

United States Patent

Westlake, Jr.

[15] 3,680,496

[45] Aug. 1, 1972

[54] **PLASTIC PALLET**
 [72] Inventor: **Edward B. Westlake, Jr.**, 307 Lincoln Ave., Havertown, Pa. 19083
 [22] Filed: **June 8, 1970**
 [21] Appl. No.: **44,154**
 [52] U.S. Cl. **108/58, 108/51**
 [51] Int. Cl. **A47b 19/38**
 [58] Field of Search **108/51-58, 150-161; 52/618-630, 406, 407, 630; 219/213, 93-136**

3,393,647 7/1968 Howell.....108/52
 3,405,666 10/1968 Miller108/58
 3,307,504 3/1967 Cloyde et al.....108/51
 3,407,758 10/1968 Simkins108/51
 3,526,195 9/1970 Maryonovich.....108/53

Primary Examiner—Bobby R. Gay
Assistant Examiner—Glenn O. Finch
Attorney—Max R. Millman

[56] **References Cited**

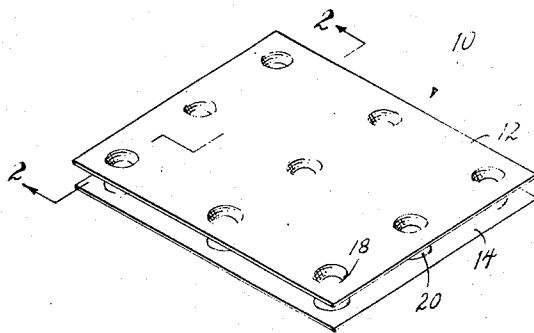
UNITED STATES PATENTS

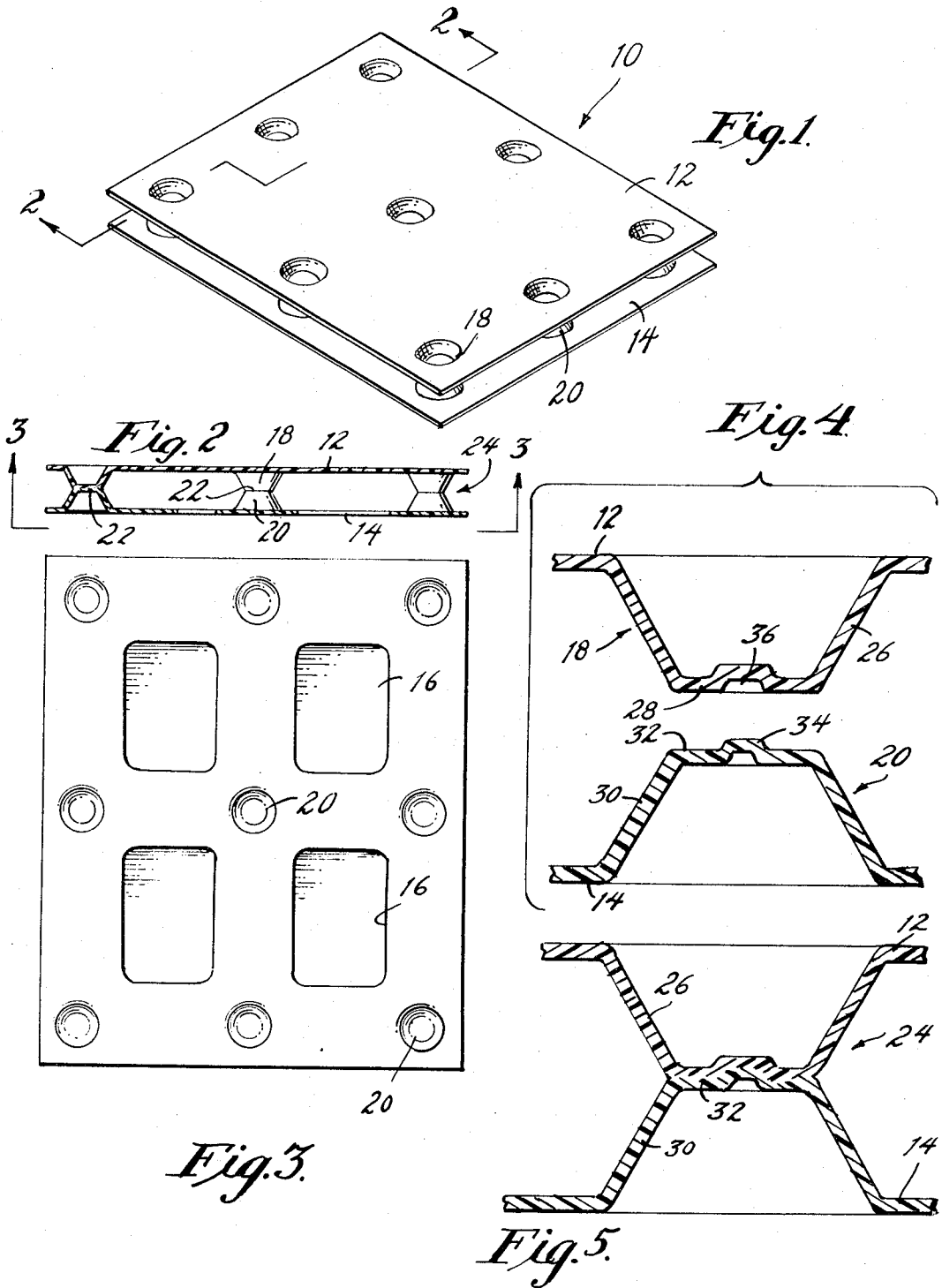
963,889	7/1910	Goodwin.....	52/630 X
1,020,991	3/1912	Lachman.....	219/93
2,298,001	10/1942	Fay.....	52/618 X
3,230,909	1/1966	Watson.....	108/53
3,511,962	5/1970	Suter.....	219/93
3,467,032	9/1969	Rowlands et al.....	108/58
1,015,738	1/1912	Kinnear.....	287/189.36 D UX
2,602,619	7/1952	McIntyre.....	108/57
2,699,912	1/1955	Cushman.....	108/56
3,123,020	3/1964	Voissem.....	108/51
3,187,689	6/1965	Hess.....	108/58

