# United States Patent [19]

**Fraser et al.**

[11] **3,727,791**

[45] **Apr. 17, 1973**


[54] **TRAY**


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



[22] Filed: **Oct. 8, 1970**

[21] Appl. No.: **79,109**

[52] **U.S. Cl.** .....**220/66,** 220/97 R

[51] **Int. Cl.** .....**B65d 1/34**

[58] **Field of Search** .....220/66, 83, 97 R, 220/97 D, 97 C



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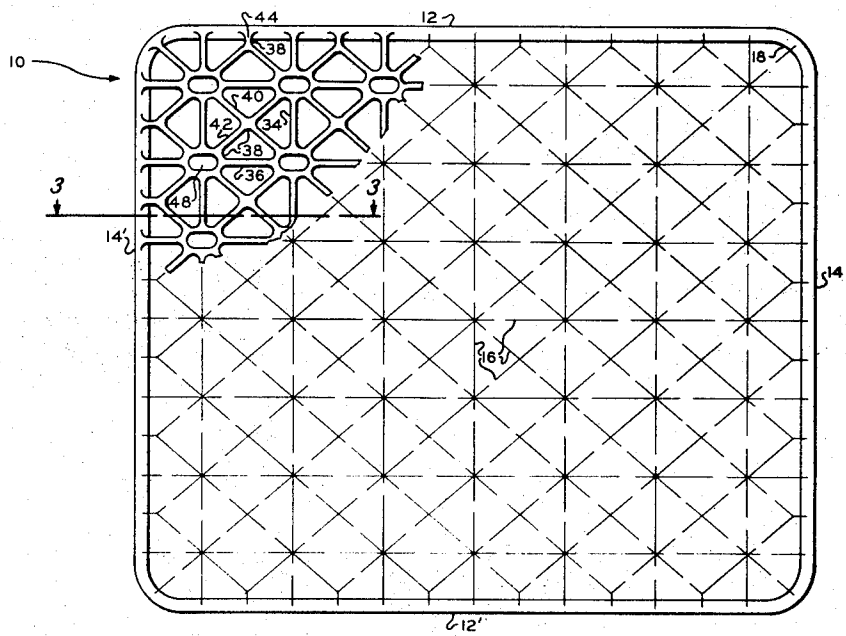
[57] **ABSTRACT**

A self-draining tray comprising upstanding side and end walls joined in curved junctions at the upstanding edges thereof, and a gridwork bottom member joined in upwardly curved junctions to the lower portions of said walls. Said wall members extend in a generally vertical direction throughout their structure so as to be self-draining, even when said tray is in an inverted position.


**14 Claims, 6 Drawing Figures**



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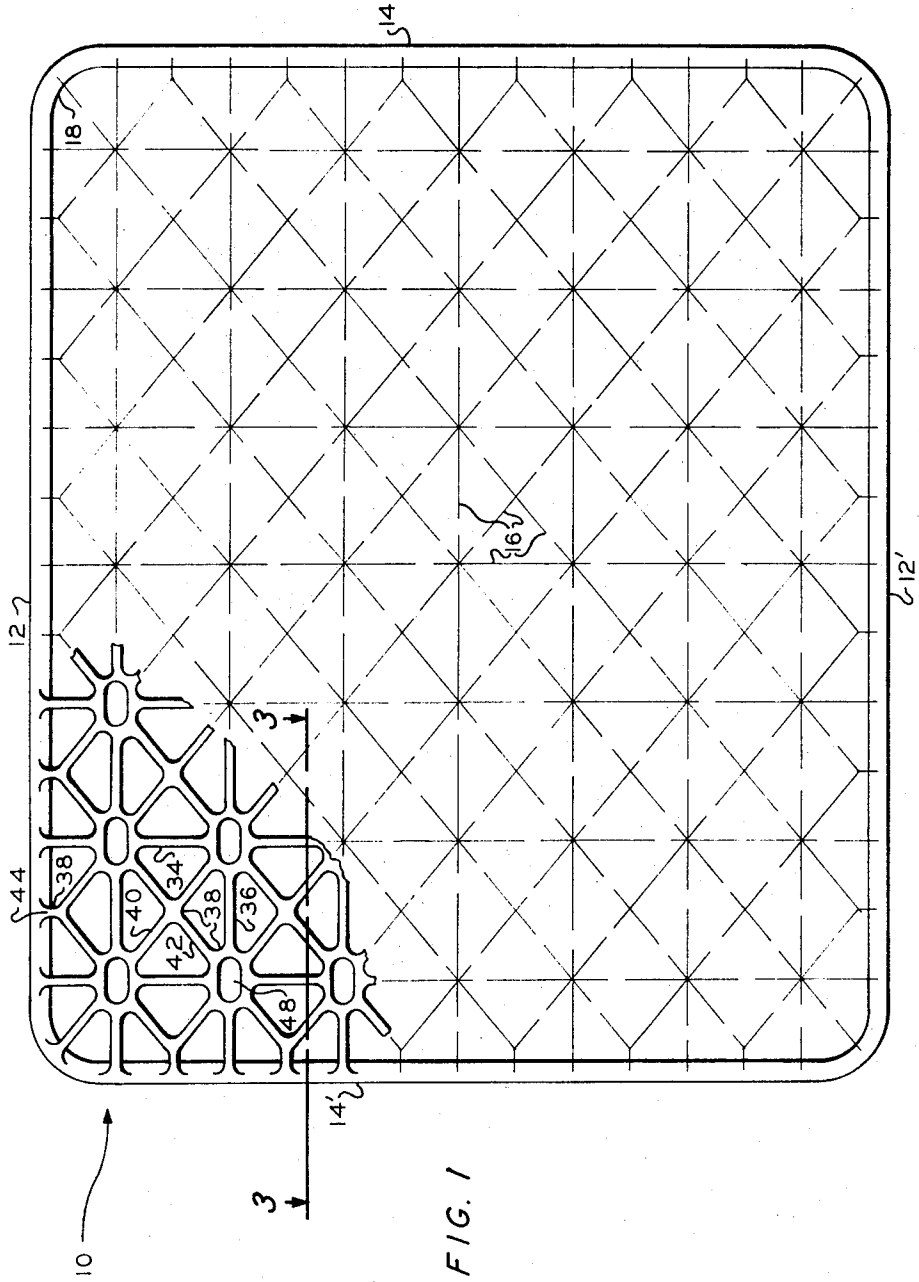


