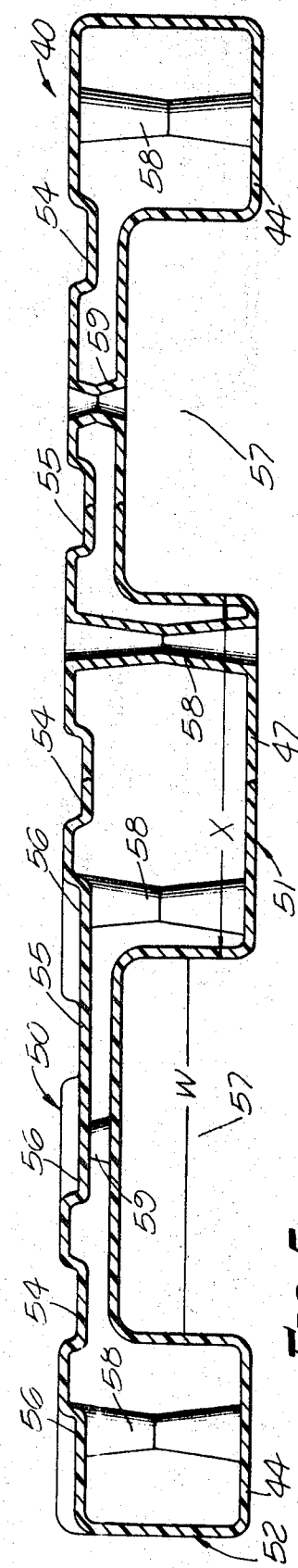


Fig. 5.

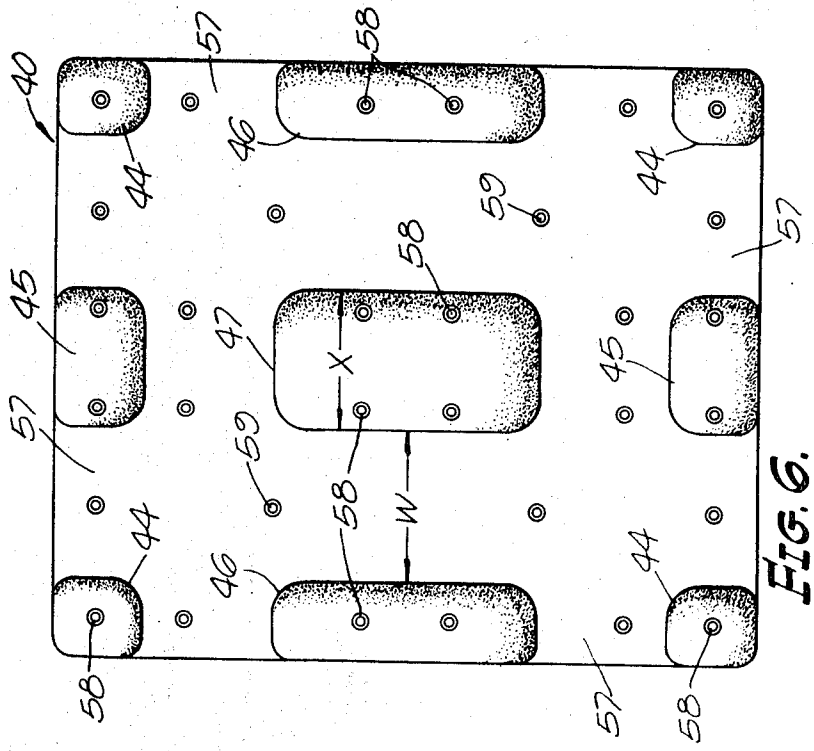


Fig. 6.

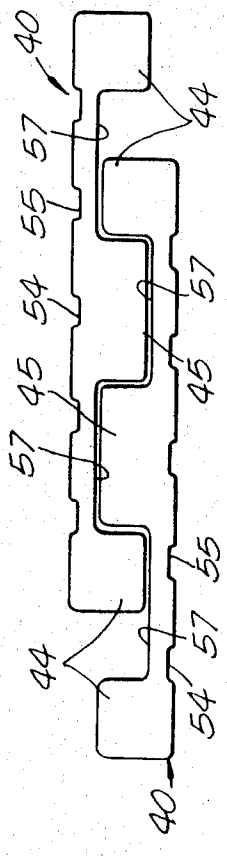


Fig. 7.