[57] **ABSTRACT**

A sterilizable reusable pallet made of a thermoplastic comprising a top substantially rectangular load engaging sheet, a bottom sheet substantially coextensive therewith, spaced plastic load sustaining legs, and means affixing said legs to and between said sheets along the sides and across the center of the sheets to provide a pallet with entry ways for forks of a fork lift truck from all four sides between the legs and the top and bottom sheets, the pallet acting to resist bending in vertical planes transverse to the main horizontal plane of the pallet. The invention also encompasses economical and efficient methods of making the pallet.

6 Claims, 20 Drawing Figures





INVENTOR,
EDWARD B. WESTLAKE, JR.
BY
Max R. Willman
ATTORNEYS.

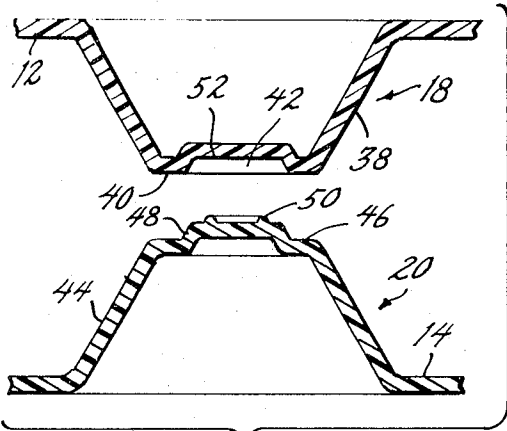


Fig. 6.

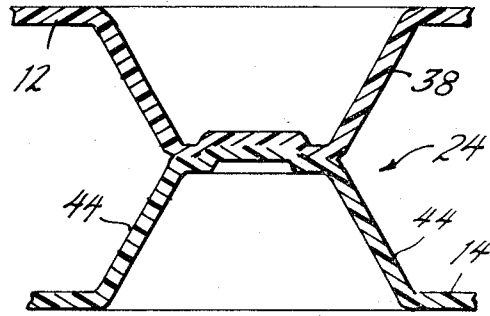


Fig. 7.

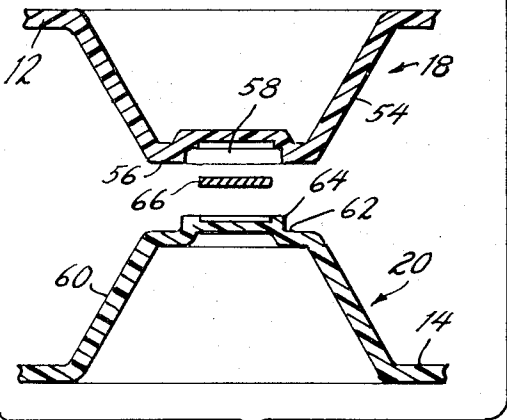


Fig. 8.

