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Phelps

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[54] SHIPPING PALLET

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

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

[58] **Field of Search** 108/51–58, 60–65; 206/46; 214/621

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[57] **ABSTRACT**

A pallet having a supporting plane for drums or cylinders in closest packed arrangement between two parallel sides and a spacer, connected to the plane, providing room beneath the supporting plane to insert fork lift fingers. The supporting plane has a plane outline definable by a first and second zone on opposite sides of a midline between two parallel sides with a distance between the sides of less than two drum diameters. The first zone has a length according to the number of drum diameters it supports. The second zone has a length according to the number of drum diameters, which may be one less than for the first zone, it supports. For a distance equal to a drum radius, the length of the second zone does not coextend with the length of the first zone. Where the second zone supports one less drum, the noncoextending length is at both ends of the second zone.

10 Claims, 6 Drawing Figures

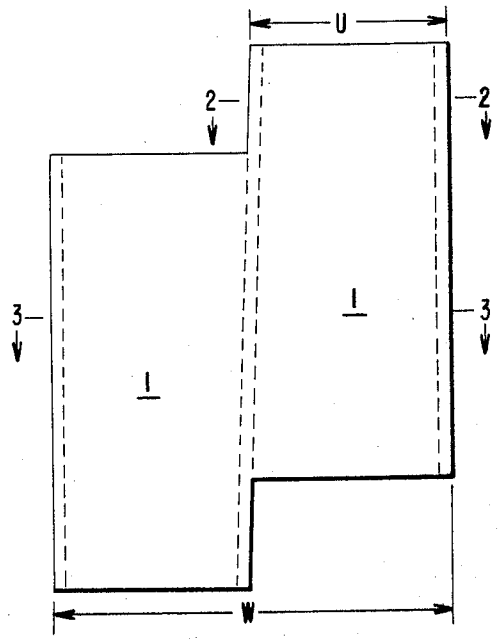


FIG. 1

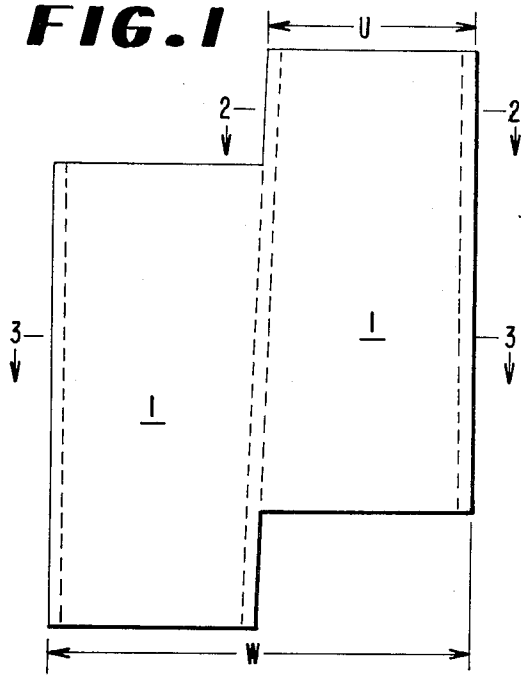


FIG. 4

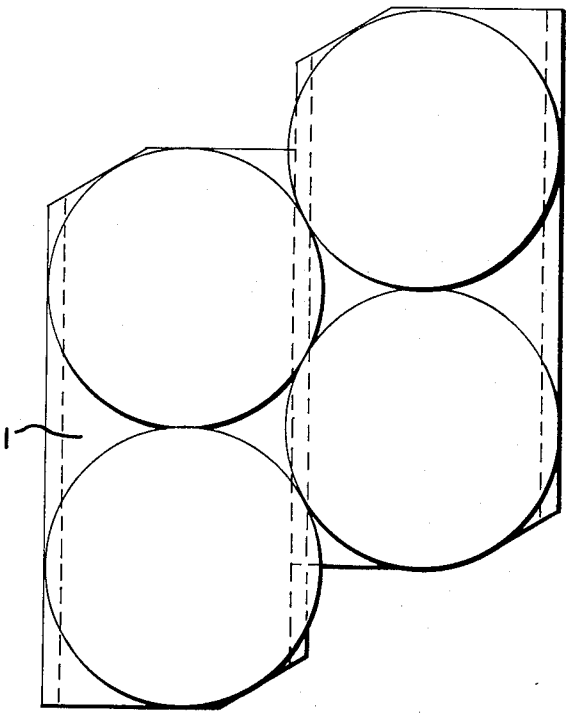


FIG. 3

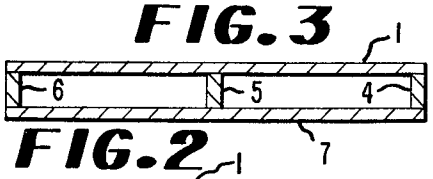


FIG. 2

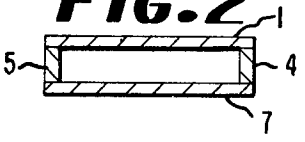


FIG. 5

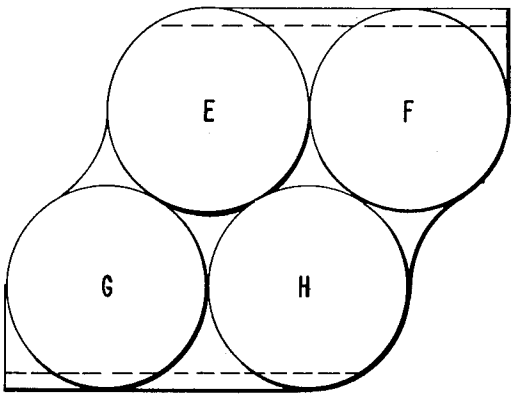
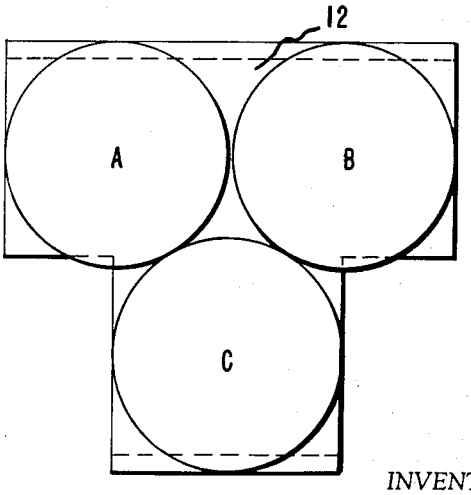


FIG. 6



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SHIPPING PALLET

BACKGROUND OF THE INVENTION

Cylindrical drums are widely used by the chemical and petroleum industries for the storage of chemical products. These drums are normally stored on their ends pending their sale, delivery or use by customers of the products.