INVENTORS
LOWELL D. HAMMOND
ELMER H. GOOD
BY
ATTORNEYS

PLASTIC PALLET

This invention relates to material handling pallets for use with forklift equipment and more particularly to a one-piece seamless molded plastic pallet characterized by its lightness, high strength, ruggedness and ability to withstand rough handling.

Many proposals have been made heretofore for improved cargo handling pallets in an effort to reduce weight while retaining strength, durability, ease of handling and other desirable characteristics. A wide variety of materials and combination of materials have been proposed to meet these and other objectives. However, these attempts have been subject to various shortcomings and disadvantages avoided by the present invention. Certain of these prior constructions have been excessively expensive to construct and others of a less expensive nature have been lacking in strength, durability, and ability to withstand the rigors of usage.

It is therefore a primary objective of the present invention to provide an improved high-strength, lightweight seamless, nestable pallet construction capable of repeated use in handling heavy loads and particularly characterized by its lightness, versatility and ease of handling. The hollow structure is molded in one piece and substantially all portions of its walls are of uniform thickness. The upper and lower main walls are uniquely contoured to improve the strength and rigidity of the structure while providing free drainage, ventilation and access for the prongs of forklift equipment from all four sides of the pallet. The upper and lower surfaces are interconnected at spaced intervals by tubular struts having reduced midportions and flaring opposite ends merging with the main surfaces of the pallet and so disposed as to transfer the weight of cargo supported on the a pallet to the underlying load bearing surfaces. Another feature is the fact that the bosses and channeling in the lower wall are so proportioned as to nest one within the other for greater compactness when storing and transporting the empty pallet.

It is, therefore, a primary object of the present invention to provide an improved, lightweight, high-strength, seamless molded plastic pallet and to provide an improved method of making the same.

Another object of the invention is the provision of a seamless hollow molded plastic pallet designed for compact nesting in pairs when not in use.

Another object of the invention is the provision of a hollow seamless pallet having a plurality of internal tubular struts interconnecting its upper and lower surfaces and equitably distributed about the interior of the pallet structure.

Another object of the invention is the provision of a unique method of making a hollow seamless molded plastic pallet without need for high pressure equipment or high temperatures, and using simply constructed inexpensive separable mold parts.

Another object of the invention is the provision of a one-piece, lightweight, high-strength material handling pallet having open-ended reinforcing drainage channels in its upper surface and a plurality of rows of bosses formed in its lower wall and distributed to form receiving channels for the prongs of a forklift handling device.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated.

FIG. 1 is a schematic representation of apparatus suitable for use in practicing the method of this invention;

FIGS. 2 and 3 are fragmentary cross-sectional views through a portion of the mold assembly, FIG. 2 showing the charge distributed before being heated to a molten condition, and FIG. 3 showing the charge after heated to a molten state and fully distributed;

FIG. 4 is a perspective view from the upper side of the completed pallet;

FIG. 5 is a cross-sectional view on an enlarged scale taken along broken line 5–5 on FIG. 4;

FIG. 6 is a bottom plan view showing a pair of the pallets; and

FIG. 7 is a side elevational view of a pair of nested pallets as seen from one end.

Referring more particularly to FIG. 1, there is shown suitable apparatus, designated generally 10, for practicing the invention method and preferably comprising a conventional type of rotary molding machine operable to tumble a mold assembly 11 about two axes at right angles to one another. Main frame 12 is rotatably mounted for pivoting about a vertical axis on a wheeled chassis 13 for convenience in moving the machine along rails 14 between an oven 15 and a cooling chamber 16. The latter is preferably equipped with a cooling water sprayhead 18 and an air circulating fan 19.

Main frame 12 has a horizontal support 22 about which yoke 23 rotates by suitable driving means such as a hydraulic motor mounted within housing 24. Rotatably supported at the outer end of one arm of yoke 23 is a support 25 which cooperates with a retractable clamping spindle 26 aligned with the axis of rotation of support 25. Drive connections 27, 28 drivingly interconnect the hydraulic motor with support 25 and serve to rotate the mold assembly about an axis lying in a vertical plane as yoke 23 slowly rotates the assembly about a horizontal axis passing through support 22. Power for opening and closing the mold is provided by pressurized air supplied through hose 30 to a double action cylinder 31 connected with the outer end of spindle 26. Pressurized water to operate the hydraulic motor is supplied by way of hose 32. Further details of the molding machine need not be described since the construction and operation of this equipment are well known to persons skilled in the molding art.