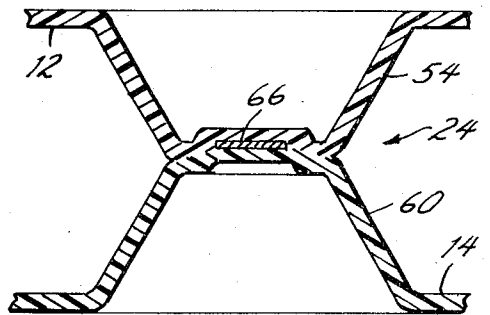


Fig. 9.

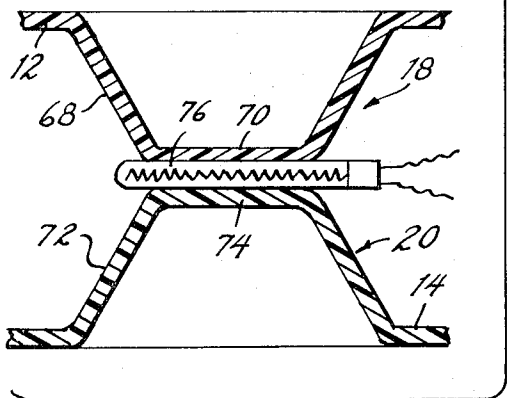


Fig. 10.

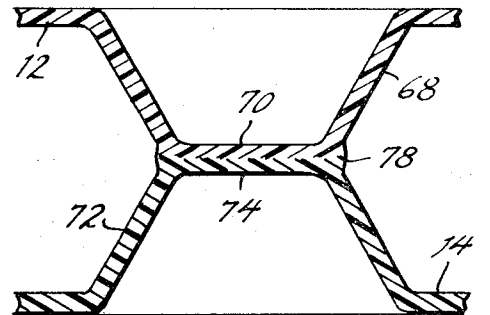


Fig. 11.

INVENTOR
EDWARD B. WESTLAKE, JR.
BY
Max R. Trullman
ATTORNEYS.

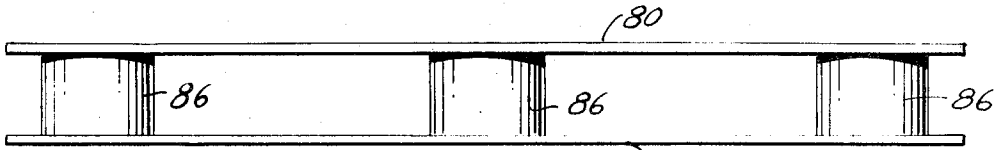


Fig. 12.

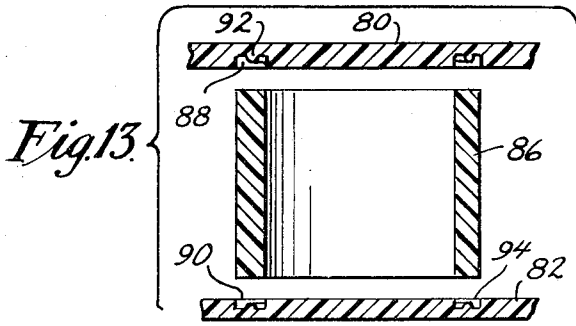


Fig. 13.

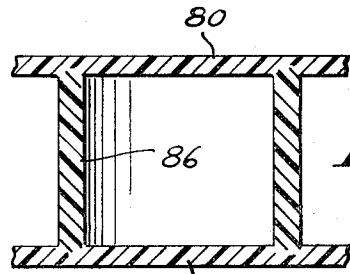


Fig. 14.

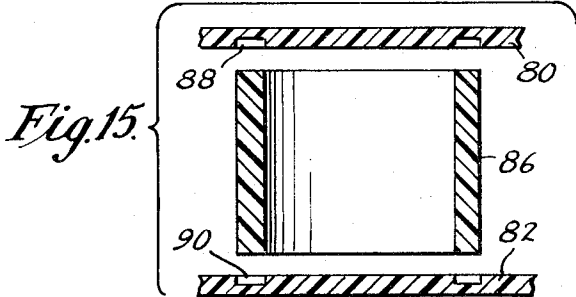


Fig. 15.

