United States Patent [19]

Johnson

[11] **3,870,151**

[45] **Mar. 11, 1975**

[54] **TRAY**

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[73] Assignee: **Phillips Petroleum Company,** Bartlesville, Okla.

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[21] Appl. No.: **383,720**

[52] **U.S. Cl.** **206/507,** 206/505, 220/66, 220/72

[51] **Int. Cl.** **B65d 21/04,** B65d 1/22

[58] **Field of Search** 206/505, 507; 220/66, 72

[56] **References Cited**

UNITED STATES PATENTS

3,387,740	6/1968	Bockenstette	206/505
3,392,875	7/1968	Bockenstette	206/507
3,425,594	4/1969	Bridenstine	206/507
3,675,815	7/1972	Rehrig	206/507
3,727,791	4/1973	Fraser	220/72

FOREIGN PATENTS OR APPLICATIONS

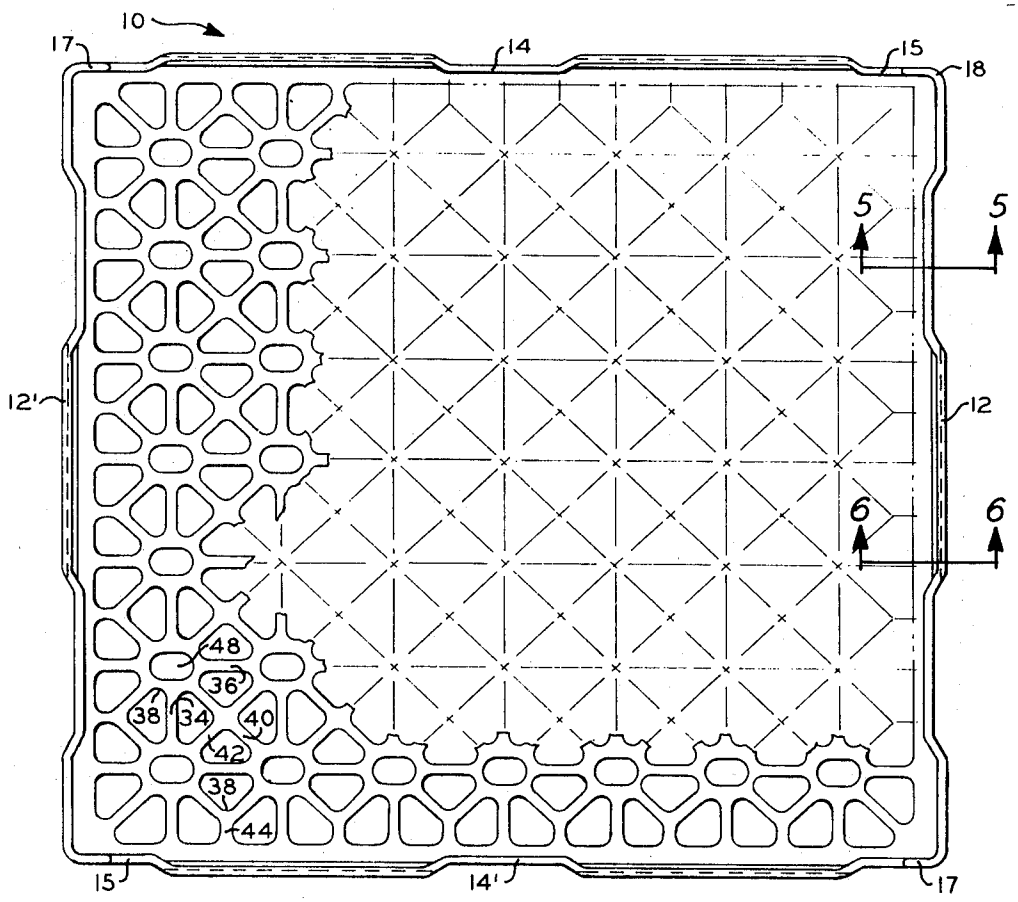
1,349,646	12/1967	France	206/509

Primary Examiner—George E. Lowrance

[57] **ABSTRACT**

A cross-nesting tray provided with means for interlocking an upper second tray in a lower first tray when said upper tray is cross-nested in a like lower tray. If desired, vertically registering stacking means can be provided on the tops of tray walls and in the bottom end portion of said walls to permit stacking a like third tray on said first tray, over said second tray, and cross-nested in said second tray.

14 Claims, 11 Drawing Figures



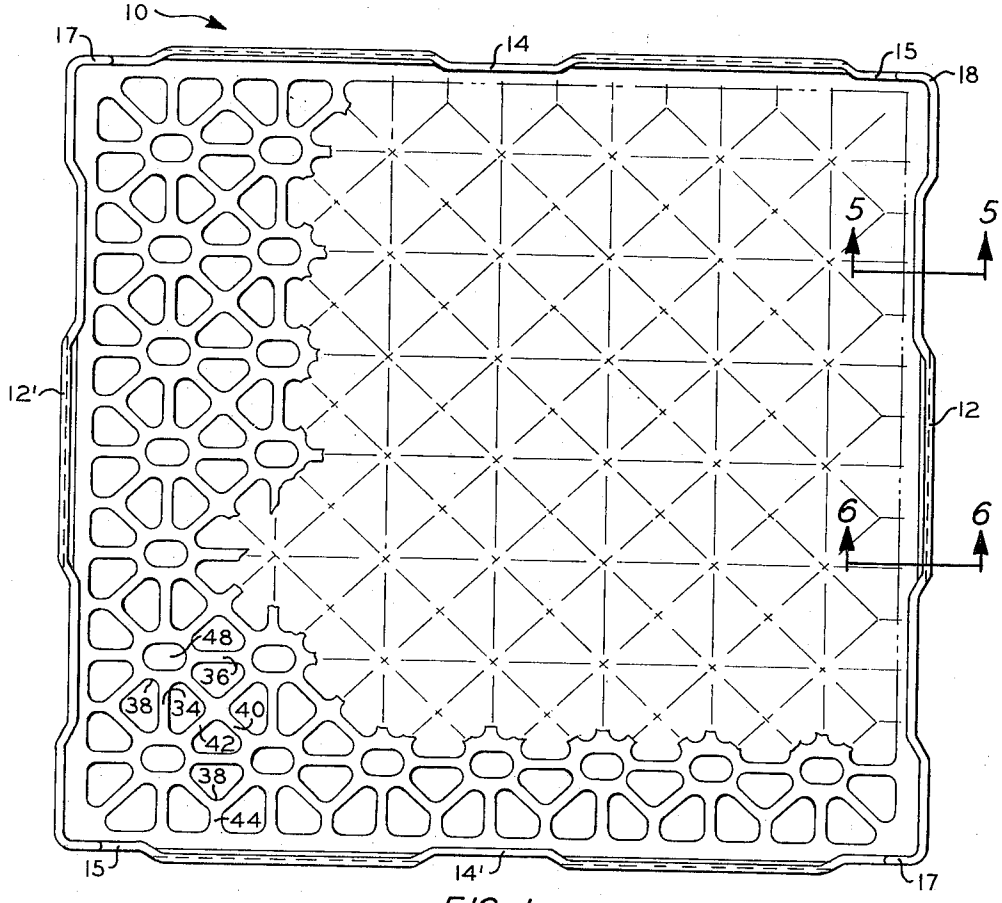

10
17
14
15
18
5
5
12'
12
6
6
48
36
38
34
40
42
38
44
15
14'
17

FIG. 1

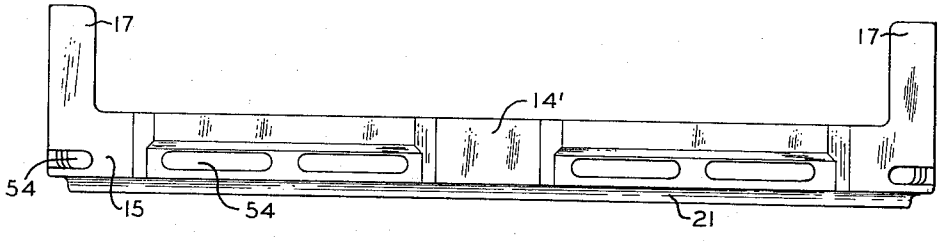

17
17
14'
54
15
54
21

FIG. 3

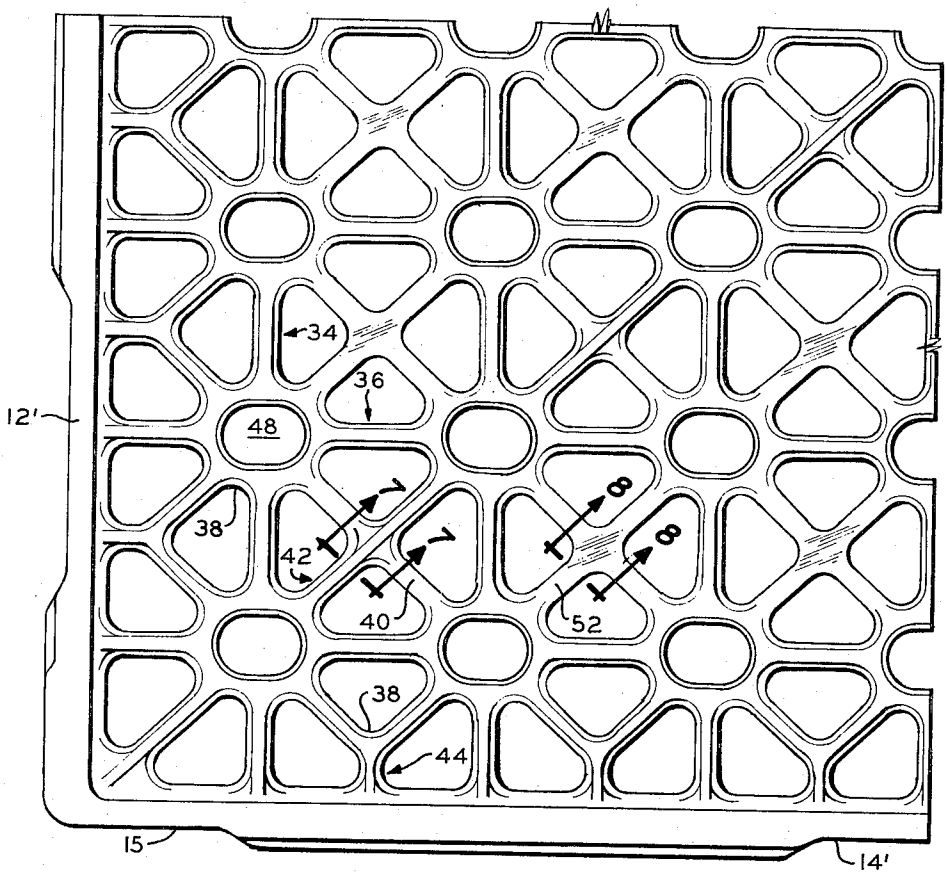


FIG. 2

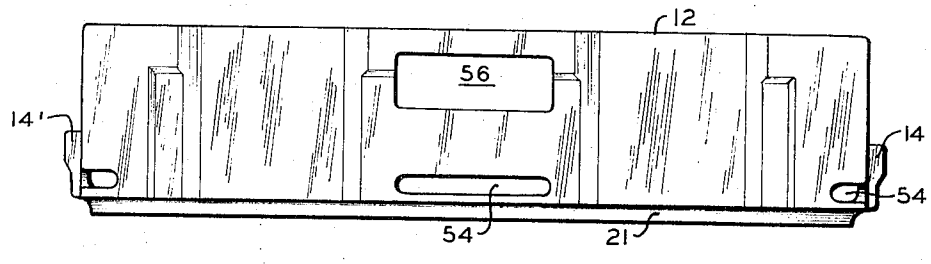


FIG. 4

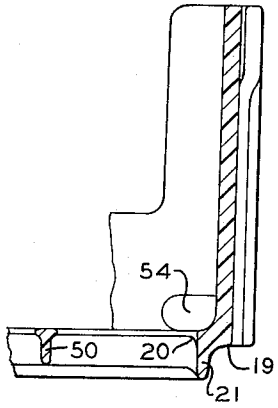


FIG. 5

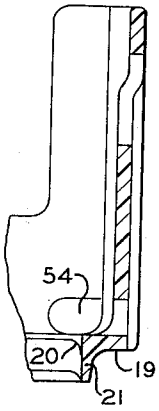


FIG. 6

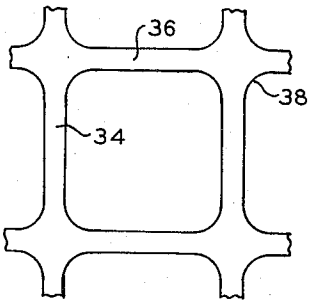


FIG. 11

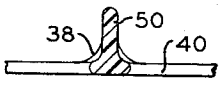


FIG. 7

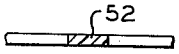


FIG. 8

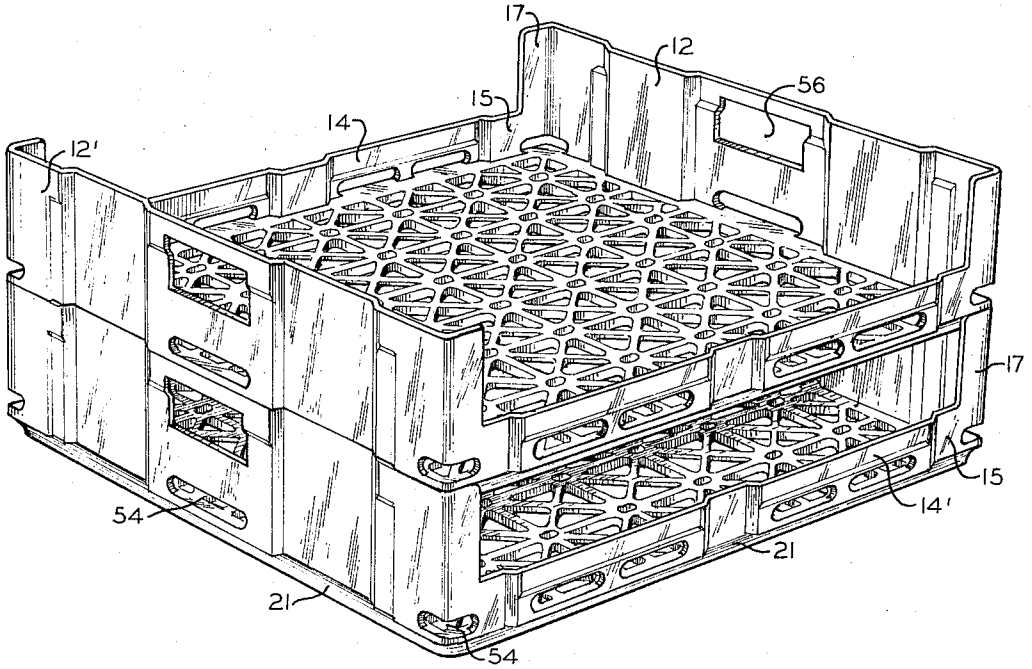

17
12
56
15
14
12'
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FIG. 9

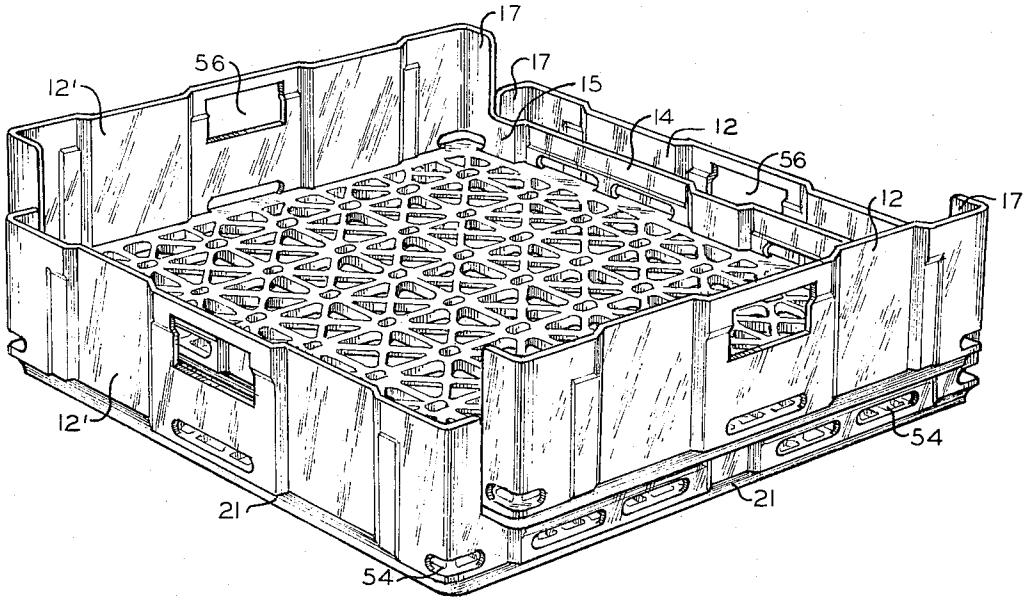

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12'
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FIG. 10

TRAY

This invention relates to a tray.

Trays of various kinds have been widely employed in moving commodities, e.g., foodstuffs, from one location to another. It is highly desirable that said trays be of a durable, rigid, light weight structure, be easy to handle in use, be easy to store when not in use, be of a simple and inexpensive construction which is easy to manufacture, and be economical in cost, regardless of size. For example, it is desirable that said trays can be stored in stable stacks occupying minimum space when not in use. Said trays should be easy to clean and, preferably, all surfaces thereof should be self-draining. It is also preferable that said trays be resistant to collection of foreign matter, e.g., dirt, flour, etc., in any corners, angles, etc., in the tray structure. Few trays meeting all of the above requirements have been provided by the prior art.

The present invention solves the above-described problems by providing trays which meet all of the above requirements. The trays of the invention are cross-nesting trays having a structure which permits said trays to be cross-nested and/or stacked in an interlocking manner whereby said trays can be stored or used in stable stacks occupying minimum space. A feature of at least some preferred embodiments of the trays of the invention is that all surfaces of the tray structure are self-draining during cleaning. A further feature of said preferred embodiments is that the trays are resistant to the collection of foreign matter in or on the structure thereof, e.g., at the junctions between structural members. Said last mentioned features are made possible by providing the tray with a structure wherein the various structural members themselves, and the intersections and other junctions between said structural members of the tray, are provided with curved surfaces. Said curved surfaces are resistant to the collection of foreign matter and are self-draining during washing operations.

Thus, according to the invention, there is provided:

A tray comprising:

a pair of upstanding opposed first walls;

a pair of upstanding opposed second walls, having a length greater than said first walls, joined to said first walls along the upstanding edges thereof;

said second walls having a height, substantially along the full length thereof, which is less than the height of said first walls for permitting cross-nesting of an upper tray in a like lower tray between the higher first walls thereof;

a bottom panel joined to the lower end portions of said first and said second walls to provide a generally rectangular open top structure; and

a generally flat wall means formed in each end portion of, and recessed inwardly from the outermost face of, each of said second walls for interlocking said second walls of an upper tray with said first walls of a lower tray when an upper tray is cross-nested in a like lower tray.

FIG. **1** is a plan view illustrating features of the improved trays of the invention and showing in detail a fragment of one gridwork bottom structure which can be employed in trays of the invention.

FIG. **2** is a fragmentary bottom plan view of a tray in accordance with the invention. The fragment shown corresponds to the lower left-hand corner of the tray of FIG. **1**.

FIG. **3** is a side elevation view of the tray of FIG. **1**.

FIG. **4** is an end elevation view of the tray of FIG. **1**.

FIGS. **5** and **6** are cross section views taken along the lines **5—5** and **6—6**, respectively, of FIG. **1**.

FIGS. **7** and **8** are cross section views taken along the lines **7—7** and **8—8**, respectively, of FIG. **2**.

FIG. **9** is a perspective view showing two trays of the invention in stacked relationship.

FIG. **10** is a perspective view showing two trays of the invention in cross-nested relationship.

FIG. **11** is a fragmentary plan view illustrating details of one bottom gridwork construction which can be employed in the trays of the invention.

Referring now to the drawings, wherein like reference numerals are employed to denote like elements, the invention will be more fully explained. In FIG. **1** there is illustrated a generally rectangular tray **10** comprising a pair of upstanding, opposed first or end wall members **12** and **12'**. A pair of upstanding, opposed second or side walls **14** and **14'** are disposed transverse to said first walls and are joined, preferably in a curved junction, along the upstanding edges thereof to the upstanding edges of said first wall members. A bottom member is joined, preferably in an upwardly curved junction, to the lower portions of said first wall members and to the lower portions of said second wall members to provide a generally rectangular open top structure. If desired, said bottom member can be a solid member, e.g., no perforations or other openings therein. In most instances it is preferred that said bottom member have an open gridwork construction. Any suitable gridwork structure can be employed, for example, such as illustrated in Roush et al. U.S. Pat. No. 3,494,502, issued Feb. 10, 1970, Bridenstine U.S. Pat. No. 3,648,883, issued Mar. 14, 1972, or Fraser et al. U.S. Pat. No. 3,727,791, issued Apr. 17, 1973. Preferably, said bottom member comprises a plurality of intersecting grid members which are joined at the ends thereof to said wall members. Preferably, the radius of curvature **18** at the junctions of said wall members and the radius of curvature **20** at the junctions of said bottom member(s) with said wall members are at least one-fourth inch.

It will be noted that said side walls **14** and **14'** have a height, substantially along the full length thereof, which is less than the height of said end walls **12** and **12'**. The purpose of this structure is for permitting cross-nesting of an upper tray in a like lower tray between the higher end walls **12** and **12'** thereof. Preferably, said height of the side walls **14** and **14'** will not be greater than one-half the height of said end walls **12** and **12'**. More preferably, the height of said side walls will be less than one-half the height of said end walls. A practical range for the height of said side walls will generally be within the range of from about one-third up to less than one-half the height of said end walls.

Said side walls **14** and **14'** will have a length greater than said end walls **12** and **12'**. Thus, in the trays of the invention, the trays will have a generally rectangular configuration wherein two sides of the rectangle have a length greater than the other two sides of the rectangle. The length of said greater length walls, e.g., the side walls, will be greater than the length of said end walls by an amount which is at least twice the overall wall thickness (including offsets or convolutions) of the other walls, e.g., the end walls.

Preferably, all the walls of the tray will be formed with offsets or convolutions therein, e.g., alternately spaced recessed and nonrecessed areas, as illustrated in the drawings, for purposes of increased strength. However, it is within the scope of the invention for the walls of the tray to be essentially straight except for the recessed, generally flat wall means **15** which is formed in the end portion of each of the side walls **14** and **14'**.

Said generally flat wall means **15** formed in each end portion of, and which is recessed inwardly from the outermost face of, each of said side walls **14** and **14'** is provided for interlocking said side walls of an upper tray with the end walls **12** and **12'** of a lower tray when an upper tray is cross-nested in a like lower tray.

Preferably, said side walls and said end walls are joined together at each of the corners of the tray by an upwardly extending corner post section **17** which preferably has the same height as the end walls. Said corner post sections **17** each comprise a portion of the above-described generally flat wall means **15** which is formed in each end portion of each of the side walls, and thus each comprises a portion of a said side wall. Said corner post sections **17** act as a lateral brace, markedly increasing the strength and rigidity of the end walls.

It will be understood by those skilled in the art in view of this disclosure that the width of the tray at said recessed generally flat wall means **15**, and the length of the tray between the portions of the end walls **12** and **12'** adjacent thereto (or the distance between the upstanding edges of corner post sections **17** when said corner post sections are employed), are dimensioned so that said flat wall means **15** will fit between said end walls (or said corner post sections) in an interlocking manner. Preferably, the length of said flat wall means **15** will be dimensioned so as to provide an interlocking fit between the shoulder **16** formed at the end of the nonrecessed portion of the side walls **14** and **14'** and said end walls (or said corner post sections). See FIG. **10.**

Referring to FIG. **10,** it is clear therefrom that a third like tray can be stacked on the end walls **12** and **12'** of the bottom or first tray, and over a second or upper tray, when the side walls **14** and **14'** of the trays have a height which is not greater than the height of the end walls **12** and **12'** of the trays, and that said third tray will be cross-nested between corner posts **17** of said second tray. In this manner, trays of the invention can be alternately cross-nested and stacked to any reasonably desired height to give a stable stack, such as for storage when not in use.

In the preferred embodiments of the invention, vertically registering stacking means are provided on the top of, and in the bottom end portion of, each of the end walls. Said vertically registering stacking means can comprise any suitable stacking means known to the art. For example, a generally V-shaped crown on the top of said walls, and a correspondingly shaped groove in the bottom of said walls. As illustrated in the drawings, the stacking means provided on the top of each of the end walls can simply comprise a generally flat surface extending generally along the top of said end walls. Also, as illustrated in FIGS. **5** and **6,** the stacking means provided in the bottom end portion of each of the end walls can comprise an inwardly and generally horizontally extending shoulder **19** formed in said bottom end portion. Preferably, each of said shoulders will have a downwardly extending inner face means or leg **21** which is contiguous with the horizontally extending portion thereof for engaging the upper inner wall surfaces of the end walls **12** and **12'** (and the corner post sections **17** when provided) when an upper tray is stacked on a lower tray. In this manner, said upper tray and said lower tray will be further interlocked against both longitudinal and transverse movement. See FIG. **9.**

If desired, each of said walls **12, 12', 14,** and **14'** can be provided with at least one drainage opening **54** therein with the bottom of said opening being essentially flush with the upper surface of the bottom panel of the tray. Said openings provide improved drainage during washing of the trays, particularly when the trays are tilted at an angle. If desired, said openings can extend around the corners of the tray, as shown. A handhold opening **56** is preferably provided in each of end walls **12** and **12'**.

In one preferred embodiment, said gridwork bottom can comprise a first plurality of grid members **34** which are disposed generally parallel to said first or end wall members **12** and **12'**, are spaced apart from each other, and extend between said pair of second or side wall members **14** and **14'**. A second plurality of grid members **36** are disposed generally parallel to said second or side wall members **14** and **14'**, are spaced apart from each other, and extend between said pair of first or side wall members **12** and **12'**. Said second grid members **36** are disposed generally parallel to said side wall members in an intersecting direction with respect to said first grid members **34** so as to form a junction therewith and form a plurality of rectangles arranged in rows generally parallel with said wall members. Said wall members form one side of the outer rows of said rectangles. A curved fillet **38** is preferably provided between each pair of adjacent grid members at said junction of said grid members. The radius of curvature of said fillet **38** is preferably at least one-fourth inch. This structure is illustrated in FIG. **11.**

In one presently preferred embodiment of the invention, said gridwork bottom member can further comprise a third plurality of grid members **40.** Each one of said third grid members **40** extends substantially diagonally across one of each of said rectangles and is joined to said first and second grid members at said junction thereof to form junctions of said first, second, and third grid members. A fourth plurality of grid members **42** is also provided. Each one of said grid members **42** extends substantially diagonally across one of each of said rectangles in a direction to integrally intersect said diagonally extending grid members **40** at approximately the center of the rectangle and is joined to said first and second grid members at said junctions thereof to form junctions of said first, second, and fourth grid members. Preferably, fillets **38** are provided between each pair of adjacent grid members at all of said junctions. In each rectangle of said outer rows of rectangles there is provided a grid member **44** which extends from the intersection of said diagonally extending grid members **40** and **42** to one of said wall members. Preferably, a fillet **38** is also provided at the junction of said grid member **44** with wall **14** and the intersection of said diagonally extending grid members **40** and **42.**

Said junctions of said first, second, and fourth grid members, together with said junctions of said first, second, and third grid members, form a reinforcing island. Preferably, an opening **48** is provided in said island as

illustrated in FIG. **1.** Preferably, the radius of curvature of the curved portions of said opening is at least one-fourth inch. Said openings are preferably generally oval in shape, as illustrated. However, said opening can have a round, elliptical, or other generally curved shape.

FIG. **2** is a view of a presently preferred structure of the underside of the tray of FIG. **1.** If desired, each of the grid members **34, 36, 40, 42,** and **44** can be provided with a downwardly extending rib **50** as shown in FIGS. **5** and **7** to give the grid members a generally T-shape and provide additional strength. The junction of the vertical rib **50** with the bar of the T is preferably provided with a fillet **38.** Where not needed for strength, the vertical rib **50** can be omitted as shown by reference numeral **52** in FIG. **8** and the grid member will have a flat ribbon-like configuration. In FIG. **2** the vertical rib **50** has also been omitted from grid members **40** and **42** except for those of said members **40** and **42** which extend in a diagonal direction between the corners of the tray.

If desired, in all the above-described embodiments of the invention, said gridwork bottom can be coved upwardly a small distance, e.g., one-sixteenth to three-sixteenths inch, from the outer edge toward the center of the tray. This will provide increased accommodation for heavier loads, i.e., without causing the bottom to sag. Preferably, as shown in FIGS. **5** and **7,** the bottom portion of the grid members which are provided with a downwardly extending vertical rib **50** are curved so as to provide better self-draining properties. Preferably, the bottom portion of said wall members is also similarly curved, as shown in said FIGS. **5** and **6.**

Trays fabricated in accordance with the invention possess a number of advantageous features over trays of the prior art. The curved surfaces which are preferably provided at the junctions of the various structural elements of the tray, and elsewhere, render the tray resistant to the accumulation of foreign materials such as flour, icings, jelly, etc., during use. Said curved surfaces also render the trays self-draining in essentially any position, even inverted, during washing or other cleaning operations. Said curved surfaces will have a radius of curvature sufficient to provide these advantageous features. A radius of curvature of at least one-fourth inch for said curved surfaces, while not essential in all instances, is preferred in order to insure obtaining said advantageous features. The trays of the invention are of a durable, lightweight structure. This is an important consideration in the use of said trays. For example, said trays are particularly well adapted for transporting bakery goods, both within the baking shop and the delivery truck. The bakery goods can be placed on the trays and the trays then placed in racks which may be easily pushed around the shop. The trays can also be readily loaded onto racks in a delivery truck. The light weight of the trays is a distinct advantage in that handling of the trays is not only less tiring for personnel handling same but also reduces the load on trucks. Thus, lighter weight trucks can be employed with obvious savings in operating expenses.

The trays of the invention can be fabricated in any suitable manner known to the art. Injection molding, for example, is one presently preferred method for fabricating said trays. Said trays can be fabricated from any suitable material. High density polyethylenes are especially desirable materials from which to fabricate said trays. The high density polyethylenes prepared by the methods disclosed and claimed by J. P. Hogan et al. in U.S. Pat. No. 2,825,721, issued Mar. 4, 1958, are one group of presently preferred materials. Said trays can also be fabricated from butadiene-styrene copolymers, and other plastic materials. If desired, a reinforcing fibrous material, such as asbestos or glass fibers, can be incorporated in the plastic material. While the various plastics are presently preferred for the manufacture of the trays, it is within the scope of the invention to fabricate said trays from other materials, e.g., lightweight metals such as aluminum, reinforced pulp materials, etc.

As an illustration, one model of a tray in accordance with the invention has an overall length of about 24.5 inches and an overall width of about 22.5 inches. The rectangles in the gridwork bottom are about 3.3 × 3.0 inches, the top surface of the bottom grid members are about 0.25 inch wide, the end walls **12** and **12'** and corner posts **17** are about 5.1 inches in height, and the side walls **14** and **14'** are about 2.25 inches in height. The width at recessed wall means **15** is about 21.94 inches and the distance between corner post sections **17** (see FIG. **3**) is about 22.06 inches. The remainder of the elements of the tray are generally proportional in size. These dimensions are given by way of illustration only, are not to be construed as limiting on the invention in any way, and all can be varied within the scope of the invention.

While certain embodiments of the invention have been described for illustrative purposes, the invention is not limited thereto. Various other modifications or embodiments of the invention will be apparent to those skilled in the art in view of this disclosure. Such modifications or embodiments are within the spirit and scope of the disclosure.

I claim:

1. A tray comprising:

a pair of upstanding opposed first walls;

a pair of upstanding opposed second walls, having a length greater than said first walls, joined to said first walls along the upstanding edges thereof;

said second walls having a height, substantially along the full length thereof, which is less than the height of said first walls for permitting cross-nesting of an upper tray in a like lower tray between the higher first walls thereof;

a bottom panel joined to the lower end portions of said first and said second walls to provide a generally rectangular open top structure;

a generally flat wall means formed in each end portion of, and recessed inwardly from a nonrecessed portion of, each of said second walls; and

an outwardly extending shoulder formed in each of said second walls at each junction of a said flat wall means and a said nonrecessed portion of said second walls for, together with said flat wall means, interlocking said second walls of an upper tray with said first walls of a like lower tray when an upper tray is cross-nested in a like lower tray.

2. A tray according to claim **1** wherein each of said second walls has a height which is not greater than one-half the height of said first walls.

3. A tray according to claim **1** wherein each of said second walls has a height which is less than one-half the height of said first walls.

4. A tray according to claim 2 wherein vertically registering stacking means are provided on the top of, and in the bottom end portion of, each of said first walls.

5. A tray according to claim 4 wherein said stacking means provided in the bottom end portion of each of said first walls comprises an inwardly and generally horizontally extending shoulder formed in said bottom end portion.

6. A tray according to claim 2 wherein a portion of each of said generally flat wall means formed in each end portion of each of said second walls comprises a corner post section having the same height as said first walls.

7. A tray according to claim 6 wherein vertically registering stacking means are provided on the top of each of said first walls, on the top of each said corner post sections, in the bottom end portion of each of said first walls, and in the bottom end portion of each of said corner post sections.

8. A tray according to claim 7 wherein:

said stacking means provided on the top of each of said first walls and on the top of each said corner post section comprises a generally flat surface extending generally along the top of said first walls and the top of said corner post sections; and

said stacking means provided in the bottom end portion of each of said first walls and in the bottom end portion of each of said corner post sections comprises an inwardly and generally horizontally extending shoulder formed in said bottom end portions.

9. A tray according to claim 8 wherein:

each of said shoulders has a downwardly extending inner face means contiguous with the horizontally extending portion thereof for engaging the upper inner wall surfaces of said first walls and said corner post sections when an upper tray is stacked on a lower tray whereby said upper tray and said lower tray are interlocked against both longitudinal and transverse movement.

10. A tray according to claim 2 wherein at least one drainage opening is provided in each of said first and said second walls with the bottom of said opening being essentially flush with the upper surface of said bottom panel.

11. A tray according to claim 2 wherein said bottom panel is of open gridwork construction.

12. A tray according to claim 11 wherein:

said open gridwork construction comprises a plurality of intersecting grid members joined at the ends thereof to said walls in an upwardly curved junction; and

a curved fillet is provided between each pair of adjacent grid members at the intersections of said grid members.

13. A tray according to claim 9 wherein at least one drainage opening is provided in each of said first and said second walls with the bottom of said opening being essentially flush with the upper surface of said bottom panel.

14. A tray according to claim 13 wherein:

said bottom panel is of an open gridwork construction comprising a plurality of intersecting grid members joined at the ends thereof to said walls in an upwardly curved junction; and

a curved fillet is provided between each pair of adjacent grid members at the intersections of said grid members.

* * * * *