Molding assembly 11 is shown in greater detail in FIGS. 2 and 3 and preferably comprises two mold halves 34, 35 formed of good heat conductive material, such as aluminum or aluminum alloy. These mold parts have an accurately finished parting surface 36 mating in a plane generally centrally of the mold cavity 37 and having a shape corresponding to the exterior surface of the pallet to be molded therein. Preferably the cavity has a shape complemental to that of the pallet structure 40 shown in FIGS. 4 and 5.

Each mold part 34, 35 also includes aligned pairs of tapered bosses of which a single pair 42, 43 is shown in FIGS. 2 and 3. A taper corresponding generally to that illustrated provides excellent results and the end surfaces 44 of the bosses preferably abut one another along the parting plane 36 of the mold assembly. The purpose of bosses 42, 43 is to form tubular struts in the pallet product to be molded and distributed about the interior of the pallet to provide high-strength tie connections between the upper and lower surfaces as well as high-strength column support capable of transferring load forces between the upper and lower wall of the pallet. A preferred distribution of these struts and the manner in which they cooperate with the associated pallet structure will be discussed presently.

Another and important feature of the mold cavity 37 is the provision in the lower mold half 35 of rows of wells distributed along all lateral edges of the mold cavity as well as centrally thereacross thereby to form rows of downwardly projecting bosses 44, 45, 46 and 47 in the pallet structure as is best shown in FIGS. 5 and 6. These bosses serve multiple functions as will now be described in connection with other pallet features.

Referring to FIGS. 4 to 6 and initially to FIG. 5, pallet 40 will be understood as comprising an upper wall 50 and a lower wall 51 bounded and interconnected at their perimeters by a continuous sidewall 52. As will be best understood from FIG. 4, sidewall 52 includes a low height portion along a portion of its perimeter and a substantially higher portion in areas forming part of the outer walls of bosses 44 through 47.

Upper surface 50 is preferably provided with open ended shallow depressions or channels 54, 55 extending lengthwise thereof. As herein shown channels 55 include U-shaped extensions 56 opening from their opposite sides and similar extensions 56 opening through the opposite lateral edges of the pallet. These channels and extensions serve numerous important

purposes such as reinforcing and stiffening the upper wall **50** as well as providing free flow escape channels for any fluid material which otherwise might tend to collect on the pallet. Additionally, it is sometimes important to provide ventilation for material carried on the pallets as where used in connection with the transport of flowers, fruit, vegetables, and the like. In other cases the channels serve to distribute refrigerated cooling air.

Lower wall **51** is formed with rows of bosses **44, 45 46, 47** which are spaced apart to provide prong-receiving channels **57** of a forklift device. It will be noted from FIG. **6** that channels **57** extend lengthwise and crosswise of the underside of the pallet and are appropriately spaced for use with conventional forklift equipment. Of importance is the fact that the width *w* of channels **57** is greater than the transverse width *x* of bosses **45, 47**. This mode of proportioning lower wall **51** permits pairs of the pallets to be inverted and internested in the manner made clear by FIG **7**, thereby effecting a very considerable space saving when storing or returning empty pallets to a point of use.

Referring now more particularly to FIG. **5** there is shown details of the internal reinforcing provided between upper and lower walls **50, 51** comprising a plurality of tubular struts **58, 59**. It will be understood that the tubular struts **58, 59** are equitably and strategically distributed to provide maximum reinforcement and so as to underlie points of high load stress typically encountered in the reinforcing of the described pallet. It will also be observed from FIG. **6** that the struts are arranged in rows with certain of the struts being located interiorly of the bosses formed in the lower wall of the pallet and so disposed relative to the sidewalls of these bosses as to cooperate therewith in providing maximum support. The flaring design of the struts is also effective in strengthening the midportion of the struts.