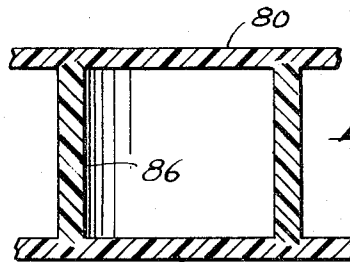


Fig. 16.

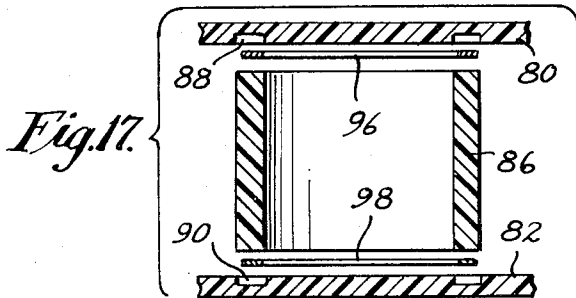


Fig. 17.

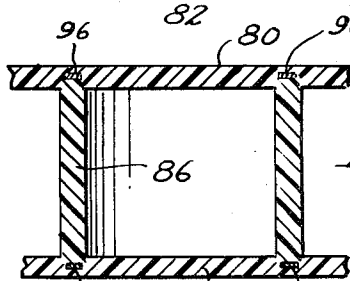


Fig. 18.

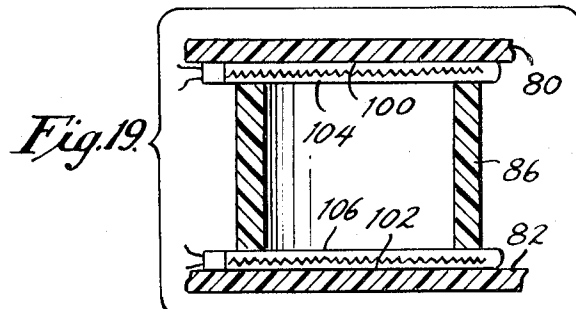


Fig. 19.

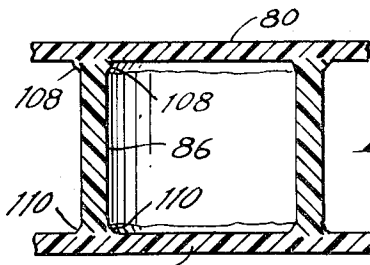


Fig. 20.

INVENTOR.
EDWARD B. WESTLAKE, JR.

BY
Max R. Millman
ATTORNEYS.

PLASTIC PALLET

This invention relates to reusable load supporting plastic pallets with four-way entries for the tines of a fork lift truck.

Wooden pallets have found widespread use in the past because they were relatively inexpensive and provided fair load support. However, they were relatively heavy, produced splinters, and were not sterilizable so that their use in the food, beverage and related industries required that they be frequently discarded and replaced.

In some instances where a sterilizable pallet having good load supporting characteristics was required, steel pallets were employed, which increased the weight and cost of the same. In other instances, pallets were made of paper or fiberboard which, of course, were light in weight and cheap but were not reusable because of a lack of rigidity and especially where sterilization was required. In still other instances, lightweight plastic pallets were made but they were of such construction and material that they were expendable and had load restrictive limits.

The trend in industry today is towards reusable sterilizable plastic pallets which can compete with the less expensive but considerably heavier so-called reusable wooden pallets, and pallets made of polyethylene, polystyrene foam and similar thermoplastics in various configurations have been provided made presumably by methods designed to reduce the cost per unit. An article entitled "The Pallet Race Is On" appearing in *Modern Plastics*, February 1970, pages 58-61 is of interest in indicating the present trends in the industry.

Because the plastic pallets now available consist essentially of a load supporting platform and spaced dependent legs, forming the entry ways for fork lift tines between them, they do not sufficiently resist bending in a transverse plane unless the forks or tines are spaced at the maximum distance permitting their entrance.

It is the primary object of the invention to provide a reusable sterilizable plastic pallet which does resist bending in a transverse plane irrespective of the entrance position of the forks therein.

It is a further object of the invention to provide a reusable sterilizable plastic pallet comprised of a top load engaging sheet and a bottom sheet, both of plastic, and spaced load sustaining plastic members or legs joining the top and bottom sheets whereby the pallet is rendered resistant to bending in transverse planes with the spaces between the legs serving as fork entry ways.

