United States Patent [19]

Fujii et al.

[11] **3,759,194**

[45] **Sept. 18, 1973**

[54] **PLASTIC PALLET**

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[22] Filed: **Dec. 7, 1971**

[21] Appl. No.: **205,639**

[52] **U.S. Cl.** **108/58**, 108/51

[51] **Int. Cl.** **B65d 19/38**, B65d 19/00

[58] **Field of Search** 108/51, 58

[56] **References Cited**

UNITED STATES PATENTS

2,621,006	12/1952	Norrefeldt et al.	108/57
2,991,965	7/1961	Drieborg	108/58
3,580,190	5/1971	Fowler	108/58
3,640,229	2/1972	Bell	108/58
3,603,272	9/1971	Ditges	108/51
3,606,844	9/1971	Lubker et al.	108/58
3,307,504	3/1967	Cloyd et al.	108/58
3,228,358	1/1966	Sepe et al.	108/51
3,404,642	10/1968	Belcher et al.	108/58
3,613,605	10/1971	Holdredge	108/58
3,638,586	2/1972	Eishout	108/58
3,661,099	5/1972	Shelor	108/51
3,654,874	5/1972	Skinner	108/56

Primary Examiner—Paul R. Gilliam
Assistant Examiner—G. O. Finch
Attorney—E. F. Wenderoth et al.

[57] **ABSTRACT**

A four-side insertion pallet of one-piece construction formed from plastics having a suitable rigidity which can receive the insertion of the fork or fingers of a fork-lift from any of its four sides.