The described pallet **40** is made quickly and inexpensively by charging an appropriate quantity of uncured thermoplastic material into the mold cavity. Although various thermoplastic compositions may be employed, one found to provide highly satisfactory results utilizes high density linear polyethylene in powder form. This material, if purchased in pellet form, is desirably ground to a fineness of 28 to 35 mesh. A sufficient quantity of this material is charged into the mold cavity to form a pallet of the desired wall thickness. The mold parts are then closed together by admitting air under pressure to clamping cylinder **31**. The entire molding apparatus **10** is rolled to the left as viewed in FIG. **1** until the rotating part of the mold is within oven **15**. The mold is rotated about both its horizontal and vertical axes to tumble and distribute the plastic material as heat is applied to the mold assembly **11**. FIG. **2** shows the charge of plastic powder **60** distributed in a uniform layer along all interior surfaces of the hot mold cavity. After the powder becomes molten, it forms a thinner, more dense uniformly distributed layer as indicated at **61** in FIG. **3**. The molding apparatus continues to be rotated at a suitable rate, such as 2 to 12 revolutions per minute, for 15 to 30 minutes, depending upon the quantity of charge placed in the mold cavity. During this period the mold is held at a suitable curing temperature for the particular thermoplastic employed, as for example, 400 to 600° F.

Thereafter, the apparatus is withdrawn from oven **15** and the upper half of the molding machine is rotated 180° about the vertical axis of the main frame and then transferred into cooling chamber **16**. Cooling water is sprayed over the mold assembly from sprayhead **18** and cooling air is circulated thereover by fan **19**. After the mold has become thoroughly cooled, it is opened and the completed product is withdrawn and is ready for use.

While the particular plastic product and method of making same herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

We claim:

1. A lightweight one-piece pallet of rotationally molded thermoplastic material adapted for use with forklift cargo handling equipment, said pallet comprising a seamless closed hollow shell of substantially uniform wall thickness having upper and lower wall portions in spaced apart parallel relationship interconnected between their perimeters by vertically disposed sidewalls integral therewith, and said bottom wall being formed with a plurality of relatively wide but shallow channels opening downwardly throughout the length thereof and open at the opposite ends thereof.

2. A plastic pallet as defined in claim **1** characterized in the provision of a plurality of tubular spaced-apart struts having their opposite ends integral with a respective one of said upper and lower wall portions and having their axes lying generally normal to said upper and lower wall portions.

3. A plastic pallet as defined in claim **2** characterized in that the sidewalls of said tubular struts flare slightly relative to the longitudinal axis thereof.

4. A plastic pallet as defined in claim **2** characterized in that the opposite end portions of said tubular struts are generally frustoconical in shape with their smaller ends adjoining and integrally connected to one another.

5. A plastic pallet as defined in claim **2** characterized in that portions of said upper and lower wall portions lie in different generally parallel planes and in that certain of said tubular struts are longer than others thereof and disposed between more widely spaced portions of said upper and lower wall portions of said pallet.

6. A plastic pallet as defined in claim **1** characterized in that said upper wall portion is formed with shallow upwardly facing channels opening laterally through the sidewall portion of said pallet to provide drainage from portions of said upper wall spaced inwardly of pallet perimeter.

7. A plastic pallet as defined in claim **6** characterized in that said shallow channels are distributed over a major portion of said upper wall and serve as drainage, ventilating and flow passages for fluids and additionally to stiffen and reinforce said upper wall.

8. A plastic pallet as defined in claim **1** characterized in that said relatively wide shallow channels in lower wall portion are spaced and proportioned to receive the prongs of forklift equipment.

9. A plastic pallet as defined in claim **8** characterized in that the lower wall of said pallet is proportioned to nest within the complementally shaped bottom of an identical one of said pallets.

10. A plastic pallet as defined in claim **1** characterized in that said lower wall portion is formed with three rows of hollow bosses arranged lengthwise and crosswise of the underside of said pallet and spaced to accept the prongs of a forklift device inserted from any edge of said pallet.

11. A plastic pallet as defined in claim **10** characterized in the provision of tubular struts disposed between said upper and lower wall portions having their opposite ends normal to and integral with the adjacent one of said wall portions.

12. A plastic pallet as defined in claim **11** characterized in that some of said tubular struts are longer and disposed within said bosses and other shorter ones thereof are disposed between adjacent rows of said bosses.

13. A plastic pallet as defined in claim **11** characterized in that said tubular bosses are arranged in parallel rows within said bosses with one end integral with the bottom of an associated boss and its other end integral with the upper one of said wall portions.