FIG. 1


FIG. 2

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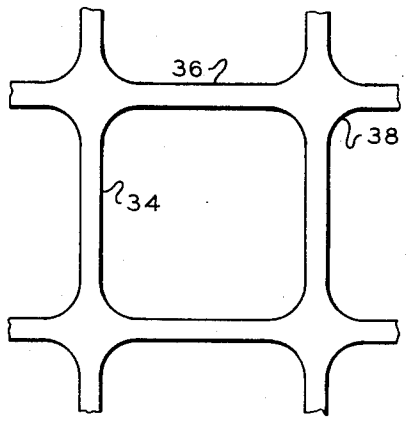


FIG. 6

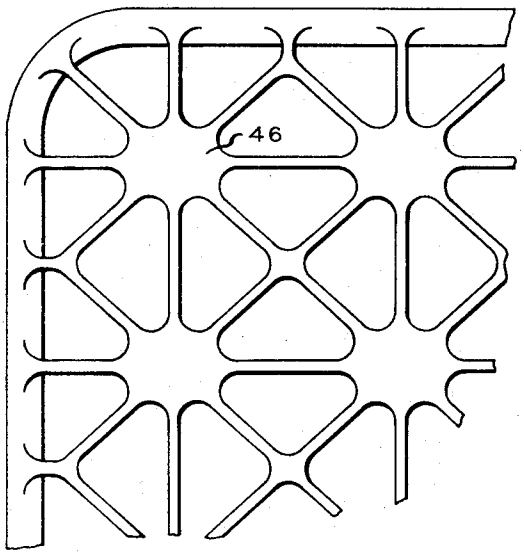


FIG. 4

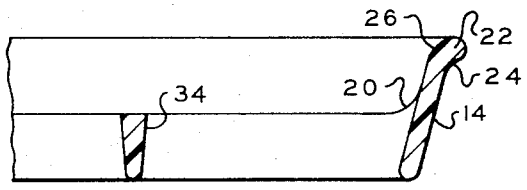


FIG. 5

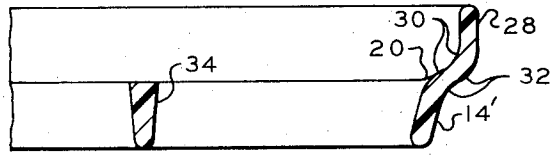


FIG. 3

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# 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. Said tray should be easy to clean and all surfaces thereof should be self-draining. It is also highly desirable 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, if any, trays meeting all of the above requirements have been provided by the prior art.

The present invention solves the above-described problems by providing a tray which meets all of the above requirements. A particular feature of the trays of the invention is that all surfaces of the tray structure are self-draining during cleaning. A further feature 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. These 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 self-draining tray comprising, in combination: a pair of upstanding opposed first wall members; a pair of upstanding opposed second transverse wall members; said first wall members being joined in a curved junction along the upstanding edges thereof to the upstanding edges of said second wall members; a bottom member joined 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 an open top structure; and wherein said wall members extend in a generally vertical direction throughout their structure so as to be self-draining even when said tray is in an inverted position.