1 Claim, 9 Drawing Figures

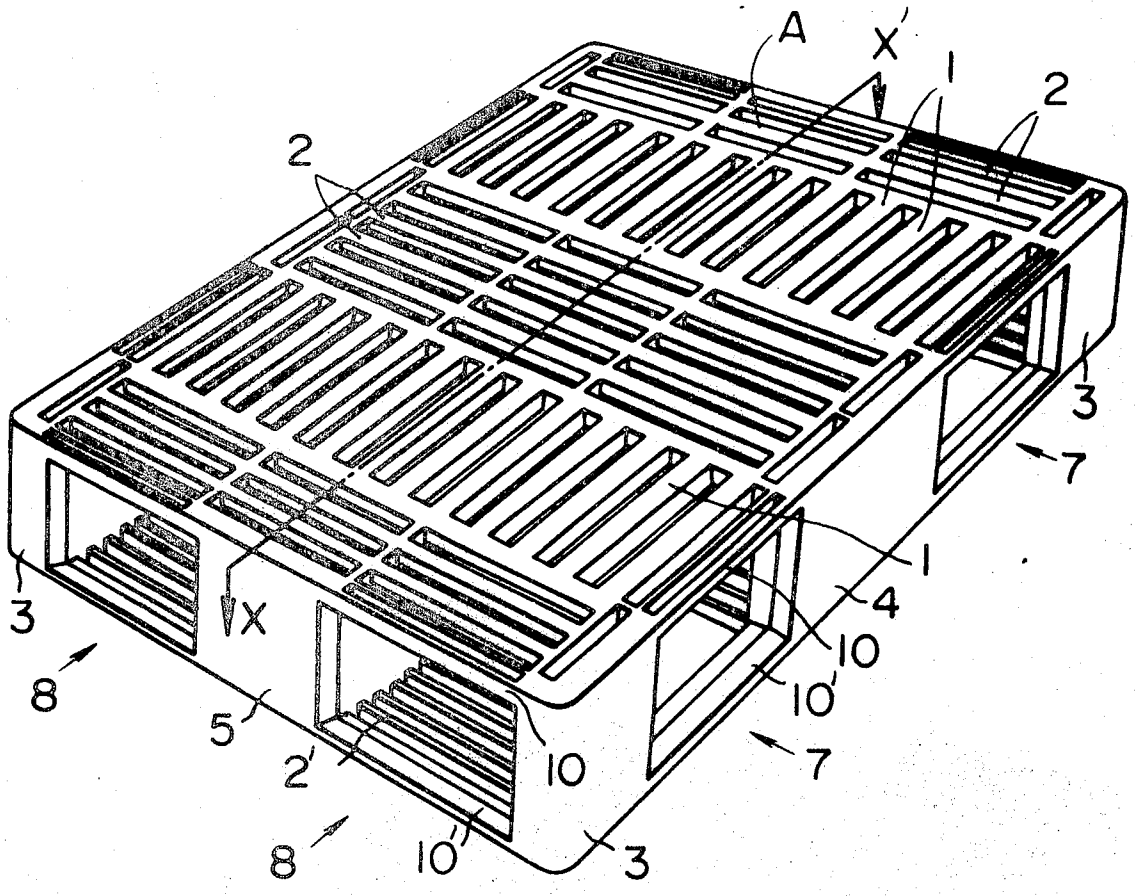

Fig. 1

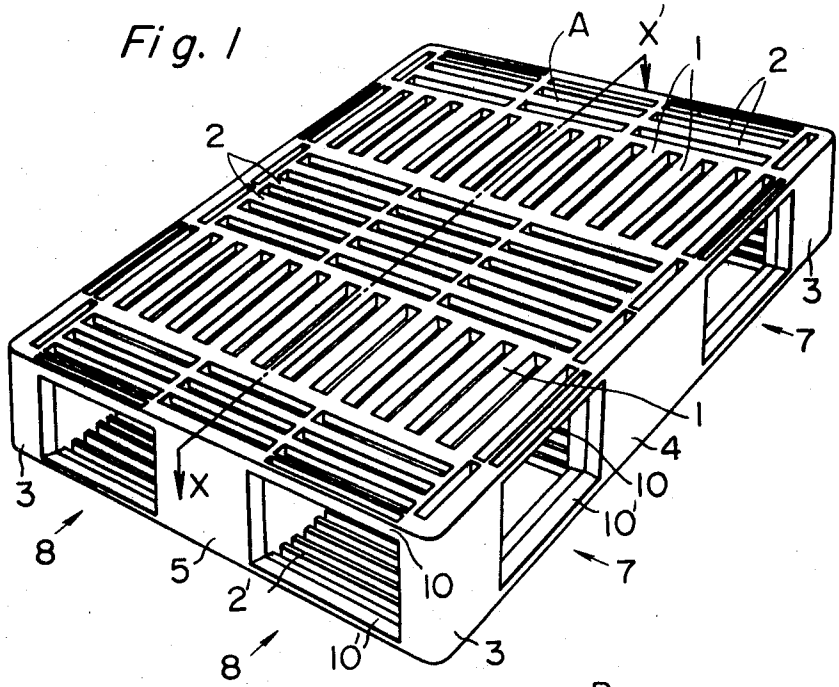

Fig. 2

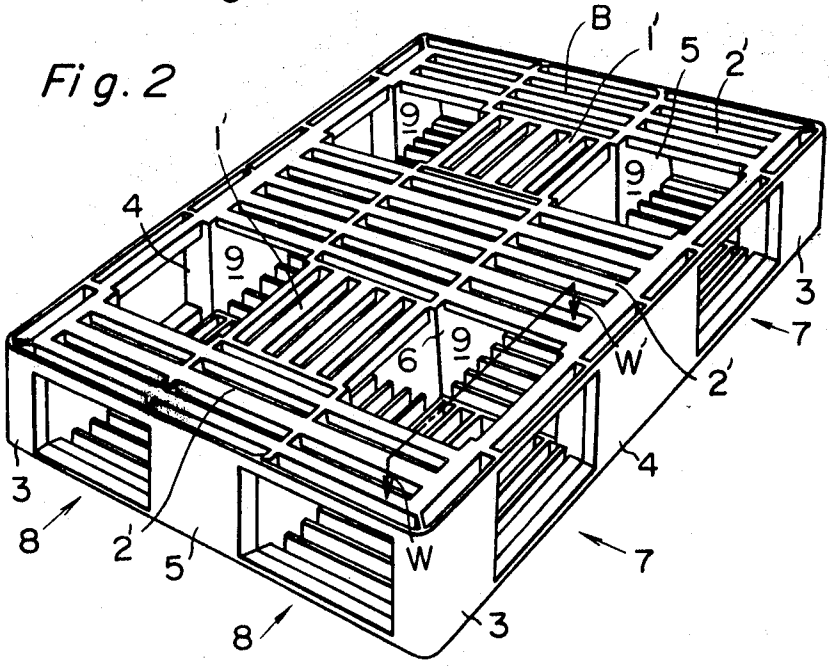

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Fig. 3

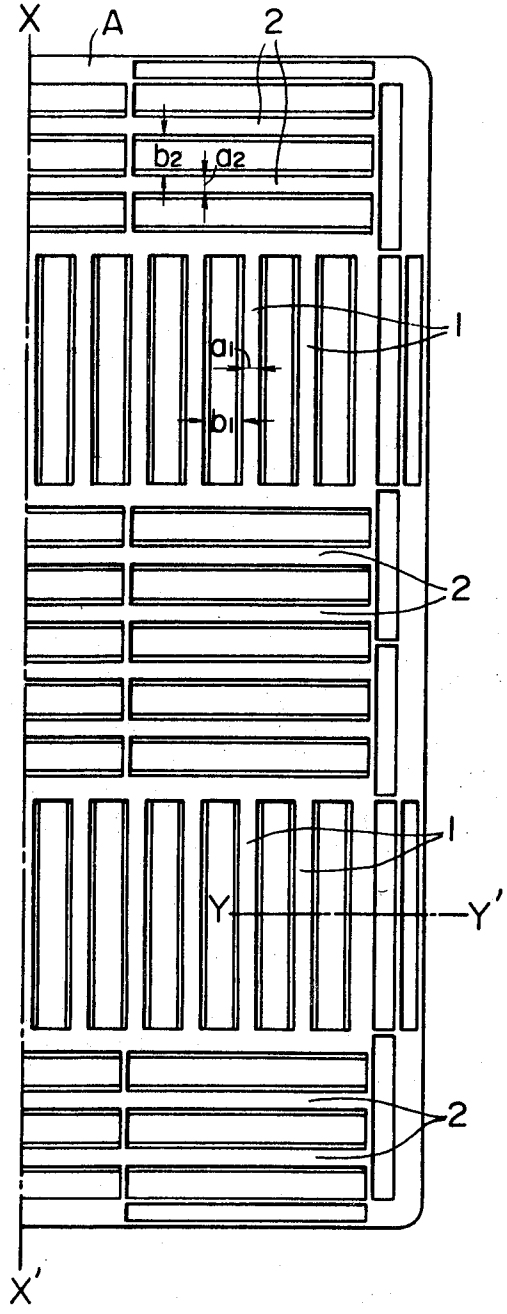

Fig. 4

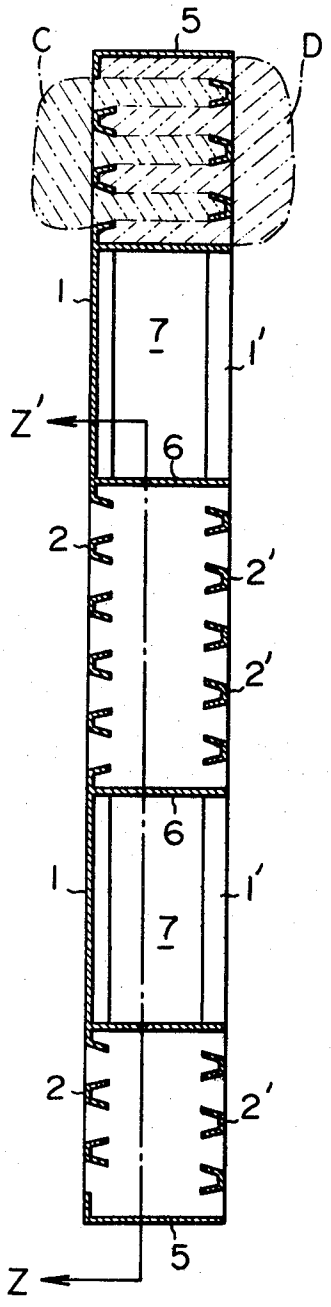

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Fig. 5

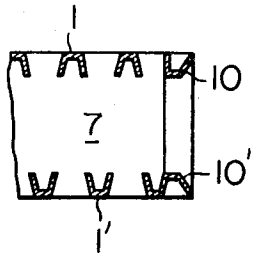

Fig. 6

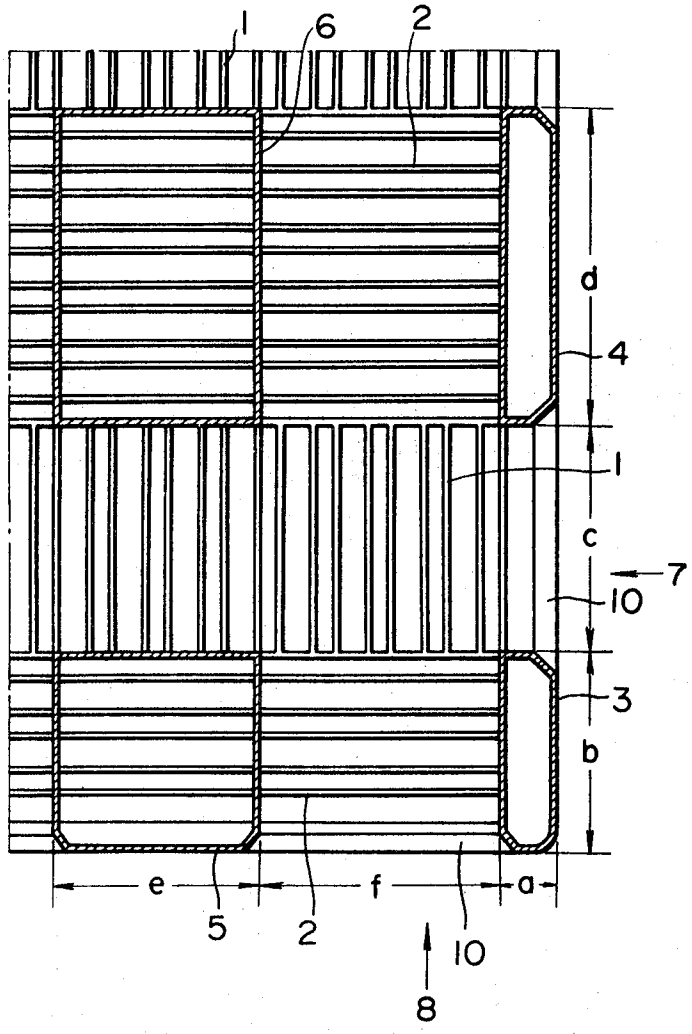

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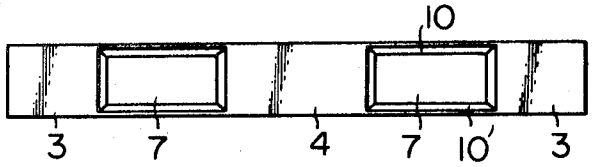
Fig. 7

(a)



(b)

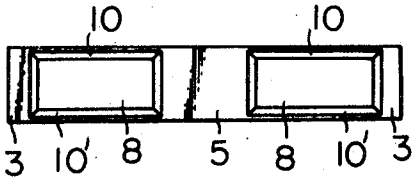
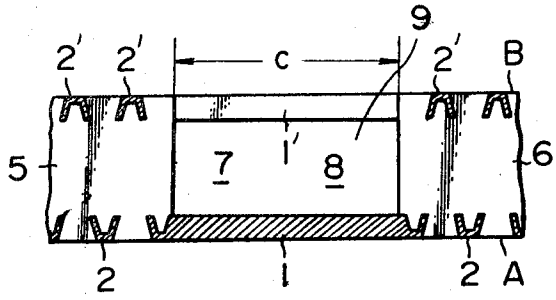


Fig. 8



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PLASTIC PALLET

This invention relates to a new and valuable pallet of one-piece construction formed from plastics having a suitable rigidity. More specifically, the invention relates to a so-called four-side insertion pallet which can receive the insertion of the fork or fingers of a forklift from any of its four sides. The term "pallet," as herein used, is meant to be a quadrilateral portable platform of sufficient thickness, which is used for the carrying of cargo in the handling, storage and movement of same, and especially a portable platform having fork-insertion cavities, making it possible to be used in the movement of cargo with a forklift.

In the past, pallets made of wood have been generally used. However, the life of the wooden pallets was short, since they were easily damaged or corroded. Again, the wooden pallets were heavy. Thus, the wooden pallets had many drawbacks. Furthermore, it is becoming increasingly difficult for the user to obtain the wooden pallets at a low cost nowadays because of the shortage of timber and a decrease in the number of concerns engaged in the woodworking industry. In view of these circumstances, numerous proposals relating to pallets made of metal or synthetic resins have been made. However, none are as yet fully serviceable from the standpoint of function or productivity, and only a very few of those proposed are being actually used.

An object of the invention is to provide a plastic pallet which not only excels in its function but also has a high productivity.

Another object of the invention is to provide a light and difficultly corroded pallet having the strength and cargo carrying stability required of a pallet, this end being achieved with the use of a small amount of the plastic material.

A still another object of the invention is to provide a plastic pallet of one-piece construction, which can be manufactured efficiently and at low cost without the use of a mold of complicated structure.

A further object is to provide a plastic pallet having an outer surface construction which has a large area of flat surfaces on which markings can be made and in which depressions which become the cause of impairing the appearance of the pallet by the accumulation of dirt and dust are scarce.

Other objects and advantages of this invention will become apparent from the following description.

The invention pallet, which conforms with the foregoing objects, is, generally speaking, made up of a quadrilateral level upper surface and a quadrilateral level standing surface, both of which are formed by joining together a plurality of ribs with a U-shaped section, and also a plurality of hollow spacers disposed in spaced relationship to each other for joining the two foregoing surfaces.

The construction of the invention pallets, which is featured in that the cavities for receiving the fork of the forklift are formed by means of these two level surfaces and the spacers, will be more specifically described hereinafter with reference to the accompanying drawings; wherein:

FIG. 1 is a perspective view, as viewed from upper surface side of the pallet, of one embodiment of the invention;

FIG. 2 is a perspective view, as viewed from the standing surface side, of the foregoing pallet;

FIG. 3 is a top plan view of the pallet cut in half taken along the line X—X′ of FIG. 1;

FIG. 4 is a view in vertical longitudinal section of the pallet taken along the line X—X′ of FIG. 1;

FIG. 5 is a fragmentary view in vertical longitudinal section of the pallet taken along the line Y—Y′ of FIG. 3;

FIG. 6 is a fragmentary view in horizontal cross-section of the pallet taken along the line Z—Z′ of FIG. 4;

FIGS. 7 - (*a*) and (*b*) are each side views as viewed from the lengthwise and widthwise directions of the pallet; and

FIG. 8 is a fragmentary view in vertical longitudinal section of the pallet taken along the line W—W′ of FIG. 2.

As shown in the accompanying drawings, the integrally formed plastic pallet of the invention is featured in the following points.

1. In the level upper surface A there are present, in alternation, a group of ribs consisting of ribs **1** of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween, and a group of ribs consisting of ribs **2** of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween and in nonparallelism with the aforesaid ribs **1**.

2. In the level standing surface B there are present, in alternation, a group of ribs consisting of ribs **1′** of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween, and a group of ribs consisting of ribs **2′** of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween and in nonparallelism with the aforesaid ribs **1′**.

3. The spacers consist of the four hollow spacers **3, 3, 3, 3,** disposed at the corners of the pallet, the hollow spacers disposed at the side portions of the pallet (in the figures the four spacers **4, 4, 5, 5** are shown), and at least one hollow spacer disposed in the inner portion of the pallet (in the figures only one spacer **6** in the central part of the pallet is shown).

4. In consequence of the presence of these spacers, a plurality of sets of cavities (in the figures the two sets of cavities **7** and **8** are shown) for insertion of the fork of a forklift are formed between the level upper surface A and the level standing surface B.

5. The ribs **1** of the level upper surface A and the ribs **1′** of the level standing surface B, when viewed from a direction perpendicular to the pallet, are parallelly but not superposedly disposed relative to each other.

6. Likewise, the ribs **2** of the level upper surface A and the ribs **2′** of the level standing surface B, when viewed from a direction perpendicular to the pallet, are parallelly but not superposedly disposed relative to each other.

7. The level standing surface B at below the hexahedral spaces **9** formed by the intersection of the several cavities (in the figure four such spaces are shown) has flared openings having a spread exceeding the cross-sectional area of the hexahedral spaces.

Referring to the drawings, ribs **1** and **2** are ribs which form the level upper surface A of the pallet. Both ribs **1** and **2** are of a U-shaped section with their channels facing towards the interior of the pallet (downwardly in FIG. 1). Ribs **1** and **2** run in different directions, i.e., they are not in parallel with each other (in FIG. 1 they

are at right angles with each other). As shown in FIG. 3, ribs 1, as well as ribs 2, are disposed in parallel at a prescribed interval (b_1, b_2) somewhat greater than their top surface width (a_1, a_2).

In the level standing surface B of the pallet there are provided ribs 1' in parallel with the ribs 1 of the level upper surface A, except that the ribs 1 do not come in superposition relative to the former. In the embodiment shown the disposition of the ribs are such that a rib 1' is present directly below the interval made between two of the ribs 1, and similarly a rib 2' comes directly below the interval between two of the ribs 2. This type of rib construction can be formed by using two molds C and D, such as imaginatively shown by means of the crosshatching with broken lines in FIG. 4.

The square-shaped hollow spacers 3, 4, 5 and 6 not only join the level upper surface A with the level standing surface B but also serve to form the cavities 7 and 8 of a prescribed width for the insertion of the fork. Spacers 3 are disposed at the four corners of the pallet and, as shown in FIG. 6, have a width of a dimension *a* and a length of a dimension *b*. In addition, they are joined at their upper edge with the ribs 2 and a fork guide frame 10 which is positioned at the entrance to the cavity; and, at their lower edge, with the ribs 2' and a fork guide frame 10'. Spacer 4 is disposed at a midpoint in the side of the pallet in its lengthwise direction and, as shown in FIG. 6, has a width of a dimension *a* and a length of a dimension *d*, thus forming the cavities 7 having a width of a dimension *c* between it and the aforesaid spacers 3. As in the case with the spacers 3, it is joined at its upper edge with ribs 2 and the fork guide frame 10 and, at its lower edge, with ribs 2' and the fork guide frame 10'. Spacer 5 is disposed at a midpoint in the side of the pallet in its widthwise direction and, as shown in FIG. 6, it has a width of a dimension *e* and a length of a dimension *b* and forms the cavities 8 having a width of a dimension *f* between it and the aforesaid spacers 3. At respectively its upper and lower surfaces the ribs 2 and 2' run in contact therewith. The corner portions of the spacers 3, 4 and 5 and the frames 10 and 10', which form the entrance to the cavities 7 and 8, are preferably chamfered so as to provide a flared opening for the foregoing entrances. Spacer 6, as shown in FIG. 2, is one whose cross-sectional external form is a square bound by the two straight lines connecting the two side surfaces of the two opposing spacers 4, 4 and the two straight lines connecting the two side surfaces of the two opposing spacers 5, 5. That is, the spacer 6 is disposed in the central part of the pallet and has a width of a dimension *e* and a length of a dimension *d*. Spacer 6 supports at its upper surface the ribs 2 running in the widthwise direction of the pallet and is joined with the ribs 1 at its upper edge. On the other hand, it supports at its lower surface the ribs 2' which run in the widthwise direction of the pallet and is joined with the ribs 1' at its lower edge.

As is apparent from FIG. 2, the ribs 1' are not present in the whole surface of the level standing surface B. That is, in those portions of the level standing surface B directly below the four hexahedral spaces 9 formed by the intersection of the cavities 7 with cavities 8 the ribs 1' are missing. Furthermore, these portions, as shown in FIG. 8, open with a flare from said hexahedral space. In the drawing, it is shown that the opening is greater than the cross-sectional area of the hexahedral space by an amount equal to the width of one rib. The reason why this flared opening has been provided is because by so doing it becomes possible to mold the pallet using a most simple mechanism wherein the opening and closing of the mold is made possible by only an up-and-down movement (in the drawing a lateral movement) as shown imaginatively by means of the crosshatching with broken lines in FIG. 4. In addition, these openings not only contribute to the reduction in the weight of the pallet but also can be used, when using a hand lifter in the handling of the loads, as openings through which the wheels provided in the neighborhood of the distal portion of the fork can be moved outwardly into their erect position.

While the ribs 1 and 2 are shown to meet the ribs 1' and 2' at right angles in the embodiment illustrated in the drawings, these ribs may also meet or intersect each other obliquely, if desired. The angle at which the ribs meet or intersect can, in short, be freely chosen within the range wherein the effect of preventing the slippage of the cargo loaded on the pallet can be achieved. Further, while in the embodiment shown there is present only one set of cavities for each side of the pallet, it goes without saying that the number of sets of caviteis can be increased by increasing the number of spacers. Again, it is also possible according to the invention to provide suitable means for reinforcing the ribs, spacers and fork guide frames.

Further, in those cases where the invention pallet is to be molded with slippery plastic materials such as high density polyethylene, an effective procedure, for example, is to drill small holes in parts of the ribs and embedding therein other materials which are not so slippery. Again, while the fork guide frames 10 and 10' in the embodiment shown are of a U-shaped section with their channels facing outwardly, these can also be of a U-shaped section with their channels facing inwardly as in the case with the ribs 1, 1', 2, 2'.

As a result of the pallet structure of the invention such as hereinbefore described, various merits, such as described below, are brought about.

The invention pallet, as shown by C and D in FIG. 4, can be molded by means of a simple mold consisting of only a male and female set. And since there is no need of a core which is operated by a hydraulic cylinder, the cost of the mold is low.

Since the invention pallet is a molded plastic article of a structure which has been obtained by joining into one piece by means of hollow spacers a level upper surface and a level standing surface, both of which are assemblies of ribs, it not only is light in weight but also has great strength as well as great resistance to corrossion.

In the case of the invention pallet, the ribs are not all disposed in the same direction (i.e., parallel). The group consisting of ribs 1 (or 1') is disposed either at right angle to or a suitable angle relative to its adjacent group consisting of ribs 2 (or 2'). In consequence, the following advantages are had. Adequate flexural strength is had uniformly over the whole surface, and hence there is no need to reinforce the ribs locally by increasing their thickness. There is no tendency for the cargo loaded on the pallet to slip in a given direction. Further, when the cargo-loaded pallets are tiered, there is no tendency of a superposedly stacked pallet to slip in a given direction over the cargo stacked below.

Since the sides of the invention pallet are formed by the hollow spacers and thus provided with a large

amount of smooth flat surfaces, no trouble is experienced by the sides of the pallet being caught by another pallet when a number of pallets are stacked abuttingly alongside each other. Again, since the foregoing smooth flat side surfaces are of sufficient size to be utilized as a marking space, this space can be printed, inscribed or painted with characters, pictures, markings, etc., as desired.

The invention pallet is of such a construction that the fork can be inserted from any of its four sides. Hence, its efficiency from the operational standpoint is high.

Further, since the invention pallet has practically no depressed portions in its external surface, the amount of dust and dirt accumulated is very small. Hence, the appearance of the pallet is not easily impaired by soiling. Again, even if it does become soiled, since its overall structure is of a slatted openworklike structure, not only its exterier but also interior can be readily washed with pressured running water from a hose.

The invention pallet can be readily molded integrally by means of the injection molding technique with a single injection of the plastic material. Furthermore, since in accordance with the invention the makeup of the mold is simple and the resulting shaped article is made up with thin members, its rate of cooling is rapid. Hence, the molding cycle is short, with the consequence that a high productivity can be achieved.

We claim:

1. In an integrally formed plastic pallet including a quadrilateral level upper surface A, a quadrilateral level standing surface B and spacers which join said two surfaces; the improvement wherein said level upper surface A comprises, in alternation, a first group of ribs comprised of ribs (1) of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween, and a second group of ribs comprised of ribs (2) of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween and in at right angles to said first ribs (1); said level standing surface B comprises, in alternation, a first group of ribs comprised of ribs (1') of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween, and a second group of ribs comprised of ribs (2') of inwardly facing U-shaped section, which are disposed with a prescribed interval therebetween and in at right angles to said first ribs (1'); said spacers comprise four hollow spacers (3), (3), (3), (3) disposed at the corners of the pallet, form hollow spacers (4), (4), (5), (5) disposed at the side portions of the pallet, and one hollow spacer (6) disposed substantially in the center of the pallet, thereby forming as a consequence of the presence of said spacers two sets of cavities (7), (8) for receiving the insertion of the fork of a forklift between said level upper surface (A) and level standing surface (B); the first ribs (1) of said level upper surface (A) and the first ribs (1') of said level standing surface (B), when viewed from a direction perpendicular to one of said surfaces (2) the pallet, being disposed parallely but not superposedly relative to each other; likewise the second ribs (2) of said upper level surface (A) and the second ribs (2') of said level standing surface (B), when viewed from a direction perpendicular to one of said surfaces of the pallet, being disposed parallely but not superposedly relative to each other; said level standing surface B having openings at below the four hexahedral spaces (9) formed by the intersection of said cavities (7) and (8), said openings being flared such that their spread exceeds the cross-sectional area of said hexahedral spaces.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,759,194 Dated September 18, 1973

Inventor(s) Mitsuru Fujii and Izumi Narusawa

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the first page of the patent, after line [21], insert the priority information as follows:

-- Foreign Application Priority Data
December 19, 1970 Japan ..... 127,488 --

Signed and sealed this 1st day of July 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.