For convenience such drums are placed in square or rectangular groups on square or rectangular pallets. Common pallets for this use have at least one supporting deck connected to supporting beams and are provided with space into which lifting fingers of forklift carriers can be inserted. The drums with the pallets are moved by forklift, rather than by manual labor.

Loaded pallets are shipped with the inefficient use of carrier space. A usual mode of transportation, such as a truck or trailer, often has an interior width which is not quite enough to accommodate more than one pallet across the width of the interior. The alternate ways a carrier can handle this problem are undesirable.

On one hand, the pallets may be loaded with but one pallet across the floor width of the carrier space. Though the loaded pallets may be stacked, this is an inefficient use of available space. On the other hand, all the available floor space can be used if drums from pallets are manually loaded, but the advantage of floor space use is offset by the impracticality of stacking the drums. In addition, the manual handling of drums is undesirable as an inefficient use of manpower and is a safety hazard to manpower.

Pallets of the prior art, normally of the square configuration, are stored in a warehouse back-to-back in an alignment squarely across open passageways provided for forklift trucks which handle these pallets. It is necessary for forklift trucks to swing to an alignment across an open passageway so that they can effectively engage or disengage forklift fingers. Passageways must be wide enough to allow for more than a full turning swing of the forklift truck so that the truck can move its pallet load without interference from adjacent stored pallets. The width required for a full turning swing represents lost valuable floor space for storing pallets.