FIG. 1 is a plan view illustrating features of the improved trays of the invention and showing a fragment of the gridwork bottom structure in detail.

FIG. 2 is a side elevation of a tray fabricated in accordance with the invention.

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

FIG. 4 is a fragmentary plan view illustrating details of the corner construction of a tray of the invention, and also illustrating another embodiment of the invention.

FIG. 5 is a cross section, similar to the cross section illustrated in FIG. 3, illustrating another embodiment of the invention.

FIG. 6 is another fragmentary plan view illustrating details of the bottom construction in one embodiment 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 side wall members 12 and 12'. A pair of upstanding, opposed second or end walls 14 and 14' are disposed transverse to said first walls and are joined in a curved junction along the upstanding edges thereof to the upstanding edges of said first wall members. A bottom member is joined 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 an open top structure. Said bottom member comprises a plurality of intersecting grid members, designated generally by the reference numeral 16, 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.

In one embodiment of the invention, the upper end portion 22 (see FIG. 5) of each of said wall members is curved outwardly in a generally vertical direction to form a flange or rim. The radius of curvature 24 on the underside of the flange, and the radius of curvature 26 on the upper side of said flange are preferably each at least one-fourth inch.

In another sometimes more preferred embodiment of the invention illustrated in FIG. 3, at least a part of the upper portion of each wall member of at least one pair of said wall members is offset outwardly in a generally vertical direction, as at 28, from the lower portion thereof to form a curved internal shoulder on the inner walls of said wall members and a curved inverted external shoulder on the outer walls of said wall members. Preferably, the radius of curvature 30 of said internal shoulder and the radius of curvature 32 of said external shoulder are at least one-fourth inch. Preferably, said internal shoulder and said external shoulder extend completely around the periphery of the tray. However, it is within the scope of the invention to omit said shoulders from large portions of said wall members and said shoulders need only be provided in one pair of the opposing wall members, e.g., 14 and 14'. Even when said shoulders are provided in only one pair of said wall members, they can be provided by one or a series of intermittent small offset portions extending along said wall members. The position of said shoulders along the height of said wall members can be varied in accordance with the desired degree of nesting the trays and the desired ease of removing an individual tray from nesting position at the top of a stack of trays. Said shoulders are preferably located so that the walls of one tray do not jam against the walls of an adjacent tray of the nested trays. Although not shown in the drawings, the ease of removing a top tray from a stack of trays can be facilitated by providing the upper portion of the wall member with a slight taper.

In one preferred embodiment, said gridwork bottom comprises a first plurality of grid members 34 which are disposed generally parallel to said second wall members 14 and 14', are spaced apart from each other, and extend between said pair of first wall members 12 and 12'. A second plurality of grid members 36 are disposed generally parallel to said first wall members 12 and 12', are spaced apart from each other, and extend between said pair of second wall members 14 and 14'. Said second grid members are disposed generally

parallel to said first wall members in an intersecting direction with respect to said first grid members 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 fillet **38** is provided between each pair of adjacent grid members at said junction of said grid members. The radius of curvature of said fillet is preferably at least one-fourth inch. This structure is illustrated in FIG. **6**. This embodiment of the tray of the invention can be provided with the wall structure illustrated in FIG. **3**, or with the wall structure illustrated in FIG. **5**.

In another 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. 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. A fillet **38** is also provided at the junction of said grid member **44** with wall **12** and the intersection of said diagonally extending grid members **40** and **42**. This embodiment of the invention can be provided with either the wall structure illustrated in FIG. **3** or the wall structure illustrated in FIG. **5**.

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 **46** (see FIG. **4**). Preferably, an opening **48** is provided in said island as illustrated in FIG. **1**. Preferably, 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.

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. **3** and **5**, the bottom portion of the grid members, e.g., **34**, are curved so as to provide better self-draining properties. Preferably, the bottom portion of said wall members is also similarly curved, as also shown in said FIGS. **3** and **5**.

Preferably, said opposed first walls **12** and **12'** slope inwardly toward each other from top to bottom, and said opposed second walls **14** and **14'** slope inwardly toward each other from top to bottom. The extent to which the trays will nest one within another will be determined by the thickness and the degree of slope of said side and end walls. The taper or slope of the walls should be sufficient that the trays are easily withdrawn from nested position. Usually a slope within the range of from about 5° to about 25° from the vertical will be sufficient. While it is preferred that the trays be provided with sloping walls, it is within the scope of the invention for said walls to be disposed essentially vertical.

Trays fabricated in accordance with the invention possess a number of advantageous features over trays of the prior art. The curved surfaces 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. It has been found that 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 polyethylene and other polyolefins 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 example, one model of a tray in accordance with the invention has a length of about **24** inches, a width of about 21 inches, the rectangles formed in the gridwork bottom were about 3.3 × 3.0 inches, the top surface of the bottom grid member was about 0.2 inch wide, and the side walls were about **1** inch in height. The remainder of the elements of the tray were generally proportional in size. These dimensions are given by way of example 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.