It is another object of the invention to provide various methods of making the reusable plastic pallets which assure their rigidity or resistance to bending in a transverse plane and which effect savings in time and labor and hence the unit cost of the pallets.

These and other objects of the invention will become more apparent as the following description proceeds in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of one form of pallet made in accordance with the instant invention;

FIG. 2 is a sectional view taken on the line 2-2 of FIG. 1;

FIG. 3 is a bottom plan view taken from the line 3-3 of FIG. 2;

FIG. 4 is an enlarged group view in vertical section through the load sustaining leg portions of the top and bottom members before being joined;

FIG. 5 is a view similar to FIG. 4 of the leg portions after they are joined, FIGS. 4 and 5 illustrating one method of joining the leg portions;

FIG. 6 is a view similar to FIG. 4 of a second form of leg portions before being joined;

FIG. 7 is a view similar to FIG. 6 after the leg portions are joined, FIGS. 6 and 7 illustrating a second method of joining the leg portions;

FIG. 8 is a view similar to FIG. 4 of a third form of leg portions before being joined;

FIG. 9 is a view similar to FIG. 8 after the leg portions are joined; FIGS. 8 and 9 illustrating a third method of joining the leg portions;

FIG. 10 is a view similar to FIG. 4 of a fourth form of leg portions before being joined;

FIG. 11 is a view similar to FIG. 10 after the leg portions are joined, FIGS. 10 and 11 illustrating a fourth method of joining the leg portions;

FIG. 12 is a side elevational view of another form of pallet;

FIGS. 13 and 14 are enlarged sectional views through the top and bottom plastic sheets and one of the load sustaining legs showing respectively the position of the members before and after they are joined and illustrating one method of performing the same;

FIGS. 15 and 16 are views similar to FIGS. 13 and 14 illustrating a second method of joining the legs to the top and bottom sheets;

FIGS. 17 and 18 are views similar to FIGS. 13 and 14 illustrating a third method of joining the legs to the top and bottom sheets; and

FIGS. 19 and 20 are views similar to FIGS. 13 and 14 illustrating a fourth method of joining the legs to the top and bottom sheets.

Specific reference is now made to the drawings in which similar reference characters are used for corresponding elements throughout.

Referring first to FIGS. 1-3, the pallet is generally indicated at 10 and comprises a top load engaging member 12 and a bottom member 14 coextensive therewith, preferably 40 x 48 inches. The bottom sheet includes substantially four openings 16 therethrough, preferably rectangular, about 9 x 13 inches and equally spaced for a purpose to appear later.

Both the top and bottom members are made by thermoforming polyethylene, polystyrene, the acrylics, ABS (acrylonitrile butadiene styrene) and similar thermoplastics to produce indented, trough-like dependent leg portions 18 in the top member and corresponding upstanding leg portions 20 in the bottom member, there being nine such leg portions equally spaced along the sides and in the center of the members.

When the leg portions 18 of the top member are joined to the leg portions 20 of the bottom member, as shown generally at 22 in FIG. 2, integrally formed load supporting columns 24 are in effect formed and the pallet is complete and ready for use. The spaces between the formed columns or legs serve as entry ways for the tines or forks of a fork lift truck which can enter the pallet between the top and bottom members from all four sides.

Forks in the fork lift trucks generally contain wheels that can be raised and lowered. When lowered and the forks are inserted between the columns or legs 24, the edges of the openings 16 will engage the wheels on their inward movement, no matter what side the entry

is made through, to serve as stops to limit this inward movement and thereby prevent damage either to the edge of the pallet or to the articles being lifted on the pallet. The openings 16 may be formed in the bottom member during the thermoforming operation or can be cut out afterwards. The latter operation is preferred so that both the top and bottom members can be made in the same mold.

Because the pallet contains upper and lower members or sheets joined together at equally spaced points by load support columns or legs, the pallet will resist bending around any vertical plane transversely therethrough. Hence there is no need to make sure that the forks should enter the entry ways at the maximum spaced apart positions, as is the case with pallets which merely contain a load engaging platform and dependent legs, since bending does occur in the platform between the legs if the forks are disposed to one side or the other of the pallet.

Various efficient methods of joining the leg portions of the top and bottom sheets to form the integral load supporting columns can be employed.

As illustrated in FIGS. 4 and 5, each leg portion 18 of the top sheet is an indentation having a downwardly tapering peripheral wall 26 and a web 28. Each leg portion 20 of the bottom sheet is a similar indentation having an upwardly tapering peripheral wall 30 and a web 32 which is substantially coextensive with web 28. Centrally thereof, the web 32 of the lower leg portions 20 is provided with a protuberance 34 serving as a locating pin adapted to enter a recess 36 centrally of the web 28 of the upper leg portion 18. Prior to assembly an appropriate cement is placed on the protuberances 34 and in the recesses 36 and the protuberances are held in the recesses under pressure until the cement is cured. It is of course understood that the protuberances and recesses can be reversed.

In FIGS. 6 and 7, the upper leg portion 18 is formed with a downwardly tapering peripheral wall 38 and a web 40 which includes a recess 42 in the bottom thereof. The lower leg portion is formed with an upwardly tapered peripheral wall 44 and a web 46 which is substantially coextensive with web 40, the web including an upstanding protuberance 48 adapted to enter recess 42. The protuberance 48 also includes an upstanding ridge 40. When all the protuberances 48 are made to enter all the recesses 42, the ridges 50 contact the inner walls 52 of the recesses. Upon application of ultrasonic sealing, the ridges 50 effectively fuse to the walls 52 in the recesses to form an exceptionally strong weld or bond between the upper and lower leg portions to form the load sustaining columns 24 shown in FIG. 7. In effect, the weld formed, as seen in FIG. 7, includes a portion of the web of the lower leg 20 embedded in the web of the upper leg 18. Here again the recesses 42 and protuberances 48 and ridges 50 may also be reversed. Also, the ridges 50 can be provided in the recesses 42 instead of on the protuberances by fly cutting the recesses in the webs 40 with a cutter that would leave the ridges 50 in the recesses.

In FIGS. 8 and 9, the upper leg portion 18 is formed with a downwardly tapered peripheral wall 54, a web 56 and a substantially circular recess 58 therein. The lower leg portion 20 is formed with an upwardly tapered peripheral wall 60 and a web 62 having a sub-

stantially circular protuberance 64 coextensive with the recess 58. Thin die cut, cold rolled steel rings or washers 66 are placed in the recesses 58 and the top and bottom sheets 12 and 14 are pressed together with the protuberances 64 entering the recesses 58, and with pressure applied to the assembled sheets, the rings 66 are subjected to heat by induction coils causing the plastic around the washers to melt and produce a very effective and consistent weld with the rings remaining in place, as seen in FIG. 5, and a portion of the web of the lower leg embedded in the web of the upper leg. It will of course be noted that the thickness of the ring 66 is less than the depth of the recess 58 to allow the protuberance 64 to enter it with the ring in place. Here again the recesses and protuberances can be reversed.

In FIGS. 10 and 11, the upper leg portion 18 is formed with a downwardly tapered peripheral wall 68 and a substantially flat web 70. Similarly, the lower leg portion 20 is formed with an upwardly tapered peripheral wall 72 and a substantially flat web 74 coextensive with web 70. With the top and bottom sheets held in appropriate supports, a Teflon coated heating element 76 is placed between each pair of webs 70 and 74 and in contact with their exposed faces. When the desired welding consistency is attained, all nine heating elements are simultaneously withdrawn and pressure applied, resulting in the production of an excellent weld with a peripheral bead 78 around the joined webs.

Before proceeding with a description of forms of inventions shown in FIGS. 12-20, it should be noted that while the upper and lower leg portions 18 and 20 are shown as tapered, this is the preferred form. Other shapes, such as circular or rectangular in cross section can also be employed. Also, the top sheet 12 and bottom sheet 14 may be secured together mechanically by punching holes in the corresponding webs of the upper and lower leg portions 18 and 20 and extending suitable headed metal or plastic connectors therethrough. Although the thermoforming of the two halves, namely the upper sheet 12 and lower sheet 14, results in producing leg portions of somewhat thinner wall sections than the flat or platform portions of the sheets, because the depth of the draw is only half the full depth of the pallet, i.e. the distance between the flat portions of the top and bottom sheets (generally $3 \frac{5}{8}$ inches), the resultant leg portion will be strong and its thinning kept to a minimum.

FIG. 12 is an overall view of the forms of invention shown in the remaining FIGS. 13-20 and comprises a substantially flat, non-porous, thermoplastic top sheet 80 and a coextensive similar bottom sheet 82 joined by nine spaced load sustaining hollow columns or tubular legs 86. The dimensions of the top and bottom sheets and the spacing of the legs in this form of the invention are the same as in those shown and described with reference to FIGS. 1-11. The sheets 80 and 82 can be extruded, injection molded, cast or thermoformed while the legs are preferably extruded. While the connecting load sustaining members, legs or columns 86 are shown in the preferred cylindrical form, it is to be understood that they can also be rectangular or even triangular in cross section. While not shown, the bottom sheet 82 will contain openings therein, as openings 16 in bottom sheet 14, to serve as stops for the fork wheels and limit inward movement of the forks from

any of the form sides of the pallet. FIGS. 13-20 illustrate the various methods and means of joining the columns or legs 86 between the inner surfaces of the top and bottom sheets.

In FIGS. 13 and 14, recesses 88 and 90 are provided in the inner surfaces of the top and bottom sheets 80 and 82 respectively, the recesses being of the same configuration as that of the periphery of the legs 86 and of a width approximating but slightly larger than the wall thickness of the leg. The recesses 88 and 90 are preferably fly cut into the sheets with the cutter that leaves ridges 92 and 94 in the recesses. The tubular legs 86 are fitted into the recesses 88 and 90 and when so held in place are subjected to ultrasonic welding to provide a strong fast weld economically, as only a single power source and nine stands are required to weld an entire pallet assembly. If desired, the ridges 92 and 94 which initiate the weld can be excluded from the recesses and machined or molded instead on the free ends of the tubular legs 86. As seen in FIG. 14 each weld includes an end portion of the leg 86 embedded in the upper and lower sheets, as a result of having been fitted into the recesses prior to the application of heat and pressure.

In FIGS. 15 and 16, the same construction as that shown in FIGS. 13 and 14 is used except that no ridges are provided either in the recesses 88 and 90 or at the free ends of the tubular leg 86. Only the recesses 88 and 90 are used as such. The legs 86 are heated between two Teflon coated surfaces until their free ends soften, then they are transferred to predetermined locations and pressed in place into the recesses 88 and 90 of the top and bottom sheets to rapidly produce a firm weld as shown in FIG. 16. If the Teflon coated surfaces are flat, the result is as shown in these Figs. However, the Teflon coated surfaces may be recessed in which case rounded edges will be imparted to the free ends of the legs 86. Each weld formed has an end portion of the legs 86 embedded in the respective upper or lower sheet. It is also possible but less desirable to coat the ends of the tubular legs 86 and the recesses 88 and 90 with a suitable cement, fit the ends of the legs into the recesses and press the sheets together until the cement is cured. Such a joint is not as strong as the weld.

In FIGS. 17 and 18, the same construction of top and bottom sheets, recesses and legs as that shown in FIGS. 15 and 16 are used. Additionally, thin die cut cold rolled steel rings 96 and 98 are provided which are fitted into the recesses 88 and 90 of the top and bottom sheets respectively. The rings are each of a thickness less than the depth of the recess in which it fits. The width of each washer approximates that of the recess into which it fits. The legs 86 are then filled into their corresponding recesses 80 and 82. The washers or rings 96 and 98 are then subjected to heat by induction coils which will cause the plastic around the washers or rings to melt and with applied pressure a very effective and consistent weld is achieved with the washers embedded as shown in FIG. 18. Here again because the ends of the tubular leg 86 has been interfitted into the recesses 88 and 90 before welding, each weld contains an end portion of the leg embedded in the sheet.

In FIGS. 19 and 20, the top and bottom sheets 80 and 82 are not provided with recesses but rather the inner surfaces 100 and 102 thereof are also substantially flat.

Teflon coated heating elements 104 and 106 larger than the outer diameter of each tubular leg 86 are placed between the upper and lower free edges of the leg and the inner surfaces 100 and 102 of the top and bottom sheets and in contact with the latter, and when the desired welding consistency is attained, the eighteen heating elements 104 and 106 are simultaneously withdrawn and pressure applied against the sheets resulting in an excellent weld with beads 108 and 110 at both the inside and outside of the tubular legs.

Thus it will be seen that the pallet shown and described with reference to FIGS. 12-20 resists bending around transverse planes through the same as does the pallet shown and described with reference to FIGS. 1-11. It should be understood that the pallets of the invention permit design flexibility as the top sheet may be heavier than the bottom sheet, and the legs may be of different wall thicknesses and diameters. The plastic pallets may be color coded to prevent pilferage and may be readily sterilized and reused without fear of absorption of spilled materials, such as oils in the good canning industry which become rancid.

It should also be noted that in the case of the forms of the invention shown in FIGS. 13-18 great strength to resist shearing or puncturing of the legs by lateral impact of the forks of a fork lift truck against the legs, as when there is a shift in load, is obtained because they do not depend only upon the weld between the ends of the legs and the top and bottom sheets but rather a combination of the weld and the recessed positioning of the legs in the sheets. This also applies to the forms of the invention shown in FIGS. 4-9. The strength of the legs to resist puncturing or shearing due to the lateral impact of the forks against them depend upon the weld in the non-recessed forms of FIGS. 10 and 11 and 19 and 20, but here the weld is exceptionally strong because the method of forming it is such as to produce a peripheral bead which enlarges the weld.

While preferred embodiments of the invention have here been shown and described, it is understood that skilled artisans may make minor variations without departing from the spirit of the invention.

What is claimed is:

1. A sterilizable reusable pallet made of a thermoplastic resin comprising a top substantially rectangular load engaging sheet, a bottom sheet substantially coextensive therewith, spaced plastic load sustaining tubular legs affixed to and between said sheets along the sides and across the center of the sheets to provide a pallet with entry ways for forks of a fork lift truck from all four sides between the legs and the top and bottom sheets, said sheets including recesses opening through the inner surfaces thereof, the ends of said legs extending into said recesses and being welded thereat.

2. The pallet of claim 1 and a metallic ring in each recess of thickness less than the depth of the recess.

3. A sterilizable reusable pallet made of a thermoplastic resin comprising a top substantially rectangular load engaging sheet, a bottom sheet substantially coextensive therewith, spaced plastic load sustaining legs and means affixing said legs to and between said sheets along the sides and across the center of the sheets to provide a pallet with entry ways for forks of a fork lift truck from all four sides between the legs and the top and bottom sheets, said legs comprising op-

7

8

posed indentations formed in the top and bottom sheets, each indentation including a peripheral wall and a web, and means joining the webs of the indentations of the top sheets to the webs of the indentations of the bottom sheets, said joining means including a recess in the web of one sheet, a protuberance in the corresponding web of the other sheet received and cemented or welded in said recess and a metallic ring embedded in said recess.

4. A precursor assembly for making a sterilizable reusable plastic pallet comprised of vertically spaced top and bottom substantially rectangular sheets of thermoplastic resin, spaced recesses opening through the inner surfaces of said sheets and disposed along the sides and in the center thereof, and tubular thermoplastic legs of wall thickness approximating the width of said recesses, the recesses conforming in shape to the ends of said legs, a metallic ring positioned in each recess of thickness less than the depth of the recess, the ends of each leg adapted to enter corresponding recesses in said sheets and to be affixed therein to form a pallet with entry ways between said legs for forks of a fork lift truck.

5. A precursor assembly for making a sterilizable reusable plastic pallet comprised of vertically spaced top and bottom substantially rectangular sheets of thermoplastic resin, the top sheet being formed with downwardly extending indentations each having a peripheral wall and a web and the bottom sheet being formed with upwardly extending indentations each having a peripheral wall and a web, the indentations

being spaced along the sides and across the center of the sheets and the webs of one set of indentations opposing the webs of the other set of indentations, a recess in the web of one indentation, a metallic ring positioned in each recess of thickness less than the depth of the recess and a substantially coextensive protuberance on the web of an opposing indentation adapted to interengage with and be secured in the recess to provide a pallet with integral legs joining the top and bottom sheets.

6. A sterilizable reusable pallet made of a thermoplastic resin comprising a top substantially rectangular load engaging sheet, a bottom sheet substantially coextensive therewith, spaced plastic load sustaining legs and means affixing said legs to and between said sheets along the sides and across the center of the sheets to provide a pallet with entry ways for forks of a fork lift truck from all four sides between the legs and the top and bottom sheets, said legs comprising opposed indentations formed in the top and bottom sheets, each indentation including a peripheral wall and a web, and means joining the webs of the indentations of the top sheets to the webs of the indentations of the bottom sheet, said joining means including a recess in the web of one sheet and a protuberance in the corresponding web of the other sheet received and cemented or welded in said recess, said protuberance including an upstanding ridge which contacts the inner wall of said recess and is fused thereto.

* * * * *

35

40

45

50

55

60

65