SUMMARY OF THE INVENTION

Shipping pallets for carrying an even number N of drums or cylinders comprising a supporting plane having at least two sides, approximately parallel and coextensive support spacers attached to the lower surface of the supporting plane to support and space the supporting plane for lifting with a forklift, the supporting plane can be considered to be comprised of a planform comprised of two smaller planforms defined as one-half the area of the larger planform that lies on either side of a midline drawn parallel to and between the support spacers such that the smaller planforms have length L along the midline and width W between the midline and the edge along which the support spacer extends can be improved by narrowing the width of each smaller planform to 93.75 percent W and shifting one of the planforms along the midline of the large planform so that the support spacers are no longer coextensive whereby the planform area is reduced for the same even number of drums. An odd number of drums ($N+1$)can be accommodated if one of the smaller planforms is made longer than the other.

DESCRIPTION OF THE INVENTION

Pallets of this invention have a plane for supporting n cylindrical bodies on their ends, n being an integer exceeding one, the cylindrical bodies having a radius r. They may support spatial equivalents of these cylindrical bodies.

These pallets are intended to support cylindrical bodies of radius r along two rows in their closest packing arrangement between two parallel lines of a support plane. That closest packing arrangement is one in which every cylindrical body of one row is positioned against each of two adjacent cylindrical bodies in the next row. Cylindrical bodies so arranged along the extent of two parallel lines require these parallel lines to be only $(2+\sqrt{3})\,r$ or $3.732\,r$ wide. For practical considerations $3.75\,r$ is considered a suitable width of two rows of cylindrical bodies in this kind of contact.

Cylindrical bodies arranged in this fashion will have a number of contacts with adjacent bodies which corresponds to the formula $2n-3$ where n is the number of bodies.

The general outline of the supporting plane is according to its intended support of an even or odd number of cylinders. For the support of an even number of cylinders the planform is a staggered form such as would result from sliding one-half a rectangle for a distance r along a bisection line which extends in a direction parallel to one side of the rectangle. The resulting planform and a similar planform can be in interfitted alignment when a bisection line of each planform is brought close to the other. The supporting plane is provided with two parallel spacing beams which keep the supporting plane away from a surface on which the pallet may be placed.

In the support of an odd number of cylinders the outline is a tee form supporting one more cylinder on the cross head of the tee than on the base of the tee.

FIG. 1 shows a preferred embodiment of this invention.

FIG. 2 is a cross-section of FIG. 1 taken along line 2—2.

FIG. 3 is a cross-section of FIG. 1 taken along line 3—3.

FIG. 4 shows a top view of the preferred embodiment of FIG. 1 having modified corners and having drums of cylinders shown thereon.

FIG. 5 shows a further modification of the corners on the preferred embodiment of FIG. 1.

FIG. 6 shows an alternate embodiment of this invention for the support of an odd number of cylinders.

The pallet in FIG. 1 consists of deck 1 and deck 7 connected to side supporting spacers 4 and 6 and to intermediate supporting spacer 5. Each of spacers 4 and 6 has the length nr, and these spacers are perpendicularly coextensive over a distance $r(n-1)$. FIG. 1 as shown in FIG. 4 is for four cylinders of radius r, so spacers 4 and 6 each has a length $4r$ and both are coextensive over $3r$. Spacer 5 is coextensive with both spacers 4 and 6 to points across from their ends. Spacers 4 and 6 have a height sufficient to provide an opening for forklift fingers and they are spaced apart so that with the deck on them the pallet has a width W of less than $4r$, preferably about $3.75r$. Spacer 5 is positioned on the planform so that the average width of deck above it beyond where spacers 4 and 6 are coextensive, shown as U and based on a straight inter-

mediate beam, is no more than half of W. Maintaining U at no larger a dimension allows the pallet to interfit with a similar pallet at its end.

Spacers **4, 5** and **6** may have any desired structure so long as they provide spacing beneath a deck for forklift carrying. They may have sufficient strength to stiffen the decks where the decks have insufficient strength in themselves to be load supports. Spacer **5** is optional in that its use will depend on the strength of the deck material. They may be simple extended blocks of rectangular cross section, may be U-beams, may be I-beams or may be built up trusses. They can have any composition meeting their load carrying requirements, e.g., wood, metal, or plastic. The preferred composition structure is wood in a rectangular cross section.

Decks **1** and **7** complete the support plane for loads to be carried by the pallet. They complete the plan outline dimensions as already given. They may be between spacers **4** and **6** in a manner such that their support surface is in a common plane with these spacers. They may cover the whole plan outline, with spacers **4** and **6** being flush with the plan outline, or the decks may project beyond spacers **4** and **6**.

Decks may be fabricated of any suitable material, such as metal, wood or plastic. They may be each in one piece or in multiple pieces extending across the spacers or connecting the spacers. As wood, the preferred material, they may be plywood or a series of wood slate across the spacers.

It is not necessary in all cases to have two decks, since necessary support of a load by the pallet may be provided by spacers **4, 5** and **6** during ground storage and by forklift fingers under a deck during handling of the pallet. In such a case space should be available between the spacers and below the deck for the insertion of forklift fingers. The two deck structure is a preferred structure because it more easily provides a rigid box-like structure and because it is more conveniently useful to stack loaded pallets one above the other. Of course, space receptive of forklift fingers should also exist in the two deck structure.

The decks, as many as are used, can be secured to the spacers in any fashion which produces the necessary load supporting capability. Adhesives, welds, rivets, nails or even staples are useful according to the composition of the spacers and deck and to the load to be supported.

It may be seen from these disclosures that the plan outline of FIG. **1** can be extended so that two more cylindrical columns of radius r can be accommodated for each extension of twice the radius r of these columns.

The plan outline of these pallets enables their storage along passageways in storage facilities in a more efficient fashion. The notched part of the plan outline allows these pallets to be stored along passageways at an angle of 25° to 35°, preferably at 30°, from an alignment squarely across the passageway. Pallets so angled along the passageway require a lesser amount of swing from the passageway into engagement or from disengagement with them by a forklift truck. The narrower passageway for forklift truck operation, produces added available pallet storage floor space.

FIG. **4** shows an alternate pallet embodiment of this invention. This embodiment shows how four cylinders of maximum radius r are mounted on this pallet to best advantage for its use in shipping. The plan outline of this pallet modifies the pallet of FIG. **1** in that it excludes the triangular segments on selected corners of the planform. One side of each triangular segment is tangent to the curve of the supported cylinder base of radius r, and the long sides of nearby triangles shown are on a common line. The natural angle of that common line back across the pallet from the square end of the pallet is 30° for cylinders in triangular arrangement. The natural starting point of that line is $1.268r$ from the exterior corner of the narrow extension of the pallet planform. That line, extending across two nearby corners determines triangles which can be removed from the pallet planform. Pallets of this invention with a support plane so modified in plan outline can be angularly stored between closer storage base lines for a more efficient use of storage floor space.

Another embodiment of this invention is illustrated in FIG. **5**. Here the plan outline is curved around the intended base positions of drums F and G and inner arcs having the radius of radius *r* tangent to the intended base positions of drums F and G, and of these drums and tangent with the intended base positions of drums E and H, respectively. Continuing these curves as shown around the intended base positions of drums E and H completes a plan outline having all the advantages of interfittability, shipping and storage which the pallet plane of FIG. **4** provides.

FIG. **6** shows an embodiment of this invention for the support of three cylinders. This embodiment includes deck **12** of the plan outline shown to support cylinders A, B and C as shown. Along parallel edges it has rectangular support spacers connected to the deck and providing clearance of the deck from a ground level so that forklift fingers are insertable.

The plan outline of the deck of the pallet of FIG. **6** can, of course, be modified as described above for FIGS. **4** and **5**.

The pallets of this invention are stored at an angle of 60° from the line of the path provided between them for passage of a forklift truck. Because forklift fingers need to be swung at an angle for insertion under a pallet deck less than 90°, the passage between rows of pallets can be narrower than those used along rows of square pallets of the prior art. The distance between floor lines in which two of these pallets can be stored is the same as that for two of the prior art pallets. Pallets of the embodiment of FIG. **4** require even less distance between floor lines.

Pallets of this invention having the support plane of the necessary plan outline can easily be made from two open-ended rectangular boxes connected in edge-to-edge relation. Such boxes would have a deck portion less than 2 *r* wide, preferably $1.875\ r$ wide, and a suitable space for inserting a forklift finger. A first box would have a length accommodating at least one cylinder of radius *r*; the second box would have a length accommodating the same number of cylinders or one more cylinder than the first box. Where the first and second boxes have equal lengths, one is slipped along the other by a distance *r*. Where the boxes are unequal in length the second box will extend beyond the first box by a distance *r* at each end. In such a case the box edges where joined and where extended

beyond being joined may be considered as a common beam.

The support plane and the spacers need not be separate elements. Such elements may be integral in this pallet. For instance, a pallet can be made from sheet form metal bent into the rectangular form, the rectangular forms being thereafter joined. Indeed a pallet can be made from a single sheet of metal bent in right angular figure-eight fashion so that edge portions of the sheet metal lap on the center cross of the right angle figure-eight to form an intermediate spacer or beam, while the outer crosses of the figure eight serve as outer spacers or support beams and the sides of the figure eight form the plane of the supporting deck. In such a case, some of the plane will require trimming to adapt to this invention.

EXAMPLE 1

Pallet for 24-inch Diameter Drums

A rectangular form of 45 by 60 inches internal size was laid level. Two 2 by 4 inches hardwood side beams each 48 inches long were laid in the form against its long sides, their 4 inch dimension upright extending to diagonally opposite corners in the form. Each side beam then had an interior end 12 inches from a corner of the form. A 2 by 4 inch intermediate beam 60 inches long was laid in the form so that it was 22-½inches from each long side of the form at an interior beam end.

Hardwood 1 by 6 inch slats were nailed to and across all of the positioned beams, being 45 inches long where the side beams coextended for 36 inches and being not over22-½inches long where they were supported only by a side beam and the intermediate beam along 12 inches of each side beam. Slats supported only by a side beam and the intermediate beam were trimmed off where they projected over the support of the intermediate beam.

The nailed structure was removed from the form. Hardwood 1 × 6 inch slats were nailed on opposite sides of the beams in corresponding locations, length and trim. The resulting pallet had the planform of a 45 × 60 inch rectangle having diagonally opposite notches each extending 22-½ inches along the 45 inch dimension along a line 12 inches from an end of the 60 inch dimension and extending from that point along the 60 inch dimension in a direction which makes the notch wider than 22-½ inches at the end of the rectangle. This planform is capable of holding four 24 inch diameter drums in triangular arrangement without their extension beyond the 45 inch dimension. Pallets of this planform can be interfitted end-to-end.

Current domestic trucks and trailers are limited by the U.S. Department of Transportation to an external width of 96 inches. Necessary side structure limits the interior dimension available for storage to 91 to 93 inches. The chemical industry standard pallet size for 55 gallon drums is 48 inches by 48 inches. Only one of these pallets could be loaded across the width of a truck or trailer.

A truck with transport space 92 inches wide and 40 feet long having one tier of standard pallets can accommodate 18 pallets. The same truck loaded with the exemplified pallet in one tier was able to accommodate 36 pallets. In this case a 100 percent improvement in the efficiency of use of the truck resulted from the use of the examplified pallet. Manual treatment of drums loaded on the pallets was unneeded at either the loading or unloading point of the truck.

EXAMPLE 2

The pallets of Example 1 were stored in a warehouse in end-to-end interfitted pairs along forklift truck passageways. As stored, they were angled 60° to 64° away from the passageway and were placed between passageways 8 feet apart. The passageways required a width of only 8 feet for forklift trucks to effectively swing these pallets into and out of storage. In a 60 foot storage span five eight-foot passageways served four rows of end-to-end pallet pairs and two rows of single pallets.

Normal four foot by four foot pallets are stored squarely across forklift passageways eight feet apart but the passageways must be twelve feet wide to effectively swing the square pallets into and out of storage. Under these conditions a 60 foot storage span can provide only three rows of end-to end pallet pairs and two rows of single pallets served by four twelve-foot passageways.

Under the above circumstances it can be seen that the use of pallets of this invention enables a 25 percent increase in efficiency of floor space use for storage.

I claim:

1. In a shipping pallet for carrying a number N or N+1 of drums or cylinders comprising a supporting plane having at least two sides, approximately parallel and coextensive support spacers attached to the lower surface of the supporting plane such that a spacer extends along each of two sides of said lower surface of said supporting plane such that sufficient room exists beneath said lower surface to insert forklift fingers of a forklift truck, said supporting plane comprising a plan outline comprising first smaller and second smaller plan outlines having their lengths parallel to the length of said support spacers and a width (W) defined by the distance between the edge along which a support spacer extends and the midline of said supporting plane drawn midway between and approximately parallel to said support spacers, the improvement comprising a reduced smaller plan outline width for each smaller plan of about 93.75 percent W and wherein the first smaller plan outline is located relative to the second smaller plan outline such that the supporting spacer of the first smaller plan outline is not coextensive with the supporting spacer of said second smaller plan outline whereby the plan outline area is reduced for a given number of drums or cylinders.

2. The improved shipping pallet of claim 1 in which said first smaller plan outline has a length equal to that of said second smaller plan outline and the number of drums or cylinders is N.

3. The improved shipping pallet of claim 1 in which said first smaller plan outline is longer than said second smaller plan outline and the number of drums or cylinders is $N + 1$.

4. An improved pallet of claim 1 for carrying on their ends a plurality of cylindrical bodies of radius r, in the closest packing arrangement of two rows possible between two parallel sides, in which (a) the plan outline has a first and second zone on opposite sides of the

midline, (*b*) the length of each zone is an even multiple of *r*, (*c*) the zones are coextensive except for a distance equal to r at each end of the plan outline, and (*c*) the width W is about 3.75 *r*.

5. A shipping pallet of claim **4** for carrying four cylindrical bodies, in which the first and second zones each have a length of 4 *r*.

6. A shipping pallet of claim **4** for carrying three cylindrical bodies, in which the first zone has a length of 4 *r* and the second zone has a length of 2 *r*.

7. A shipping pallet for supporting two rows of cylindrical bodies of radius *r* in their closest packing arrangement between two parallel lines of a support plane, which pallet comprises

a. a plane for supporting n cylindrical bodies of radius *r*, *n* being an even integer, said plane having
   i. parallel opposite sides,
   ii. a width of 3.75 *r* between the two parallel sides, and
   iii. a planform such as would result from sliding half of a rectangle for a distance of *r* along a bisection line between said parallel sides thus forming two zones, a first zone on one side of the bisection line and a second zone on the opposite side of the bisection line, and
b. parallel spacing beams for keeping supporting plane (a) away from a surface.

8. A shipping pallet of claim **7** for carrying four cylindrical bodies of radius *r* on end, wherein the first and second zones of the pallet each have a length of 4 *r*.

9. A shipping pallet for supporting two rows of cylindrical bodies of radius *r* in their closet packing arrangement between two parallel lines of a support plane, which pallet comprises

a. a plane for supporting n cylindrical bodies of radius *r*, *n* being an odd integer greater than one, said plane having
   i. parallel opposite sides,
   ii. a width of 3.75 *r* between the two parallel sides, and
   iii. a planform whose outline is a tee form supporting one more cylinder on the cross-head of the tee than on the base of the tee, and
b. parallel spacing beams for keeping supporting plane (a) away from a surface.

10. A shipping pallet of claim **9** for carrying three cylindrical bodies of radius *r* on end, wherein the cross-head of the tee has a length of 4 *r* and the base of the tee has a length of 2 *r*.

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