We claim:

1. A self-draining tray comprising, in combination:
a pair of upstanding opposed first wall members;
a pair of upstanding opposed second transverse wall members;
said first wall members being joined in a curved junction along the upstanding edges thereof to the upstanding edges of said second wall members;
a bottom member joined 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 an open top structure; and wherein
said wall members extend in a generally vertical direction throughout their structure so as to be self-draining on both sides, being devoid of any horizontal portion even when said tray is in an inverted position: and
said bottom member comprises a plurality of intersecting grid members joined at the ends thereof to said walls; and
a curved fillet is provided between each pair of adjacent grid members at the intersections of said grid members.

2. A tray according to claim 1 wherein:
the radius of curvature at the junctions of said wall members and at the junctions of said bottom member with said wall members is at least one-fourth inch; and
the radius of curvature of said fillet is at least one-fourth inch.

3. A tray according to claim 2 wherein the upper end portion of each of said wall members is curved outwardly to form a flange.

4. A tray according to claim 3 wherein:
the radius of curvature on the underside of said flange is at least one-fourth inch; and
the radius of curvature on the upper side of said flange is at least one-fourth inch.

5. A tray according to claim 2 wherein at least a part of the upper portion of each wall member of at least one pair of said wall members is offset outwardly and upwardly from the lower portion thereof to form a curved internal shoulder on the inner walls of said wall members and a curved inverted external shoulder on the outer walls of said wall members.

6. A tray according to claim 5 wherein:
each wall member of both pairs of said wall members is provided with said offset portion, and each of said shoulders extends around the periphery of said tray;
the radius of curvature of said internal shoulder is at least one-fourth inch; and
the radius of curvature of said external shoulder is at least one-fourth inch.

7. A tray according to claim 1 wherein said tray is generally rectangular in shape and said bottom member comprises:
a first plurality of grid members spaced apart from each other, extending between said pair of first wall members, and disposed generally parallel to said second wall members;
a second plurality of grid members spaced apart from each other, extending between said pair of second wall members, disposed generally parallel to said first wall members in an intersecting direction with respect to said first grid members 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 forming one side of the outer rows of said rectangles;
a third plurality of grid members, each one of which extends substantially diagonally across one of each of said rectangles and is joined to said first and second grid members at said junctions thereof to form junctions of said first, second, and third grid members;
a fourth plurality of grid members, each one of which extends substantially diagonally across one of each of said rectangles in a direction to integrally intersect said first-mentioned diagonally extending grid members 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; and
in each rectangle of said outer rows of rectangles, there is provided a grid member which extends from the intersection of said diagonally extending grid members to one of said wall members;
a fillet is provided between each pair of adjacent grid members at said junction of said grid members.

8. A tray according to claim 7 wherein:
the upper end portion of each of said wall members is curved outwardly to form a flange;
the radius of curvature on the underside of said flange is at least one-fourth inch;
the radius of curvature on the upper side of said flange is at least one-fourth inch; and
the radius of curvature of said fillet is at least one-fourth inch.

9. A tray according to claim 8 wherein said junctions of said first, second, and third grid members and said junctions of said first, second, and fourth grid members of adjacent rectangles form reinforcing islands at corners common to the adjacent rectangles.

10. A tray according to claim 9 wherein an opening is provided in said reinforcing island, at least a portion of the wall of said opening is curved, and the radius of curvature of said curved wall portion is at least one-fourth inch.

11. A tray according to claim 8 wherein at least a part of the upper portion of each wall member of at least one pair of said wall members is offset outwardly from the lower portion thereof to form a curved internal shoulder on the inner walls of said wall member and a curved external shoulder on the outer walls of said wall members.

12. A tray according to claim 11 wherein:

each wall member of both pairs of said wall members is provided with said offset portion, and each of said shoulders extends around the periphery of said tray;

the radius of curvature of said internal shoulder is at least one-fourth inch; and

the radius of curvature of said external shoulder is at least one-fourth inch.

**13**. A tray according to claim **12** wherein:

said junctions of said first, second, and third grid members and said junctions of said first, second, and fourth grid members of adjacent rectangles form reinforcing islands at corners common to the adjacent rectangles.

**14**. A tray according to claim **13** wherein an opening is provided in said reinforcing island, at least a portion of the wall of said opening is curved, and the radius of curvature of said curved wall portion is at least one-fourth inch.

* * * * *

UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,727,791 Dated: April 17, 1973

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

Column 6, line 60, Claim 11 should depend on Claim 7 instead of Claim 8.

Signed and sealed this 27th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents