Aug. 25, 1964 W. H. LOCKWOOD 3,145,870

REVERSIBLE NESTING AND STACKING CONTAINER

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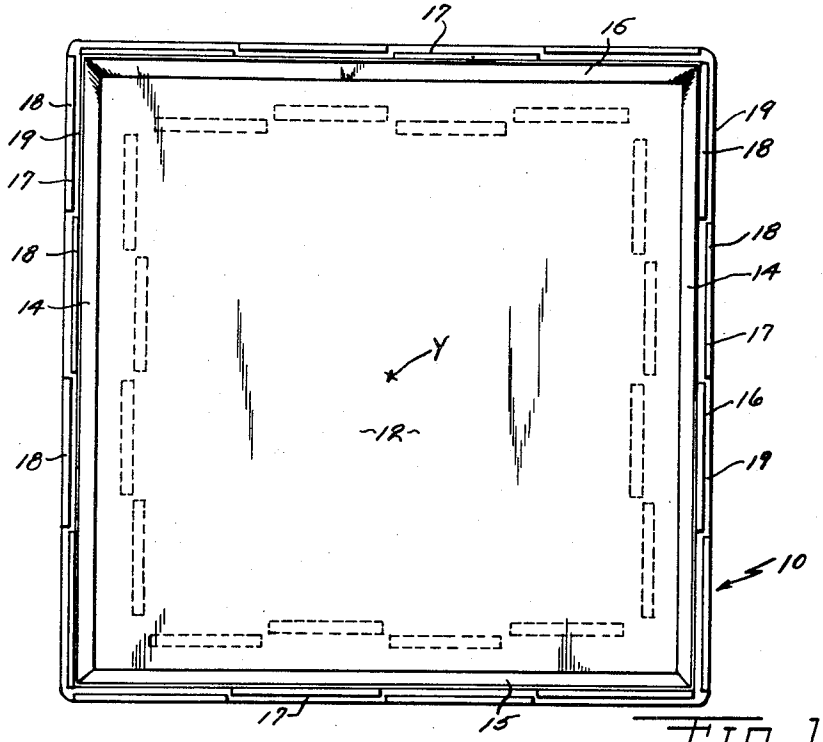


FIG. 1

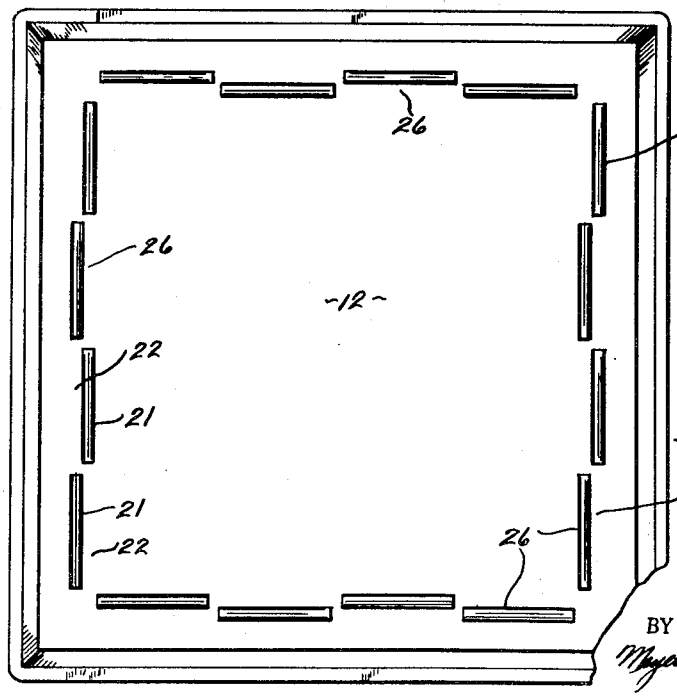


FIG. 2

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BY
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REVERSIBLE NESTING AND STACKING CONTAINER

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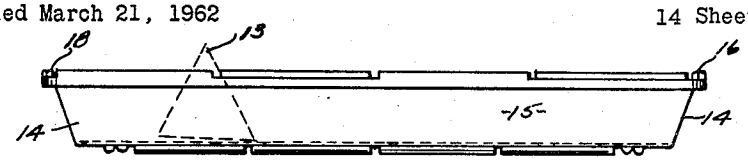


FIG. 3

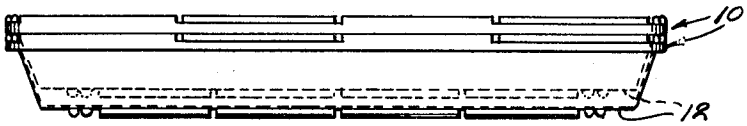


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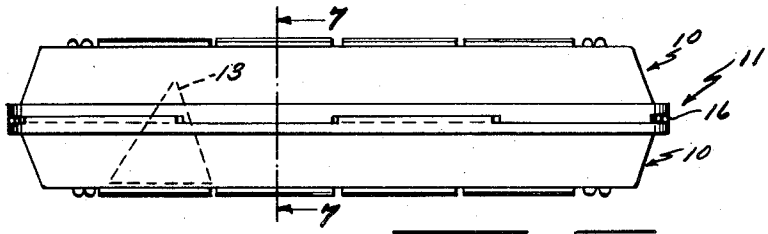


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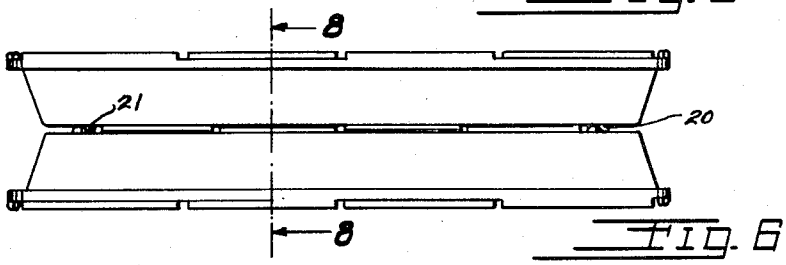


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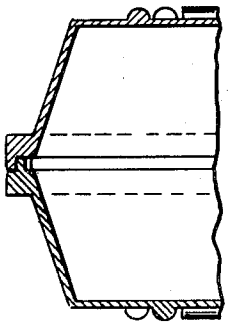


FIG. 7

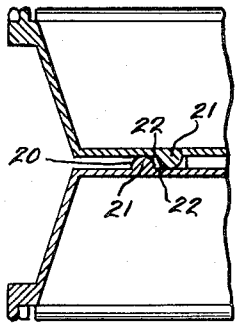


FIG. 8

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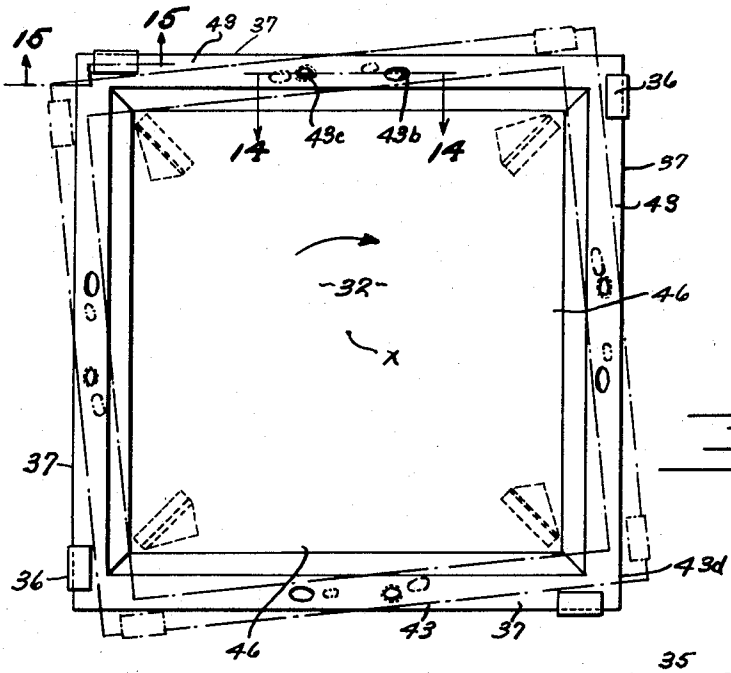


Fig. 9

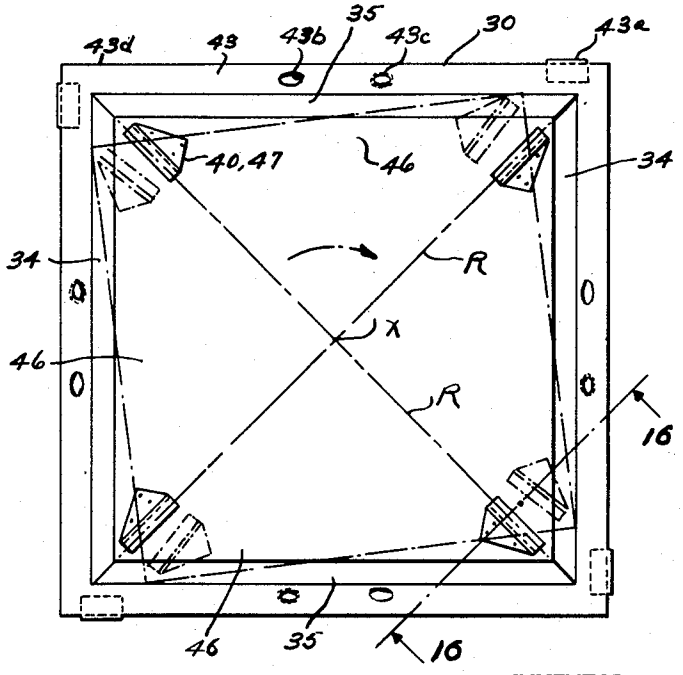


Fig. 10

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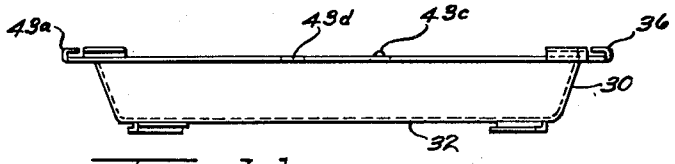


Fig. 11

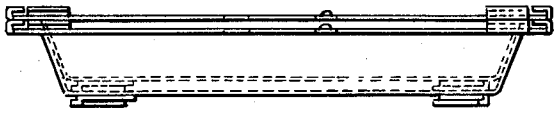


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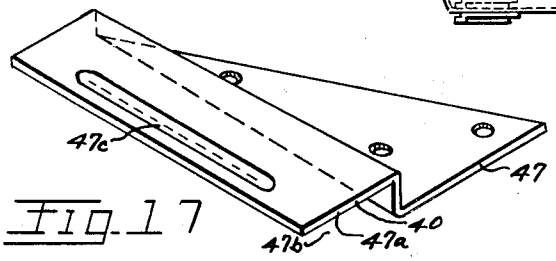


Fig. 17

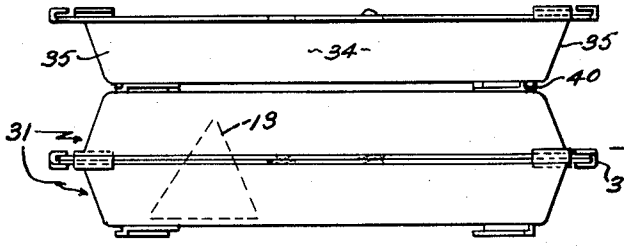


Fig. 13

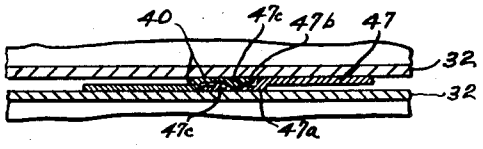


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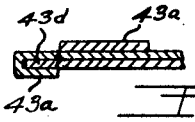


Fig. 15

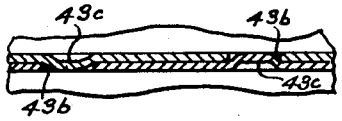


Fig. 14

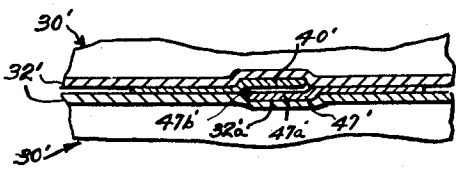


Fig. 18

INVENTOR.

WARREN H. LOCKWOOD

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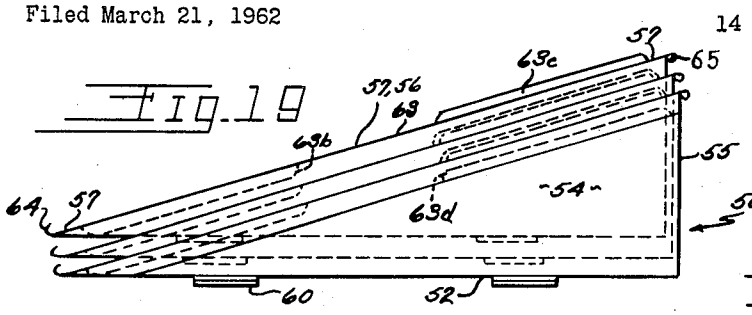
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Fig. 19



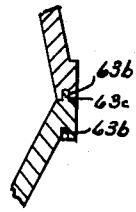


Fig. 21

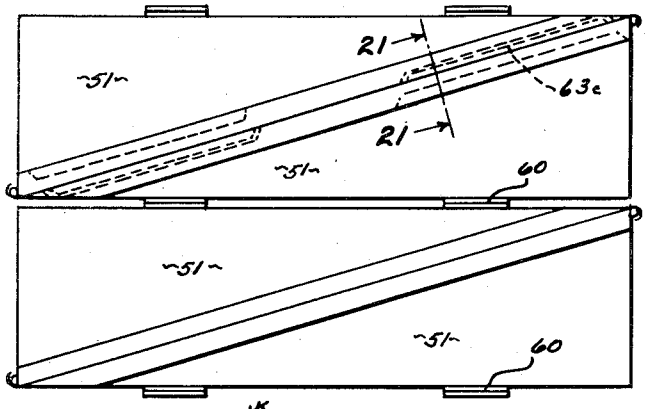


Fig. 20

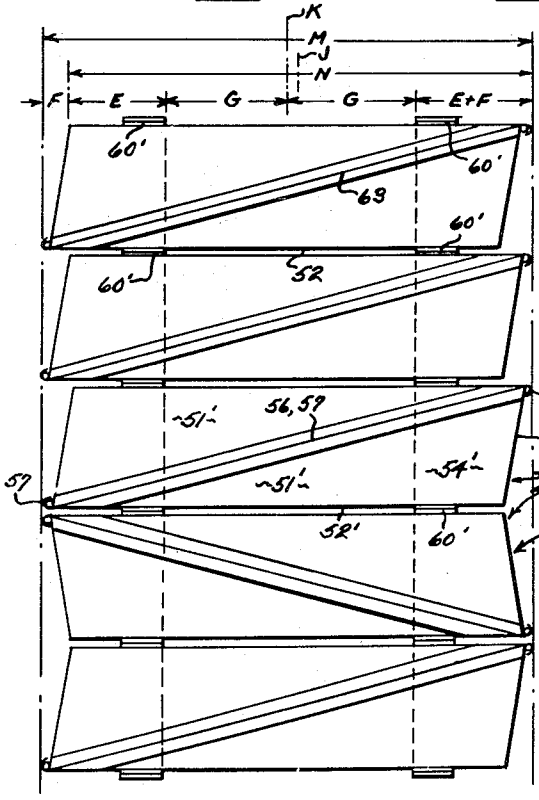


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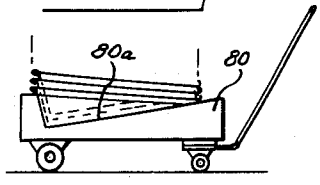


Fig. 23

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REVERSIBLE NESTING AND STACKING CONTAINER

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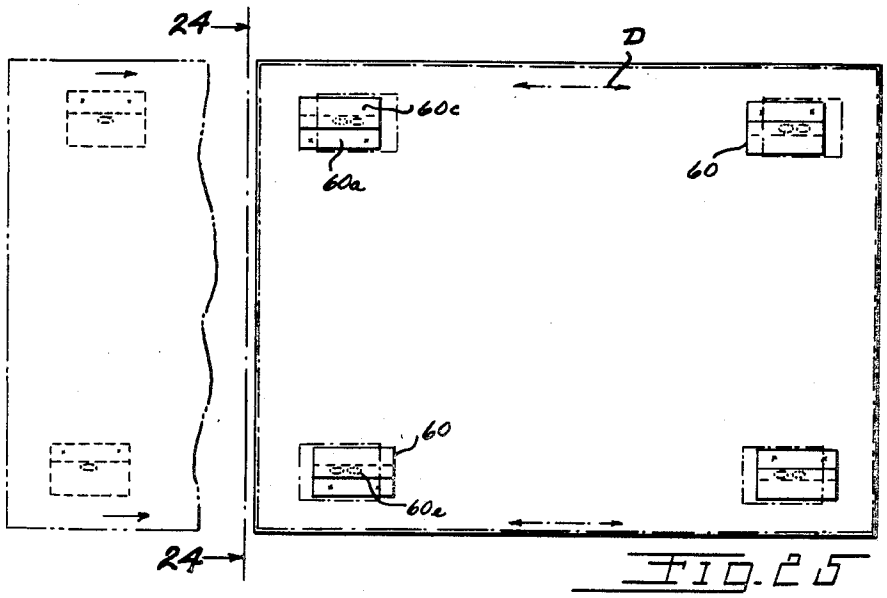


FIG. 25

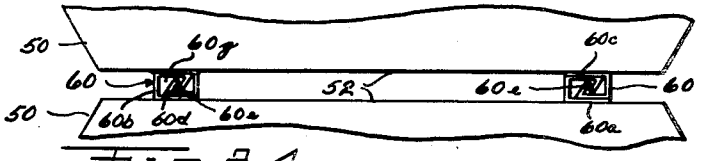


FIG. 24

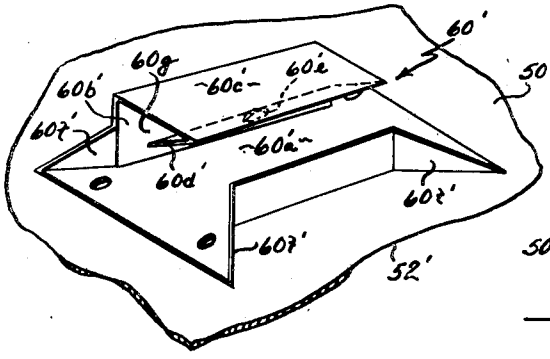


FIG. 27

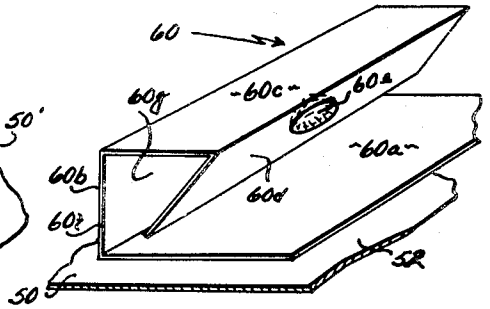


FIG. 26

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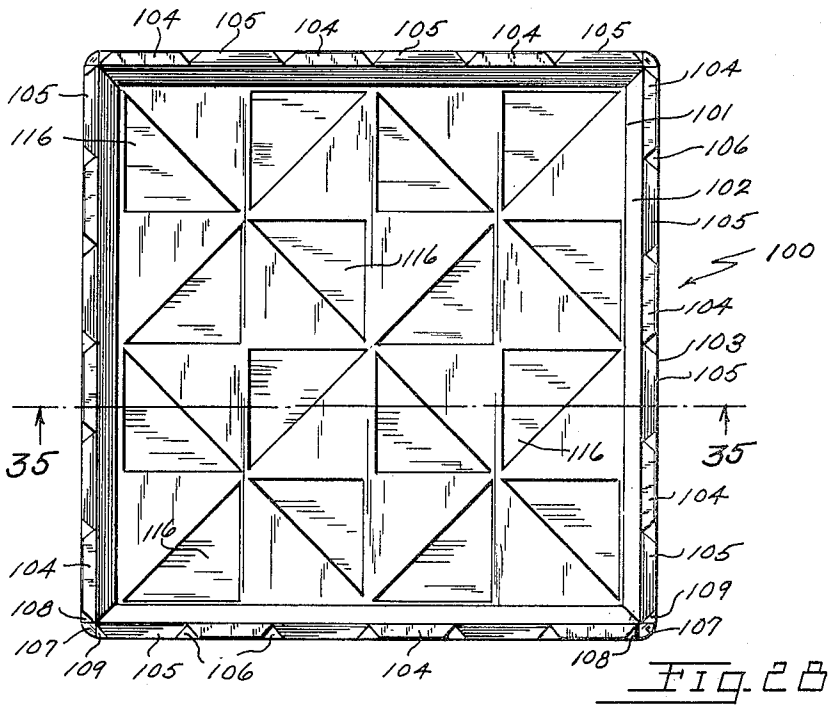


FIG. 28

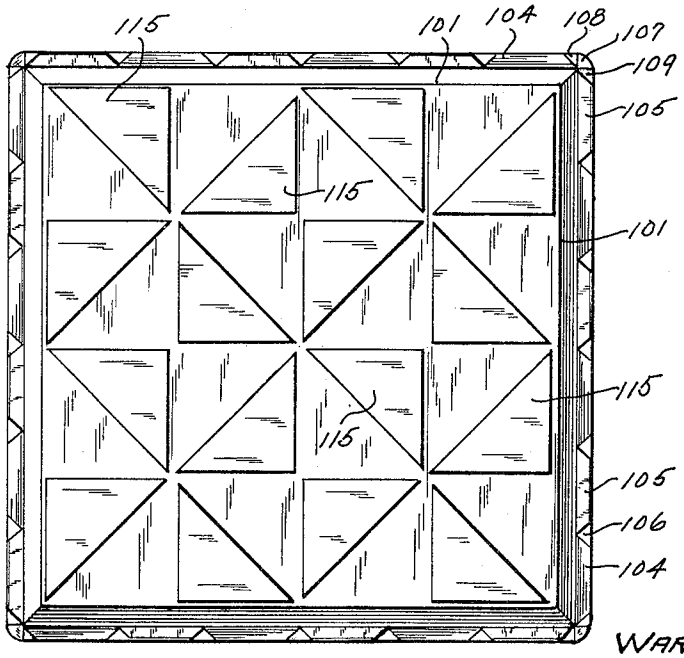


FIG. 29

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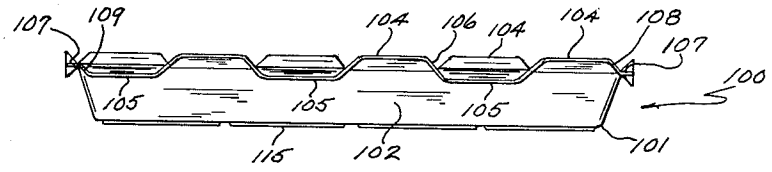


FIG. 30

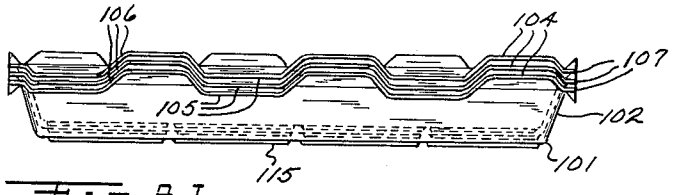


FIG. 31

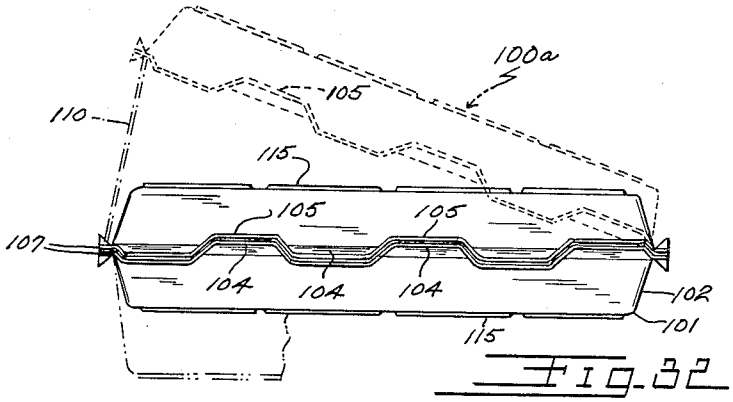


FIG. 32

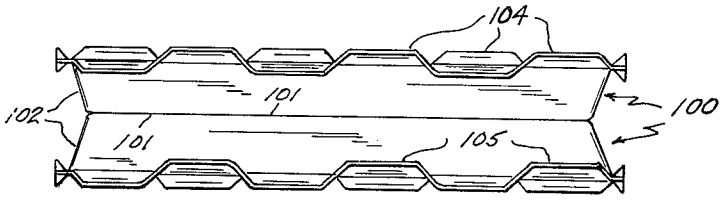


FIG. 33

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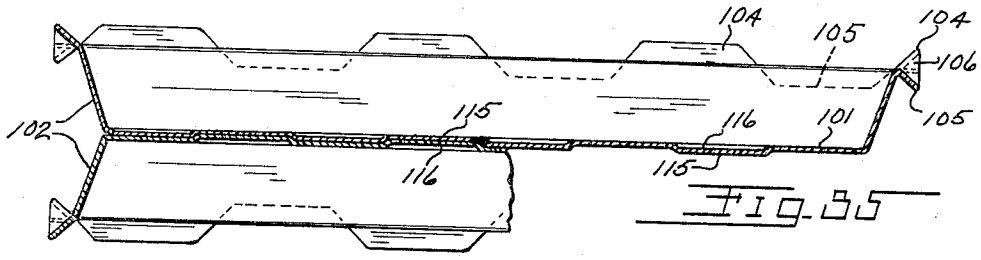


Fig. 35

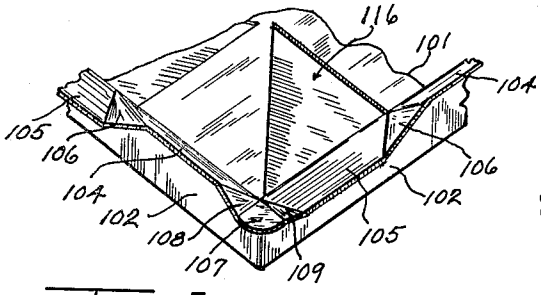


Fig. 34

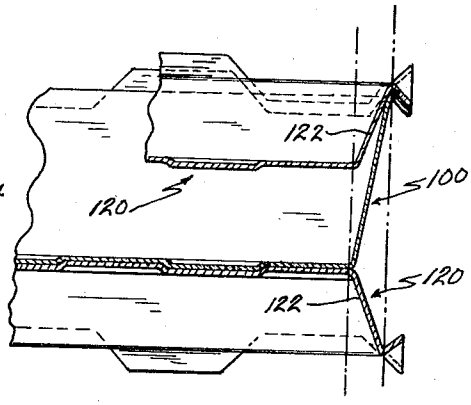


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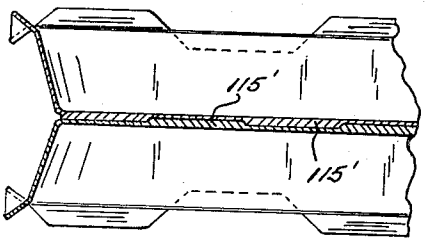


Fig. 37

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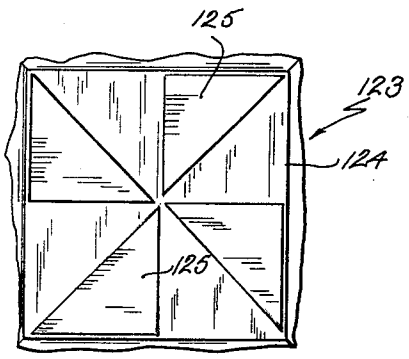


Fig. 38

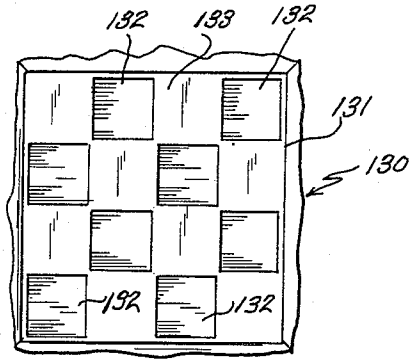


Fig. 40

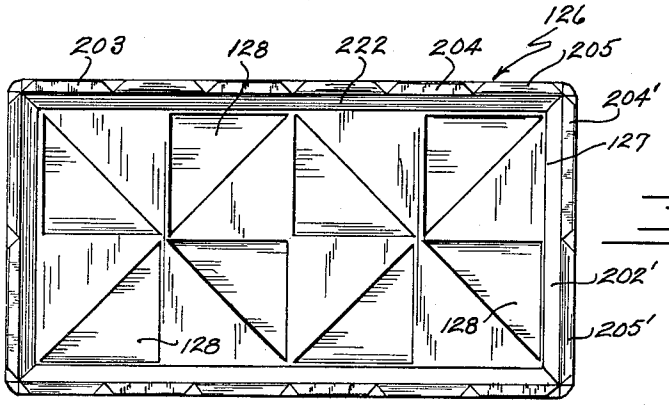


Fig. 39

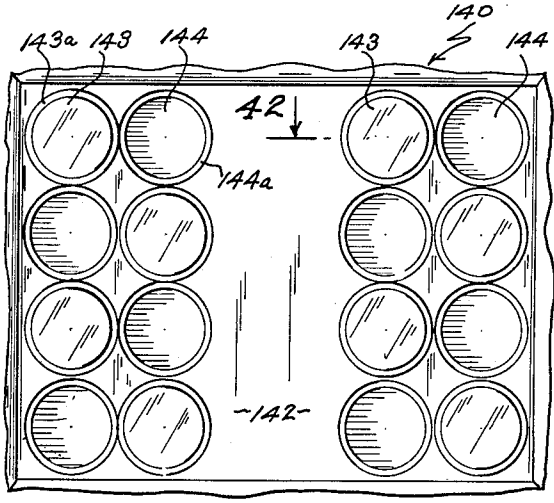


Fig. 41

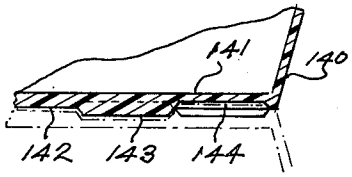


Fig. 42

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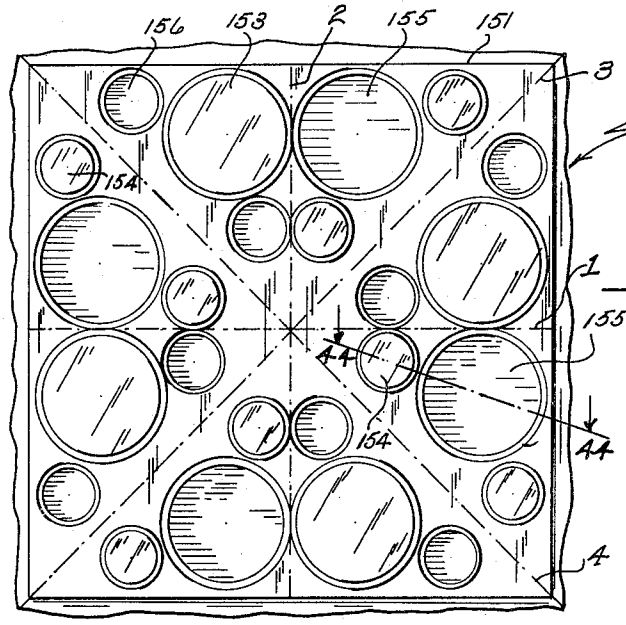


FIG. 43

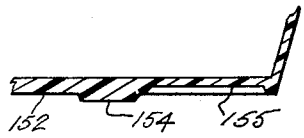


FIG. 44

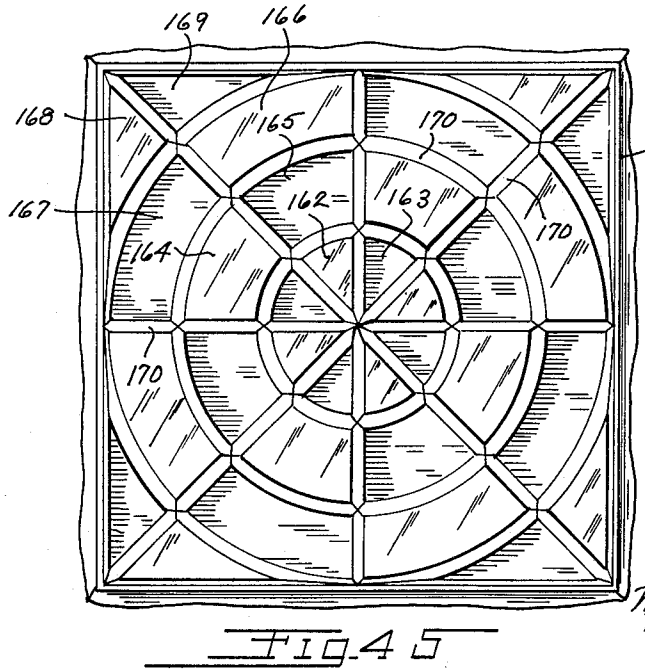


FIG. 45

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ATTORNEYS

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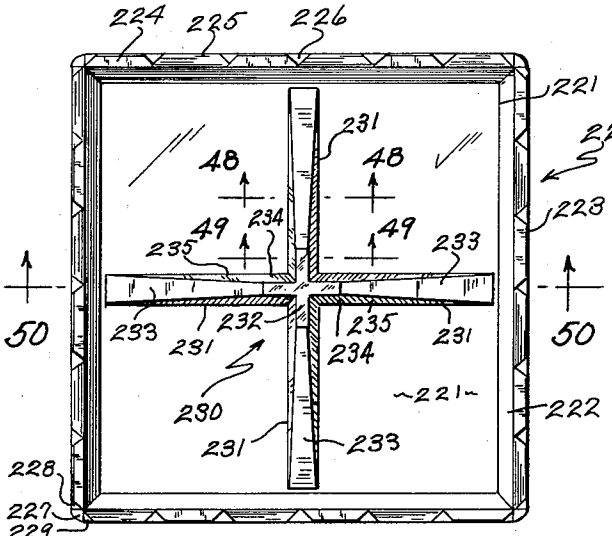


FIG. 46

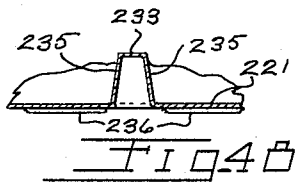


FIG. 48

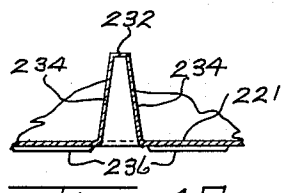


FIG. 49

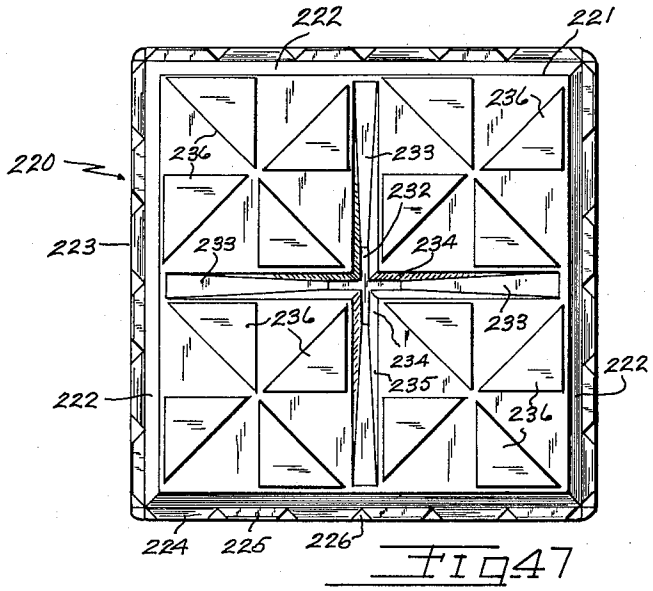
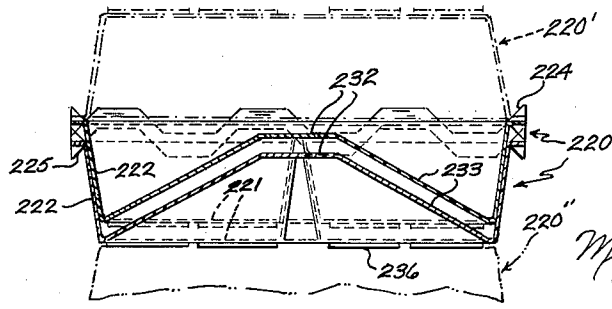


FIG. 47

FIG. 50



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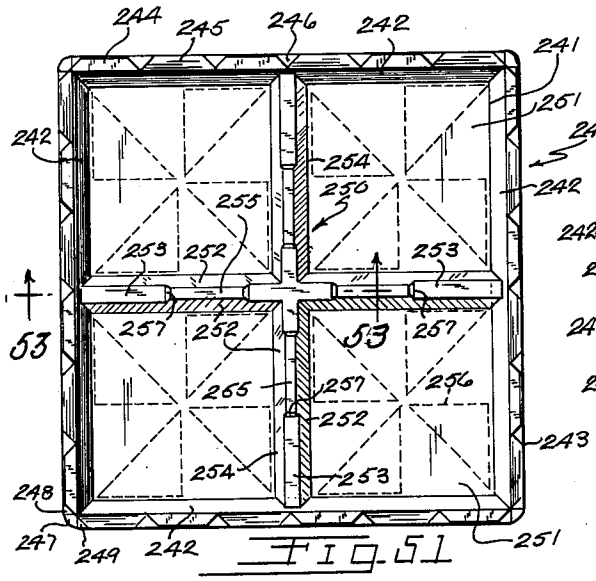


FIG. 51

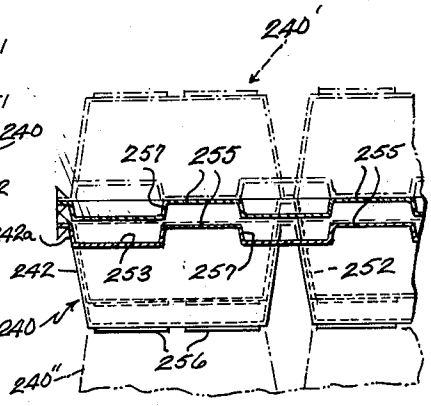


FIG. 53

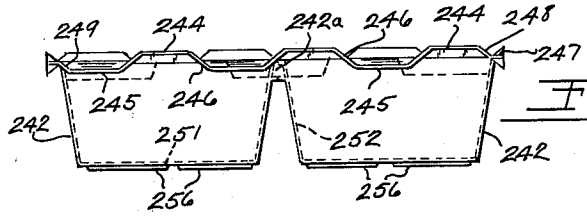


FIG. 52

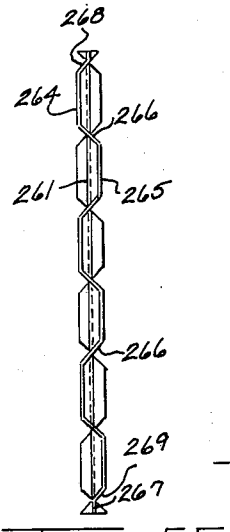


FIG. 55

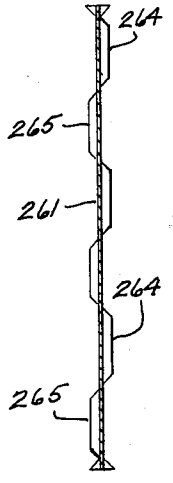


FIG. 56

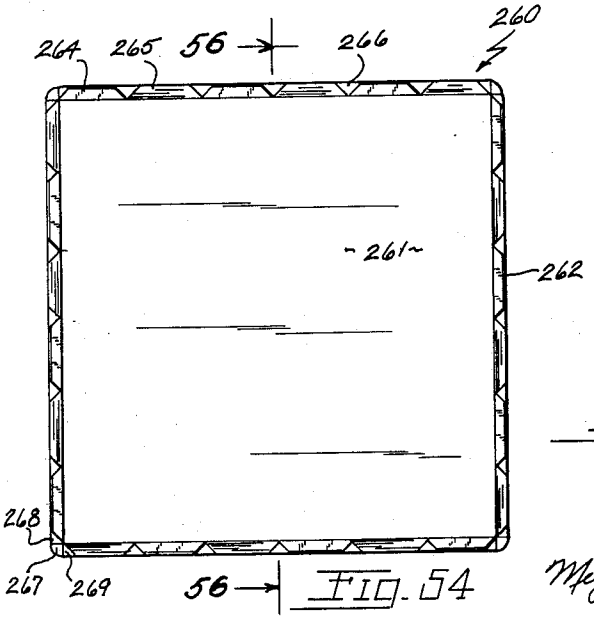


FIG. 54

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REVERSIBLE NESTING AND STACKING CONTAINER

Filed March 21, 1962 14 Sheets-Sheet 14

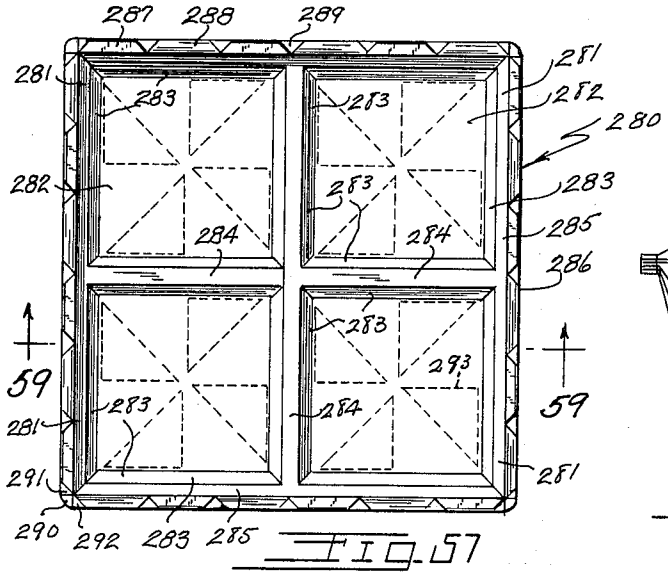


FIG. 57

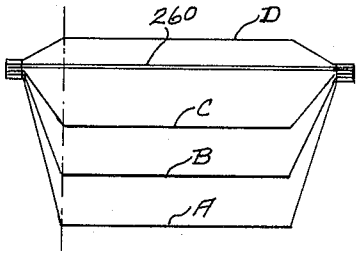


FIG. 60

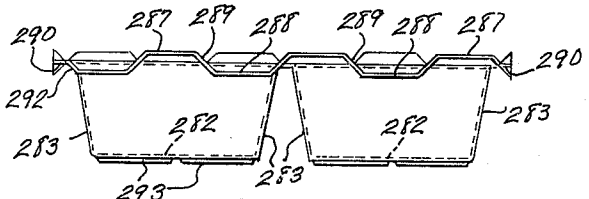


FIG. 58

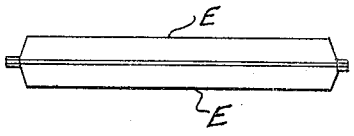


FIG. 61

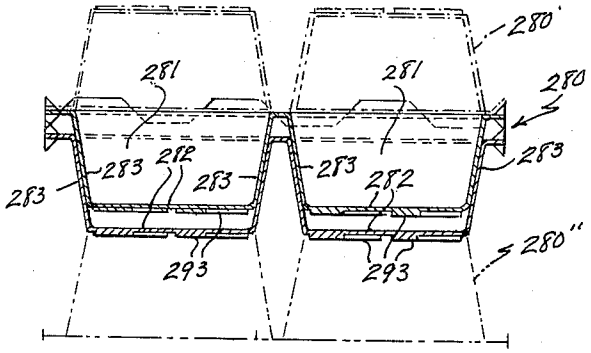


FIG. 59

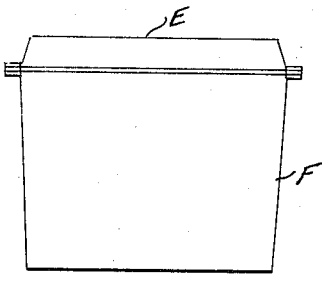


FIG. 62

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United States Patent Office 3,145,870 Patented Aug. 25, 1964

3,145,870

REVERSIBLE NESTING AND STACKING CONTAINER

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Filed Mar. 21, 1962, Ser. No. 181,430
9 Claims. (Cl. 220—4)

This invention relates to improvements in trays or receptacles, and more particularly to that type tray adapted to form a receptacle by coacting with an upside down similar tray, to nest with similar trays when empty, and to tier with similar trays to form a generally vertically aligned stack of trays or receptacles.

This application is a continuation-in-part of my copending United States patent application, Serial No. 35,535, filed June 13, 1960, and entitled "Reversible Nesting and Stacking Container," and now abandoned.

Whenever in the specification and claims these trays are referred to as "trays," it is intended that this term includes crates, boxes, baskets, trays, skids, pallets, flats and similar article carrying devices which may form receptacles and which have at least one open side. Whenever in the specification and claims the term "receptacle" is used, it is intended to define a structure composed of two such trays, one upside down with respect to the other, with the open sides facing each other. The words "similar trays" are intended to include all trays having identical tiering support parts engaging in tiering position, and/or having identical receptacle forming support parts engaging in receptacle forming position whether the vertical heights of the trays are the same or are different. These trays may be tiered one upon another, when in use, and be nested when empty for conservation of space. "Like trays" would be "similar trays" with each tray having the same vertical height. Since "similar trays" includes "like trays," the description will use the term "similar trays" wherever possible.

One of the objects of the present invention is to provide a tray tierable, nestable, or adapted to form receptacles with similar trays with this tray having no moving parts, and having rigidly connected receptacle forming support parts or receptacle tiering support parts for either forming receptacles or providing tiering engagement with similar trays.

A further object of the present invention is to provide a tray characterized by its inexpensive manufacturing cost, strong and sturdy nature, structural simplicity, ease of manufacture, compactness in nesting position with similar trays, multiplicity of functional advantages, and/or ease of assembly with similar trays in tiering, nesting, or receptacle forming positions.

Other features of this invention reside in the arrangement and design of the parts for carrying out their appropriate functions.

Other objects and advantages of this invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claims.

In the drawings,

FIG. 1 is a top plan view of a first form of tray;

FIG. 2 is a bottom view of the tray shown in FIG. 1;

FIG. 3 is a side elevational view of the tray in FIGS. 1 and 2;

FIG. 4 is a side elevational view of two similar trays, of the type shown in FIG. 1, in nesting position;

FIG. 5 is a side elevational view of the same two similar trays in receptacle forming position;

FIG. 6 is a side elevational view of these two similar trays in tiering position;

FIG. 7 is a vertical sectional view taken generally along the line 7—7 in FIG. 5;

FIG. 8 is a vertical sectional view taken generally along the line 8—8 in FIG. 6;

FIG. 9 is a top plan view of a second form of tray shown in solid lines with the outline of a similar tray shown in dot-dash lines immediately prior to being moved clockwise in the direction of the arrow to reach receptacle forming position with the tray shown in solid lines;

FIG. 10 is a bottom view of the tray in FIG. 9 shown in solid line and a portion of the bottom of a similar tray shown in dot-dash line position immediately before being moved clockwise in the direction of the arrow into engagement with the tiering support parts of the solid line tray in tiering position;

FIG. 11 is a side elevational view of the tray in FIG. 9;

FIG. 12 is a side elevational view of two similar trays, of the type shown in FIG. 9, in nesting position;

FIG. 13 is a side elevational view of three similar trays, of the type shown in FIG. 9, with the bottom two trays in receptacle forming position and the top two trays in tiering position;

FIG. 14 is a vertical sectional view taken generally along the line 14—14 in FIG. 9 with two similar trays in receptacle forming position;

FIG. 15 is a vertical sectional view taken generally along the line 15—15 in FIG. 9 of two trays in receptacle forming position;

FIG. 16 is a vertical sectional view taken generally along the line 16—16 in FIG. 10 through two trays in tiering position;

FIG. 17 is an enlarged perspective view of one of the four tray tiering support plates removed from the base part of the tray in FIG. 10;

FIG. 18 is a sectional view, similar to FIG. 16, of a portion of a third form of tray, a modification of the second form of tray shown in FIGS. 9–16, having a modified tiering support part construction;

FIG. 19 is a side elevational view of three similar trays of a fourth tray form with these trays shown in nesting position;

FIG. 20 is a side elevational view of four similar trays, of the type shown in FIG. 19, with the bottom two trays in receptacle forming position, the middle two trays in tiering position, and the top two trays in receptacle forming position;

FIG. 21 is a sectional view taken generally along the line 21—21 in FIG. 20;

FIG. 22 is a side elevational view of a dolly having a tray supporting surface constructed to support the trays in nesting position in FIG. 19 with corresponding parts in vertical alignment so that similar trays may be nested into a high and stable stack;

FIG. 23 is a side elevational view of a plurality of similar trays of a fifth form with each tray being a slight modification of the tray shown in FIGS. 19–21, with the ten trays in FIG. 23 arranged to form five separate receptacles with each having a pair of trays in receptacle forming position, and with vertically adjacent receptacles being engaged in tiering position;

FIG. 24 is an end view of the stack in FIG. 20 showing in detail the tray tiering support parts and being taken generally along the line 24—24 in FIG. 25;

FIG. 25 is a schematic top view showing the top surface of the bottom tray in FIG. 24 in solid line position and the bottom surface of the top tray in FIG. 24 in double dot-dash line position when laterally offset and in dot-dash line position when vertically aligned in tiering position;

FIG. 26 is an enlarged perspective view of one of the tray tiering support parts;

FIG. 27 is a perspective view of another form of tiering support part useable, in the manner shown in FIGS. 24 and 25, in FIG. 23;

FIG. 28 is a top plan view of a sixth form of tray;

FIG. 29 is a bottom plan view of the tray in FIG. 28;

FIG. 30 is a side elevational view of the tray in FIG. 28;

FIG. 31 is a side elevational view of three similar trays, of the type shown in FIG. 28, in nesting position;

FIG. 32 is a side elevational view of two similar trays of the type shown in FIG. 28 in receptacle forming position in solid lines with the top tray swung to the dotted line raised position by a hinge type action, and with a lower, nested tray of greater depth added in dot-dash line at the lower left hand corner;

FIG. 33 is a side elevational view of two trays of the type shown in FIG. 28 in tiering position;

FIG. 34 is a perspective view, taken from the top, of a corner of one of the trays of FIG. 28;

FIG. 35 is a vertical sectional view of the trays in FIG. 33 showing the interlocking action in the tiering position;

FIG. 36 is a vertical sectional view of similar trays, of the type shown in FIG. 28, with the lower two trays in tiering position, the upper two trays in nesting position, and the lower and upper trays being one-half the depth of the middle tray;

FIG. 37 is a vertical sectional view, similar to FIG. 35, of a plurality of trays of a seventh form which is a modification of the trays of the sixth form shown in FIGS. 28–36, but having a smooth inside bottom surface;

FIGS. 38, 39 and 40 are bottom plan views of portions of an eighth, ninth and tenth form of tray (a modification of the sixth form of tray shown in FIG. 28) having a modified tiering support part construction;

FIG. 41 is a bottom plan view of the base of an eleventh form of tray;

FIG. 42 is a section taken along the line **42—42** of FIG. 41;

FIG. 43 is a bottom plan view of a twelfth form of tray;

FIG. 44 is a section taken along the line **44—44** of FIG. 43;

FIG. 45 is a bottom plan view of a thirteenth form of tray;

FIG. 46 is a top plan view of a fourteenth form of the tray;

FIG. 47 is a bottom plan view of the tray of FIG. 46;

FIG. 48 is a section taken along the line **48—48** of FIG. 46;

FIG. 49 is a section taken along the line **49—49** of FIG. 46;

FIG. 50 is a section taken generally along the line **50—50** of FIG. 46 but showing two of the trays in nested position;

FIG. 51 is a top plan view of a fifteenth form of the tray;

FIG. 52 is a side elevation of the tray of FIG. 51;

FIG. 53 is a section taken generally along the line **53—53** of FIG. 51 but showing two of the trays in nested position;

FIG. 54 is a top plan view of a cover or divider for use with the trays of FIGS. 28–38, 40, 43–52, and 57–59;

FIG. 55 is an edge view of the cover of FIG. 54;

FIG. 56 is a section taken along the line **56—56** of FIG. 54;

FIG. 57 is a top plan view of a sixteenth form of the tray;

FIG. 58 is a side elevation of the tray of FIG. 57;

FIG. 59 is a section taken generally along the line **59—59** of FIG. 57 but showing two of the trays in nested position; and

FIGS. 60–62 semidiagrammatically illustrate various combinations of the items illustrated in FIGS. 28–59 in nested and/or receptacle forming positions.

Before the trays and receptacles here illustrated are specifically described, it is to be understood that the invention here involved is not limited to the structural details or arrangement of parts here shown since trays and receptacles embodying the present invention may take various forms. It also is to be understood that the phraseology or terminology herein employed is for purposes of description and not of limitation since the scope of the present invention is denoted by the appended claims.

The first tray form is shown in FIGS. 1–8. This tray **10** is constructed (1) for forming a receptacle **11** in FIG. 5 by coacting with an upside down similar tray **10**, (2) for tiering with similar trays in tiering position in FIG. 6, and (3) for movement into nesting position with similar trays, as shown in FIG. 4. This tiering position in FIG. 6 is especially adapted for tiering a plurality of tray formed receptacles **11** in the manner shown in FIGS. 13, 20 and 23.

Each tray **10** may be made in many different ways and by many different materials. Tray **10** may be manufactured by vacuum formed plastic, drawn aluminum sheet, open wire mesh, plastic cast in cavity molds, or plywood. Each tray **10** may have solid walls or open wire mesh walls.

Tray **10** has rigidly interconnected together a base part **12** for load support, such as supporting an article **13** in FIGS. 3 and 5; two side parts **14** and two side parts **15** rigidly connected with base part **12**, and located on the upward one side of and projecting upwardly to this one side of base part **12** for forming a portion of receptacle **11**; receptacle forming support parts **16** rigid with parts **12**, **14** or **15** and located on the same upward one side of base part **12** for forming with a similar tray, as shown in FIG. 5, receptacle **11** in the receptacle forming position; and tray tiering support parts **20** rigid with some of these aforementioned parts, adapted to interengage to maintain similar trays in the tiering position shown in FIG. 6, and having tiering engagement portions located on the other or lower side of base part **12** from parts **14**, **15** and **16**.

Use of receptacle or container **11** is especially desirable for shipping articles **13** by common carrier where enclosed protection of these articles would be desirable. Receptacle forming support parts **16** have four receptacle forming edges **17** located generally on the surface of a right parallelepiped having one face thereof coplanar with base part **12**. These edges **17** have projection and projection receiving portions **18** and **19** respectively. Receptacle **11** in FIG. 5 is formed by two trays **10**, a right side up bottom tray **10** and an upside down similar tray **10**, coacting with parts **16**, edges **17**, and portions **18** and **19** mutually engaged. Projection portions **18** are located in projection receiving portions **19** and receptacle forming side parts **14** and **15** are vertically aligned to form completely enclosed receptacle **11**. When the corners formed by side parts **14** and **15** are vertically aligned on similar trays **10**, receptacle **11** is properly formed.

A plurality of receptacles **11** may be interlocked in tiering position to provide a tiered stack of receptacles, as partially shown in FIGS. 6 and 8, by interengagement of tray tiering support parts **20** on similar tray **10**. These tiering support parts **20** are engaged on similar trays to maintain trays **10** in tiering position. These tiering support parts **20** include tiering projection portions **21** and tiering projection receiving portions **22** located one within the other and interengage in the tiering position in FIGS. 6 and 8. There, the receptacle forming side parts **14** and **15** are vertically aligned so that all of the trays **10** will be easily maintained in this tiering position even though the tiered stack may be very high. When the corners of trays **10** are vertically aligned, their tray tiering support parts **20** will be properly engaged.

When a plurality of similar trays **10** are correspondingly positioned, they are easily moved into the nesting position in FIG. 4 by relative approach movement of their base parts **12** with the upper tray moving downwardly into the lower tray. It should be readily apparent that after articles **13** are removed from the trays **10** and receptacles **11**, the empty trays **10** may be moved into this nesting position for return as a compact stack back to the original shipper or to the loading position.

As will be apparent hereinafter, the description of the

structure and mode of operation in the preceding paragraphs relating to trays **10** and receptacles **11** also applied generically to the same named parts, etc. in FIGS. 9–27.

FIGS. 9–17 disclose tray **30** having rigidly interconnected base part **32**; side parts **34** and **35**; receptacle forming support parts **36** including four receptacle forming edges **37**, projection portions **43***c* and **43***d*, and projection receiving portions **43***a* and **43***b*; tray tiering support parts **40** including tiering projection portions **47***a* and **47***c* and tiering projection receiving portions **47***b*.

Each tray **30'** in FIG. 18 is identical to tray **30** except for a modified form of base part **32'** and for the tray tiering support parts **40'** (four in number but only one being shown) having projection portions **47***a'* and projection receiving portions **32***a'* and **47***b'*.

FIGS. 19–22 and 24–26 disclose tray **50** having rigidly interconnected base part **52**; side parts **54** and **55**; receptacle forming support parts **56** including four receptacle forming edges **57**, projection portions **63***c* and **65**, and projection receiving portions **63***b* and **64**; and tray tiering support parts **60** including tiering projection portions **60***d* and **60***e* in FIGS. 24 and 26, and tiering projection receiving portions **60***g*.

Each tray **50'** in FIGS. 23 and 27 has substantially the same parts as tray **50** in FIGS. 19–21 except for modified side parts **54'** and **55'**, and tiering support parts **60'** in FIG. 27 including tiering projection portions **60***d'* and **60***e'* and tiering projection receiving portions **60***g'*.

The different forms of trays in FIGS. 1–28 have many different forms of receptacle forming support parts.

Tray **10** in FIGS. 1–8 has receptacle forming support parts **16** arranged along four receptacle forming edges and including projection portions **18** and projection receiving portions **19**. These projections **18** and **19** on opposite edges **17**, as seen in FIG. 1, are arranged as reversed mirror images. These edges **17** form a square in FIG. 1 on the surface of a right parallelepiped with the square lying in a plane parallel to base part **12**. Now, it should be apparent that two trays **10**, one right side up and the other upside down, will form, by interengagement of their receptacle forming support parts **16**, receptacle **11** with side parts **14** and **15** thereof vertically aligned. Note that the receptacle will be formed with the upside down, top tray **10** in FIG. 5 in either of four 90 degree displaced positions around vertical center axis Y in FIG. 1 because of the construction of the projection portions **18** and projection receiving portions **19** so that four different receptacle forming positions are possible. Hence, it is possible to form receptacle **11** in any of these four 90 degree displaced positions instead of in only one position. This is true because any two opposite receptacle forming edges **17** have on each edge both a projection portion **18** and projection receiving portion **19** instead of only one of these portions.

In FIG. 5, receptacle **11** is formed from two like or identical trays **10**. However, it will be apparent that a plurality of similar trays, such as trays of different depth, will provide the same advantages. Each of these similar trays will have identical tiering support parts **20** engaging in tiering position in FIG. 6 and have identical receptacle forming support parts **16** engaging in the receptacle forming position in FIG. 5. However, some tray may be of smaller depth, such as three inches, while other trays will be exactly identical except of greater depth, such as four inches so that these are similar trays. Since all parts **16** and **20** are identical, a receptacle **11** can be formed from two three inch depth trays **10**, or from one three inch depth and one four inch depth tray **10**. Thus, with these two different tray depths, it is possible to get with a plurality of trays three different receptacle vertical dimensions; with three different tray depths, it is possible to get six different receptacle vertical dimensions; with four different tray depths, it is possible to get ten different receptacle depth dimensions; etc. These similar trays of different depths will nest together in the manner shown in FIG. 4, although not as efficiently as the trays **10** shown in FIG. 4 of identical or like size.

It will be apparent hereinafter that the description of the receptacle forming support part **16** in the immediately preceding paragraphs applies equally well to the same named parts, positions, etc. in FIGS. 9–18.

Two trays **10** in FIG. 5 form receptacle **11** by interengagement of receptacle forming support parts **16**. Parts **16** have four edges **17** arranged along a square and each receptacle forming edge **17** has bar-like projections portions **18**. These provide, as shown in FIG. 3, a level silhouette for receptacle **10**. Then, when upper tray **10** is turned upside down on top of lower tray **10**, the upper tray will be dragged across the lower tray, without hang up, by smooth movement into vertical alignment with the receptacle forming position in FIG. 5 so that it may drop downwardly into receptacle forming position shown in FIG. 5.

Trays **30** in FIGS. 9–17 and trays **30'** in FIG. 18 form receptacle **31** in FIG. 13 in exactly the same manner so the description will be restricted to trays **30**. Receptacle forming support parts **36** are formed along four receptacle forming edges **37**. These parts **36** include four coplanar flanges **43** extending outwardly from side parts **34** and **35** and generally parallel to base part **32**, inwardly facing hook **43***a* at corresponding ends of each flange, and a hole **43***b* and struck up bump **43***c* on each flange. These parts **36** are preferably made of resilient material, such as steel, so they can interengage after yielding. To form receptacle **31**, flanges **43** of two like trays, a right side up lower tray and an upside down upper tray, are placed in parallel and vertically spaced apart planes and in vertical alignment. Then, upper tray **30** is rotationally displaced counterclockwise about vertical axis X in FIG. 9 into the dot-dash line position in FIG. 9 out of vertical alignment, the base part **32** of the upper tray is moved downwardly toward lower tray **30** in approach movement until their respective flanges **43** engage and are straddled by hooks **43***a*, and upper tray **30** is rotationally displaced clockwise about vertical axis X in the opposite or clockwise direction in FIG. 9 until receptacle forming side parts **34** and **35** are vertically aligned to form receptacle **31** in the receptacle forming position in FIG. 13. Then, each tray has its hooks **43***a* engaged over a flange on the other tray, and has its bumps **43***c* detachably engaged in holes **43***b* on the other tray. Flanges **43** have an outline of a square in FIGS. 9 and 10 so that these like trays may be engaged in any of four, 90 degree displaced positions about vertical axis X to form receptacle **31**. Hooks **43***a* prevent the receptacle forming trays **30** from vertically disengaging unless the upper tray is twisted in a reverse direction (counterclockwise in FIG. 9 about axis X). To prevent accidental untwisting of these trays about axis X, bumps **43***c* are detachably engaged in holes **43***b* so that a certain amount of manual twisting force must be applied to disengage the trays **30**. Of course, spring clips, studs, or other detachable connections might be used in place of holes **43***b* and bumps **43***c*. Now, it should be apparent that projection portions are formed by bumps **43***c* and by the portions **43***d* of flanges **43** received by a hook **43***a* on an adjacent like tray **30** in receptacle **31**. Projection receiving portions are formed by holes **43***b* and by hooks **43***a*.

Receptacles **50** and **50'** in FIGS. 19–27 have identical type receptacle forming position support parts **56** so the description will be restricted to receptacles **50**. These parts **56**, being formed on generally coplanar flanges **63** extending outwardly from opposite side parts **54** at opposite edges **57**, include on the top of each flange **63** linearly aligned a bar as projection portion **63***c* and a slot as this projection receiving portion **63***b*. Parts **56** also include hook portion **64** (preferably made of spring steel so as to be resiliently deformable) and hook receiving portion **65** respectively facing in opposite vertical

directions from the top surface of flanges 63 and located on opposite ends of receptacle 50 between side parts 54 having these projection and projection receiving portions 63*c* and 63*b*.

Receptacle 51 is formed by taking two like trays 50, one right side up and the other inverted; snapping the resilient hook 64 on the right-hand end of the upper tray in FIG. 20 over the hook receiving portion 65 on the right-hand end of the tray immediately therebelow; and swinging the upper tray counterclockwise about this right-hand end as a pivot until receptacle 51 is formed with portion 63*b* and 63*c* interengaged, as shown in FIGS. 20 and 21, and with the hook receiving portion 65 on the upper tray snapped into the resilient hook 64 on the tray immediately thereinbelow.

This tray 50 could be of value in shipping products needing protection in closed receptacle 51, especially protectively wrapped products. Then, when the trays 50 were disconnected, each tray 50 could be used as a display tray because of the inclined angle of its upper edges 57 on side parts 54. It should be noted that the upside down tray 50 can be interengaged with a low similar tray in only one position to form receptacle 51, instead of the four 90 degree displaced positions described for receptacles in FIG. 1–18.

Now, there will be discussed sequentially the tray tiering support action provided between adjacent similar trays by tray tiering support parts 20 in FIG. 6, parts 40 in FIG. 13, 40′ in FIG. 18, parts 60 in FIG. 24, and parts 60′ in FIG. 27.

Like trays 10 are tiered in FIG. 6 by interengagement of their tray tiering support parts 20. These parts 20 on each tray in FIG. 2 are rigid with and located on the bottom side of base part 12, arranged along the outline of a square having four equal length tiering sides respectively located equidistance from the four receptacle forming edges 17 and centered with respect to base part 12. Each tiering support side 26 has tiering projection portions 21 and tiering projection receiving portions 22 arranged so that the portions on opposite tiering sides and from the intersection of adjacent tiering sides are reversed mirror images. Now it should be apparent that two similar trays 10, the lower one upside down in FIG. 6 and the upper one right side up, may have their tiering support parts 20 engaged to maintain the similar trays in the tiering position shown in FIG. 6 with receptacle forming edges 17 vertically aligned when the trays 10 are tiered in any of four 90 degree tray displaced tiering positions about vertical axis Y in FIG. 1. As will be apparent hereinafter, the description of the structure and mode of operation in this paragraph on tray tiering support parts 20 applies equally well to the same named parts, positions, etc. in FIGS. 9–18.

Tiering support parts 20 in FIG. 2 include along each tiering side 26 square bar-like projections as tiering projection portions 21 alternately arranged in two parallel rows. These projections 21 form a level silhouette on lower tray 10 in FIG. 6 so that, when the upper tray 10 is placed thereon, one can drag the upper tray smoothly across the lower tray, without hang up, and then the upper tray will drop vertically down into the tiering position shown in FIG. 6 and lock in this position in generally the same manner as earlier described for interengagement of projection portions 18 in the receptacle forming position in FIG. 5.

Similar trays 30 in FIGS. 9–17 are held in tiering position by interengagement of their tray tiering support parts 40, as shown in FIGS. 13 and 16. These tiering support parts on each tray 30 include four plates 47, located along the outline of a square, having tiering sides 46 in FIG. 10. Each plate 47, secured to the bottom surface of base part 32, has a hook 47*a* forming with this bottom surface an opening 47*b*. These plates 47 are identical to each other and in identical relationship to each edge and corner, are arranged as reverse mirror images to each other, and are arranged so that the center line of two diagonally opposite hooks 47*a* lie along an identical radial line R in FIG. 10 to the central, vertical pivotal axis X of the containers.

Two similar trays 30, the upper one right side up and the lower one upside down as shown by the top two trays in FIG. 13, are interlocked in tiering position by rotating the upper tray about the vertical axis X in FIG. 10 in substantially the same manner earlier described for interengaging parts 36 by a turning action in FIG. 9. Then, each hook 47*a* will enter a corresponding opening 47*b* on the other tray 30 so as to be detachably interlocked in the tiering position. As will be apparent hereinafter, the description, the structure and mode of operation in this paragraph applies equally well to the same named parts, positions, etc. in FIG. 18 for trays 30′.

Tray 30 has on tray tiering support parts 40 (in FIGS. 16 and 17) a locking projecting bump or projection portion 47*c* on one inner face of each hook or projection portion 47*a* extending into opening or projection receiving portion 47*b* formed by the hook so that bumps of similar trays are adapted to move past each other, and thus engage as shown in FIG. 16 during this turning action, to maintain trays 30 interlocked in tiering position. Then, the proper twist in the reverse direction must be given to unlock them. Plates 47 can be made of any resilient suitable material, such as spring steel, permitting this interlocking by yielding.

In FIG. 18, trays 30′ are interlocked in tiering position by interengagement of tray tiering support parts 40′ thereon. Each tray 30′ has four plates 47′ secured to the bottom thereof in the same arrangement as the four plates 47 in FIG. 10. Each plate 47′ forms a hook 47*a*′, and forms an opening 47*b*′ with a depression 32*a*′ in the bottom surface of base part 32′. Depression 32*a*′ is vertically aligned with and at least horizontally coextensive with the portion of opening 47*b*′ formed by hook 47*a*′ to form therewith a projection receiving portion. Then, after the aforedescribed twisting motion about vertical axis X has occurred and the upper and lower tray 30′ in FIG. 18 are vertically aligned, the upper tray 30′ in FIG. 18 can settle vertically downwardly so that each hook or projection portion 47*a*′ on each tray 30′ will engage into depression or projection receiving portion 32*a*′ in the other tray to maintain trays 30′ in the tiering position in FIG. 18. This engagement would provide an interlock to resist untwisting about vertical axis X. To disengage the trays 30′, upper tray 30′ would have to be raised to disengage hooks 47*a*′ from depressions 32*a*′ before the untwisting movement about axis X could occur.

In FIGS. 19–21 and 24–26, each tray 50 has four tray tiering support parts 60. Each part 60 includes integrally connected together, and preferably made of resiliently yieldable spring steel, a securement flange 60*a* secured to the bottom of base part 52, a vertically extending portion 60*b*, a horizontally extending portion 60*c*, and a turned-in portion 60*d*. These four parts 60 are secured to base part 52, as shown by the solid line positions in FIG. 25, so that corresponding portions on all four parts are arranged along parallel lines extending parallel to horizontal direction line D. It should be noted in the solid line positions that the two upper parts 60 in FIG. 25 are displaced slightly to the left of the vertical with respect to the two lower parts in FIG. 25, the upper parts are in horizontal alignment, and the lower parts are in horizontal alignment parallel to line D. Each portion 60*d* in FIG. 26 has a bump 60*a* thereon forming a projection portion receivable in channel 60*g* on a similar tray forming a projection receiving portion.

Now, it should be apparent that if lower receptacle 50 in FIG. 24 is in the solid line position in FIG. 25, the upper receptacle 50 in FIG. 24 may be slid horizontally from the double dot-dash line position in FIG. 25 in direction D to the dot-dash line position, which is the tiering position shown in FIG. 24. This action takes place by relative linear movement in direction D in FIG. 25 be-

tween one tray, and a reversed similar tray, in FIG. 24. This action causes the bumps **60***e* of the upper tray to move past the corresponding bumps on the lower tray in the upper left-hand corner and the upper right-hand corner in FIG. 25 by a snap action while the bumps at the lower left-hand corner and the lower right-hand corner in FIG. 25 on the upper tray approach the corresponding bumps on the lower tray. Then, the upper and lower trays **50** are firmly locked in tiering position. It should be apparent that upper tray **50** may approach the lower tray from the right-hand side in FIG. 25 and can then be moved into locking position by movement in the direction opposite to direction D. Also, it should be apparent that the upper tray may be turned end for end through a 180 degree turn about a vertical axis, and then it can be interlocked with the lower tray, as shown in FIG. 25, by movement in direction D or in the opposite direction. In any situation, bumps **60***e* will interlock in basically the same manner.

Parts **60** requiring movement in the direction D or in the opposite direction in FIG. 25, would be especially good for rectangular type trays, or trays which always have to have a certain end facing in a given direction, such as shown by the one direction orientation of trays **50** in nesting position in FIG. 19, of trays **50** in receptacle forming position in FIG. 20, and of trays **50'** in tiering position in FIG. 23.

It will be apparent hereinafter that the description of the structure and mode of operation in these preceding paragraphs on part **60** applies equally well to the same named part, positions, directions and movements in FIGS. 23 and 27.

Four tray tiering support parts **60'** in FIG. 27 are secured to the bottoms of trays **50'** in FIG. 23 in identically the same arrangement as previously described for parts **60**. Part **60'** has integrally formed from a resiliently yieldable material, such as spring steel, a securement flange **60***a'*, vertically extending portion **60***b'*, horizontally extending portion **60***c'*, turned-in portion **60***d'*, channel **60***g'*, and bump **60***e'*. Portion **60***d'* and bump **60***e'* form a projection portion received within receiving portion or channel **60***g'* on a similar tray.

The only difference between parts **60** and **60'** is that end portions **60***f* in FIG. 26 extend parallel to the longitudinal lines of part **60** and movement direction line D in FIG. 25, while each part **60'** has end portion **60***f'* diverging outwardly to provide a guiding action at opposite ends during relative movement between trays **50'** in direction D in FIG. 25, or in the opposite direction, during interlocking in tiering position.

Next will be described the structure required for the movement into the nesting positions in FIGS. 4, 12, 19 and 22.

For proper nesting action, at least some of the corresponding side parts on each receptacle must diverge upwardly away from the base part. For example, side parts **14** and **15** diverge upwardly away from base part **12** in FIGS. 1, 3 and 4 so that similar trays **10**, correspondingly positioned, may be nested by moving the upper of said trays downwardly into the nesting position of FIG. 4 by approach movement of their base parts **12**. It should be apparent that this description and mode of nesting also applies to trays **30** in FIG. 12, trays **50** in FIG. 19, and trays **50'** in FIG. 23 because their respective side parts **34** and **35**, side parts **54**, and side parts **54'** and **55'** on these respective trays upwardly diverge away from their corresponding base parts. Hence, all of the side parts upwardly diverge in this manner in the tray form shown in FIGS. 1–18 and in FIG. 23. In FIGS. 19–22, side part **55** is vertically extending with respect to base part **52**, but nesting occurs because side parts **54** upwardly diverge and an open side is opposite each side part **55**.

Trays **50** and **50'** in FIGS. 19 and 33 are interlockable against substantial horizontal movement in nesting position, as shown in FIG. 19. Since the structure on each tray **50** and **50'** is substantially identical, the description will be restricted to tray **50**. Projection portions **63***c* of receptacle forming position support parts **56** and projection receiving portions **63***d* are constructed to nest and interlock one within the other on similar trays in FIG. 19 because they are arranged in pairs of vertically aligned portions **63***c* and **63***d* formed respectively on the tops and bottoms of flanges **63**. These portions **63***b*, **63***c* and **63***d* extend along diagonal flange **63** converging toward base part **52**, as shown in FIG. 19.

FIGS. 22 and 23 show two ways of maintaining trays in a vertical stack to prevent tip over. First, in FIG. 19, it will be observed that each upper tray **50** moves forwardly to the left so that the stack, as it gets higher and higher, may become top heavy and fall over. However, by putting the stack in FIG. 19 in a recess **80***a* in a dolly **80** in FIG. 22, the stack can be made to go straight up although the individual trays **50** would have their base parts **52** slanted with respect to the horizonatl. Second, as to the lower three receptacles **51'** in FIG. 23, upward divergence of side parts **55'** permits all of the trays **50'** in a vertically nested stack to be vertically aligned, instead of being laterally offset, as shown in FIG. 19 because of vertical side parts **55**. Third, as to the upper two receptacles **51'** in FIG. 23, the vertical alignment of a stack of these tiered receptacles **51'**, turned upside down one with respect to another, is regained by offsetting center K of the group of tray tiering support parts **60'** (which center K is shown by equidistance dimensions G in FIG. 23 from tiering support parts **60'**) from center J of the horizontal dimension N of the bottom surface of base part **52** to the true center K of the vertical perimeter of a stack or tier of receptacles **51'**. Respective dimensions E, F and G are used to show the symmetrical arrangement of parts **60'** about center line K. Tiering support parts **60'** are symmetrically arranged with respect to center K of the overall dimension M of each tray **50'** measured horizontally in FIG. 23 and generally parallel to base part **52** and generally parallel to the plane of each diagonal flange edge **63**. Although tiering support parts **60'** are engageable by a generally horizontal linear movement along direction D in FIG. 25, it should be readily apparent that tiering support parts **40** in FIG. 13 or **40'** in FIG. 18 may be used in place of parts **60'** in FIG. 23 with interengagement caused by rotational relative movement between vertically adjacent receptacles **51'** in FIG. 23 about vertical center line or axis K in the same manner earlier described for axis X in FIG. 10.

Hence, in FIG. 23 nested trays **50'** will stack or tier in vertical alignment without dolly **80**. These receptacles **51'** are maintained in vertical alignment (whether turned upside down with respect to each other as shown by the lower three receptacles **51'** in FIG. 23 or whether all are right side up as shown by top two receptacles **51'** in FIG. 23) as long as receptacles **51'** are engaged in always the proper illustrated direction D in FIG. 25, or the reverse of that direction.

Tiering support parts **20** in FIG. 6, parts **40** in FIG. 13, parts **40'** in FIG. 18, parts **60** in FIG. 24 and parts **60'** in FIG. 27 are in each drawing figure illustrated in one suitable arrangement, but it should be readily apparent that they may vary in number, relative position, or purpose. These tiering support parts are only dependent on their relation to each other and identical positioning on another tray. They would lock together any two tiered trays of any two different sizes as long as the pattern of these parts was identical on the two trays. It would be possible to have the four parts located in the four corners of a single plate, which plate could be attached to any flat surface having similar parts to which one might want to join it. Instead of four tiering support parts on each tray, there might be more than four or less than four. When the trays are relatively rotated into engagement about a common center axis, such as axis X in FIGS. 9

and 10, it could be possible to have three, or any other suitable number of equally arcuately spaced tiering support parts.

Referring now to the form of the invention shown in FIGS. 28–37 and particularly to FIGS. 28–30, at **100** there is shown a tray having a base **101**, upwardly diverging side walls **102**, and a marginal lip **103** integral with and surrounding the upper edges of said side walls. The base **101** is square in shape, and the side walls **102** diverge upwardly in a uniform manner whereby the tray is square in any horizontal plane of cross section and whereby the marginal lip **103** is also square.

At each side wall **102**, the marginal lip **103** is formed alternately obliquely upwardly and downwardly with respect to the upper edge of its associated side wall in uniform, longitudinally spaced portions. The upwardly angled lip portions are designated **104** and the downwardly angled lip portions are designated **105**, and between each adjacent pair of lip portions there is provided a tilted, connecting plane **106**. As best shown in FIG. 34, at each corner of the tray **100** there is provided a horizontal, wedge shape portion **107** which is connected to endmost lip portions **104** and **105** of two intersecting side walls **102** by upwardly and downwardly angled connecting planes **108** and **109** respectively. The angled lip portions **104** and **105** are uniformly angled respectively above and below a horizontal plane defined by the upper edges of the side walls **102**. The marginal lip **103** is so formed as to provide a lip portion **104** adjacent the right-hand end of each side wall and a lip portion **105** adjacent the left-hand end of each side wall as viewed in FIG. 30, all four sides being alike; and the lip adjacent each side wall is provided with a like number of angled lip portions and connecting planes in relatively the same positions as seen in corresponding views of the separate sides of the tray.

As shown in FIG. 29, the base or bottom of the tray **101** is provided with a plurality of downwardly or outwardly projecting, triangular projections **115**. The overall pattern of the bottom of the base **101** comprises a division of the bottom surface into sixteen equal, imaginary squares with each triangular projection **115** representing substantially one-half of one of the squares divided on the diagonal. The triangular projections are, therefore, arranged in four horizontal and four vertical rows with each pair of adjacent triangles being rotated 90 degrees relative to each other in either the vertical or the horizontal direction. The resulting pattern is that shown in FIG. 29 wherein no two triangular projections have sides parallel and adjacent each other.

The bottom pattern as shown in FIGS. 28 and 29 illustrates the triangular projections **115** as being pressed or formed downwardly or outwardly from the bottom of the base **101** by the application of a triangular tool or form to the upper surface of said base. The resulting effect is an embossing of the bottom of the base and a corresponding debossing of the top or inner side of said base. However, as illustrated in FIG. 37, it will be noted that the debossing effect of FIG. 28 may be eliminated, and triangular projections may be simply molded or otherwise attached to the outer side of the base, as shown at **115'**. This affords a completely smooth inner surface to the base.

As in the first form of the invention, the embodiment of FIGS. 28–37 comprises a tray which, cooperant with a similar or a like tray, may be placed in receptacle forming position (FIG. 32), nesting position (FIG. 31), or tiering position (FIG. 33). The marginal lip **103**, with its angled lip portions, connecting planes, and the like, form the receptacle forming supporting parts whereby one tray may be turned upside down on top of another tray to form a closed receptacle. The lip portions **104** and **105** and the connecting portions **106–109** are so complementarily formed as to enable the lip of one tray to nest or mate with the lip of another tray; the lip portions **104** of one tray nestingly interfit the lip portions **105** of the other tray with the connecting planes or portions **106–109** abutting in flatwise engagement. Thus the receptacle formed with two similar or like trays is completely closed.

This nesting or mating characteristic of the lips of two of the trays is equally utilized when the trays themselves are nested in the manner illustrated in FIG. 31. In other words, the lips are so formed as to have mating engagement whether both trays are in the upright position or one of them is in the inverted position. Also, these lips will mate in the manner described in any position rotated about their vertical centers as long as the side walls of the different trays are aligned. Rotation of one of the trays 90 degrees with respect to the other has no effect on this mating characteristic.

Any two trays **100** are adapted for tiering whereby the outer surfaces of their respective bases come into flatwise and interlocking engagement with each other in the manner illustrated in FIGS. 33 and 35–37. In such tiering position, the triangular projections **115** of one of the bases **101** fit into triangular areas immediately adjacent triangular projections of the other of said bases.

The trays of FIGS. 28 and 29 are inverted relative to each other whereby the triangular projections **115** which appear as embossments in the bottom view of FIG. 29 appear as triangular recesses **116** in the top plan view of FIG. 28. Noting, therefore, that each recess **116** represents a corresponding projection **115**, it will be readily seen that when a tray in the position of FIG. 28 is tiered upon a like or similar tray as shown in FIG. 29, the embossments of each tray will fit into the triangular, debossed areas adjacent the embossments of the other tray. This will be true even through one of the trays be rotated 90 or 180 degrees in either direction. The pattern on the bottom of each tray **100** is invertibly complementary on either side of perpendicular center lines drawn horizontally through the center of the tray parallel with its edges, or diagonally across its corners, whereby when a second tray is inverted relative to a first tray, the triangular projections and recesses of the separate trays become complementary to each other. Two trays thus tiered are positively interlocked against horizontal movement in any horizontal direction while in the tiered position.

As shown in FIG. 36, similar trays **120** having the identical lip and bottom embossment formations of the trays **100** but with shallower side walls **122** may be either tiered or nested with a similar tray **100**. Obviously, a similar tray **120** may also be placed in receptacle forming position with a tray **100** to form a closed receptacle. It is also anticipated that a marginal lip **103** may be provided on a plain, flat plate or divider which could be placed on top of any one of the trays to act as a cover or be sandwiched in between any two trays in receptacle forming position to act as a divider.

FIG. 32 illustrates the manner in which the portion of the marginal lip **103** at the upper edge of any one of the side walls **102** acts like a hinge for the purpose of opening a receptacle formed by two trays in receptacle forming position to gain access to the inside of such receptacle. The upper tray **100** is shown in the open position in broken line at **100*a***, and a supporting prop or rod **110**, also shown in broken line, is provided for holding the receptacle in an open position. This allows access to articles contained or stored within the receptacle without the necessity of completely removing the upper tray. The alternately upwardly and downwardly angled lip portions **104** and **105** serve to interlock the like edges of the two trays in such manner as to prevent lateral movement of the upper tray relative to the lower tray sufficient to provide the hingelike action illustrated.

The marginal lip **103** is also adapted for effectively shedding water whereby a receptacle of the type shown in FIG. 32 will keep its contents dry even though exposed

to rain. The lip portions **105** of the upper tray serve as gutters, collecting water which drains downwardly on the slanted side walls **102** in that area, and direct the water laterally toward the lip portions **104** from which the water will drain free of the receptacle at a level well below the upper edge of the side walls of the bottom tray.

The plan view of FIG. 38 shows a base formation of a tray **123** in which only a quarter of the pattern shown in FIGS. 28 and 29 is utilized. A base **124** is here simply divided into four substantially equal imaginary squares with triangular projections **125** each representing substantially one-half of one of the squares cut on the diagonal. Applying the principle as described in connection with FIGS. 28 and 29, it will be readily seen that two bases of the type shown in FIG. 38 may be readily tiered by engaging the bottom or outer surfaces of their respective bases.

FIG. 39 presents a further variation of the pattern of FIGS. 28 and 29 adapted to a rectangular tray **126** having a base **127** and triangular projections **128**. This tray is provided with angled side walls **202**, angled end walls **202'**, and a marginal lip **203** generally having the forms of the side walls **102** and the lip **103** but adapted to a rectangular tray. The lip comprises upwardly and downwardly angled portions **204** and **205** along the side walls **202** and similar portions **204'** and **205'** along the end walls **202'**. The lip **203** forms a pattern which is invertibly complementary on either side of longitudinal and lateral center lines through the tray **126**. A pair of trays **126** may be placed in receptacle forming position or tiering position although the rectangular shape of the trays inherently limits them to two relatively rotated positions 180 degrees apart.

In the base patterns illustrated in the remaining FIGS. 40–45, it is assumed that each plan view represents a tray having a marginal lip **103** or **203** or recpetacle forming support parts **16**. It is anticipated that the support parts **16** are readily adaptable to a rectangular tray in the same manner that the lip **103** was adapted to form the lip **203**.

FIG. 40 shows a checkerboard base pattern for a square tray **130** wherein the base **131** of the tray is divided into sixteen equal or substantially equal squares with every other square in either direction being a projection or embossment **132**. Between the projections **131** there are flat or relatively depressed areas **132** adapted to receive the embossment of an inverted similar tray **130** tiered thereupon. As in the bottom pattern of FIG. 29, the bottom pattern of the tray **130** is divided into four equal square portions around the center of the tray with each portion having a pattern identical to that of every other portion. A top tray **130** tiered upon a similar tray interlocks with the lower tray in either one of two positions rotated about a vertical axis running through the centers of the bases, these two positions being disposed 180 degrees apart.

FIGS. 41–43 show forms of the invention wherein the bottom or outer surface of the tray base is provided with alternate projections and recesses relative to a common or mean outer surface of the base. FIG. 41 shows the bottom or base **141** of a tray generally indicated at **140**, and as shown in the section of FIG. 42, the outer surface of the base is generally flat as indicated at **142**. The base is provided with a plurality of rows of alternating circular projections **143** having outwardly converging, frusto-conical side walls **143***a*, and circular recesses **144** having outwardly diverging, frusto-conical walls **144***a*. The patterns of circular projections and recesses are disposed in pairs of parallel rows across the tray adjacent the ends of a generally rectangular base. It will be noted that in each grouping of circles, the positions of each circular projection **143** is the same in each group as the corresponding projection in the other group. Therefore, when a similar tray is inverted, each recess **144** of one tray will complementarily receive a projection **143** of the opposite tray, and the outer surfaces **142** of the two trays will come into substantial, flatwise abutment with each other. As in the rectangular tray of FIG. 39, two tiered trays **140** will interlock in either of two rotated positions 180 degrees apart.

FIG. 43 shows a tray **150** having a square base **151** utilizing a random pattern of circular projections and recesses. Large and small circular projections **153** and **154** project outwardly beyond the outer surface **152** of the base, and large and small recesses **155** and **156** respectively are recessed below said outer surface. Although the pattern is a random one, it will be noted that said pattern is invertibly complementary on either side of centerlines through the base **151** whether said centerlines are parallel with the base edges or diagonal across its corners. Thus the tray **150** will interlock with a like tray in tiered position whenever the sides of the tray bases are aligned, or in four rotated positions 90 degrees apart.

The pattern of the tray **160** in FIG. 45 comprises segments constituting concentric, circular portions generated about the center of a base **161** and extending radially outwardly to the edges of the base. The central area is made up of wedge shape portions which are circumferentially alternately projections **162** and recesses **163**. The next outwardly disposed ring of segments is made up of circumferentially alternating projections **164** and recesses **165**, and the next concentric ring of segments is made up of alternate projections **166** and recesses **167**. The remaining corner areas of the base **161** at each corner comprise a projection **168** and a recess **169**. Adjacent projections and recesses are connected by slanted walls **170** which extend from the bottoms of the recesses upwardly to the tops of adjacent projections. It will be noted that in addition to having the recesses and projections alternate in a circumferential direction, said projections are also alternately positioned in a radial direction. For example, a projecting segment **162** is adjacent a recessed segment **165** while outwardly beyond said recess **165** there is radially consecutively positioned the projection **166** and the corner recess **169**. As in the foregoing embodiments of FIGS. 28–44 the projections of an upright tray **160** which is tiered upon a similar inverted tray will interfit the recesses of the tray upon which it is tiered. This interfit is effected in any one of four positions 90 degrees apart wherein one of the trays is rotated about a vertical axis disposed through the center of its base.

The form of the invention as shown in FIGS. 46–50 comprises a square tray **220** having a base **221**, upwardly diverging side walls **222**, and a marginal lip **223** at the upper edges of said side walls. The marginal lip **223** is substantially identical in form and function with that shown at **103** in FIGS. 28 and 29 and comprises upwardly angled lip portions **224**, downwardly angled lip portions **225**, connecting planes **226**, wedge shaped corner portions **227**, and corner connecting planes **228** and **229**. The above referred to parts numbered **223** through **229** correspond exactly to the parts **103–109** of the embodiment of FIGS. 28 and 29.

The primary difference between the tray of the embodiment of FIGS. 28 and 29 and the tray illustrated in FIGS. 46 and 47 is found in the form taken by the base **221**. Said base is provided with a symmetrical, cross-shaped divider **230** which projects upwardly within the tray **220** from said base affording a similarly shaped recess in the bottom of the base as shown in the bottom view of FIG. 47. The divider **230** is so positioned that the arms of its crosslike configuration are disposed parallel with the outside edges of the base **221**. The highest point of the divider **230** is disposed adjacent the center of the base **221**, from which four arms **231** radiate at 90 degree angles from each other. The centrally disposed, uppermost portion of the divider comprises a cross-shaped, horizontal top wall portion **232** from which extend downwardly sloping top wall portions **233**. The horizontal wall portions **232** and the sloping wall portions **233** are connected

to the base 221 by downwardly diverging side wall portions 234 and 235 respectively. The outer ends of the arms 231 intersect the base 221 just inside the outer edges of said base. The divider 230 is preferably integrally molded or formed with the base 221 and affords at the bottom of said base a cross-shaped recess adapted to nestingly receive a like divider of a like tray nested therewith. FIG. 50 shows, in section, the positions which two dividers take with respect to each other when two like trays 220 are nested together.

The substantially flat portion of the base 221 is divided into 4 substantially equal portions due to the presence of the divider 230. The bottom surface of the base 221 is provided with a plurality of triangular projections 236 arranged in substantially the same pattern as the triangular projections 115 of FIG. 29 and adapted to function in the same manner as said last mentioned projections. In other words, the bottom surfaces of a pair of trays 220 are adapted to interfit each other whenever said bottom surfaces are relatively rotated about their vertical axes to one of four possible positions 90 degrees apart and brought together in flatwise contact.

The embodiment of FIGS. 46–50 is adapted for use under conditions where it is desirable to have a container receptacle which is internally divided for the purpose of separating articles to be stored therein. Trays of this last described form are nestable, tierable, or capable of forming a receptacle in any one of four relative positions of rotation about a vertical axis through the center of a pair of aligned, superimposed trays. It will be obvious that more than two of the trays 220 may be nested in the position shown in full line in FIG. 50. The manner in which one of the like trays can be inverted and placed upon top of an upright tray 220 is illustrated in broken line in FIG. 50 as indicated at 220'; the manner in which one of the trays 220 can be tiered upon an inverted like tray is illustrated in the same figure in broken line at 220''.

FIGS. 51–53 illustrate a square tray 240 having a base 241, upwardly diverging side walls 242, and a marginal lip 243. The lip 243 is of the same form as the lips 103 or 223 and comprises upwardly angled lip portions 244, downwardly angled lip portions 245, connecting planes 246, wedge shaped corner portions 247, and corner connecting planes 248 and 249. A hollow, cross-shaped divider 250 is provided which divides the tray 240 into four, separate, equal compartments and which divides the base 241 into four equal base segments 251.

The divider 250 is preferably integral with and is formed upwardly and inwardly from the base 241 and the side walls 242. Said divider comprises upwardly converging side walls 252 connected at their upper edges by a generally horizontally disposed top wall 253. The top walls 253 intersect the side walls 242 of the tray 240 a short distance below the marginal lip 243, and each arm of the crosslike divider, indicated at 254, has an upwardly directed boxlike step portion 255 radially intermediate the center of the tray and the associated side wall 242. As shown in FIG. 53, the step portions have upwardly converging end walls 257 which connect the adjacent divider side walls 252 thereby reinforcing them against movement away from each other. The side walls 252 are similarly reinforced by relatively narrow portions 242*a* of the tray side walls 242 above the line of intersection between the top walls 253 of the divider and said side walls 242. In this manner the entire tray 240 is reinforced against bending in the middle by forces applied downwardly thereon as shown by the arrow in FIG. 52.

The bottom surface of each base segment 251 has triangular projections 256 arranged in substantially the same pattern as that shown in FIG. 29 or FIG. 47. It will be understood that by means of the base pattern of projections, two like trays 240 may be tiered with their bottom surfaces in contact as illustrated in FIG. 53 wherein an upright tray 240 is positioned upon an inverted tray shown in dotted lines at 240''. Similarly, two of the trays 240 may be placed in closed receptacle forming position with the lips 243 thereof mating as illustrated by the inverted tray 240' also illustrated in FIG. 53.

Two or more of the trays 240 can be nested together in any one of four positions rotatively 90 degrees apart with the divider 250 of each relatively lower tray interfitting the hollow divider of the tray immediately thereabove. Therefore, all of the nesting, tiering, and receptacle forming characteristics of the tray 100 of FIGS. 28 and 29 are present in trays 220 and 240 wherein internal dividers are provided.

FIGS. 54–56 illustrate a cover or partition 260 which may be used with any of the trays illustrated in the FIGS. 28, 46, 51 or 57 or which may be readily modified for use with a rectangular tray as illustrated in FIG. 39. The cover or partition 260 comprises a flat body portion 261 which is square in plan view and is provided with a marginal lip 263. The marginal lip is substantially identical with the marginal lips 103, 223 and 243 having upwardly and downwardly angled lip portions 264 and 265, connecting planes 266, wedge shaped corner portions 267, and corner connecting planes 268 and 269.

A partition 260 may be placed upon any one of the enumerated trays of FIGS. 28, 46, 51 or 57 to be used as a cover therefor and it will, of course, fit the tray in any one of four rotated positions 90 degrees apart. The partition 260 may also be placed between two of the trays in closed receptacle forming position, as between 220–220' or between 240–240', whereby the receptacle thus formed is divided into upper and lower compartments. A partition 260 may also be used as a flat base upon which articles are placed to be subsequently covered and protected by an inverted tray of the present invention placed thereupon.

The upwardly directed steps 255 of the tray 240 (FIG. 51) are coplanar with the upper edges of the side walls 242 and afford four areas of support for a partition 260 placed thereon as a cover or dividing wall of a receptacle. This particularly adapts said partition for the support of relatively heavy loads when used with a tray 240. Said steps 255 also abut the steps of a like tray when two like trays are assembled in receptacle forming position whereby to provide great strength to the receptacle in a vertical direction.

The embodiment of FIGS. 57–59 is a further extension of the divider concept of FIGS. 46–52 wherein the division of the tray, in effect, provides four identical tray compartments joined to each other. FIG. 57 shows a tray 280 made up of four tray compartments 281 joined together along two adjacent sides of each said compartment. Each compartment 281 comprises a compartment base 282 and upwardly diverging, compartment side walls 283. The tray compartments 281 are joined to each other symmetrically about the center of the tray by a cross-shaped web or horizontal wall 284. A horizontal flange 285 continuously surrounds all four compartments and extends outwardly from the upper edges of outer side walls 283. The outer edge of the flange 285, as herein illustrated, defines a square and has preferably integrally joined thereto a marginal lip 286. The lip 286 is identical with the prior marginal lips 103, 223, 243, and 263 having upwardly and downwardly angled lip portions 287 and 288, connecting planes therebetween at 289, wedge-shaped corner portions 290, and corner connecting planes 291 and 292. The bottom or outer surface of each compartment base 282 is provided with a plurality of triangular projections 293 arranged in the manner shown in FIG. 38 whereby said tray 280 will interfit in tiering position with an inverted like tray in any one of four positions rotated 90 degrees apart in the manner previously described in connection with the trays of FIGS. 28, 38, 46 and 51.

FIG. 59 shows, in dotted line, an inverted tray 280' placed in closed receptacle forming position upon a tray 280 and an inverted tray 280'' disposed in bottom-to-bot-

tom tiering position beneath a tray **280**. It will be noted that the horizontal walls **284** and the horizontal flanges **285** of the trays **280** and **280'** would abut in the receptacle forming position to provide great strength to such receptacle in a vertical direction. FIG. 59 further shows the manner in which the tray compartments **281** of one tray **280** nest within like compartments of a like tray. Since the web **280** is level with the flange **285** and substantially at the level of the marginal lip **286**, it will be readily seen that a partition **260** placed thereupon effectively closes off each tray compartment separately and is effectively supported by said web and flange. All of the features of nesting, receptacle forming and tiering discussed in connection with the tray **100** of FIGS. 28 and 29 applies equally to the previously discussed tray **280**.

FIGS. 60–62 illustrate in a semi-diagrammatic manner some various possible uses and combinations of the trays illustrated in FIGS. 28–53 and 57–59 and the partition **260** of FIGS. 54–56. Speaking of the trays generically, similar trays of varying depths may be nested as shown at A, B, and C of FIG. 60 wherein each tray is respectively shallower than the prior mentioned tray but wherein they are properly similar trays in having the same base and marginal lip mentioned. The bottom of tray B is spaced substantially above the bottom of tray A and the bottom of tray C is spaced substantially above the bottom of tray B. The result is that tray A is effectively divided internally into a plurality of compartments by the subsequent addition of the shallower trays B and C. A partition **260** effectively provides a cover for the uppermost tray C and, consequently, for the entire assembly of A, B and C. A tray D may be inverted and placed over either the partition **260**, to cover articles placed thereon, or the tray C, to act as a cover therefor.

FIG. 61 shows the manner in which a pair of relatively shallow like trays E may be placed in closed receptacle forming position to provide a relatively flat container for storing articles or the like. FIG. 62 shows a substantially deep tray F having placed thereon a tray E in receptacle forming position. In the latter instance, tray E affords a suitable cover for the substantially deeper tray F.

It will be understood that the bottom patterns illustrated in any of the FIGS. 29, 38, 39, 40, 41, 43 or 45 may be readily adapted to any of the trays to obtain the desired interfit between the bottoms of like or similar trays in the tiered position. It is anticipated that any of the patterns illustrated in connection with square trays may be readily adapted for use on the bottoms of rectangular trays, subject always to the inherent limitations of rectangular trays that they will interlock only in two relatively rotated positions 180 degrees apart instead of in four positions 90 degrees apart.

In FIG. 43 there are shown horizontal center lines **1**, **2**, **3** and **4** disposed in the plane of the tray base. Center lines **1** and **2** pass through the center or vertical axis of the base and are parallel with opposite pairs of parallel side edges of the base. Center lines **3** and **4** are diagonally disposed between respective pairs of opposed corners of the base. It will be noted that in the pattern of alternating projections and recesses, no projection or recess crosses or overlaps one of the center lines **1–4**. This is necessary where it is desired that the surfaces mate in any one of four rotated positions 90 degrees apart and it will be noted that this holds true in the embodiments of FIGS. 2, 29, 38, 43, 45, 47, 51 and 57. Where the pattern would cross or overlap one of the diagonal center lines **3** or **4**, as disclosed in the tray **130** of FIG. 40, the mating positions are limited to two rotated positions 180 degrees apart. The patterns of FIGS. 39 and 41, being adapted to rectangular trays having one dimension longer than the other, are, of course, inherently limited to two mating positions 180 degrees apart.

To summarize, the center lines **1–4** of FIG. 43 may be applied to any of the base surface patterns or marginal receptacle forming support parts of FIGS. 1–9, 28–53 and 57–59 to illustrate the principles underlying the various patterns. When a pattern portion in a defined area of a base or marginal lip can be "folded" upside down upon another pattern portion and the projections of each portion will fit into or fill the recesses or depressions of the other portion, such portions are defined in the claims as invertibly complementary. And when one of the trays is turned about its own vertical axis relative to an other tray to cause interlocking of either the lip or base patterns, it is referred to in the claims as rotated to a position. When a pattern is invertibly complementary on either side of center lines **1** and **2**, the trays will interlock in either of two rotated positions 180 degrees apart in the receptacle forming or tiering position. When a pattern is invertibly complementary on either side of center lines **1**, **2**, **3** and **4**, the trays will interlock in any of four rotated positions 90 degrees apart.

Various changes in details and arrangement of parts can be made by one skilled in the art without departing from either the spirit of this invention or the scope of the appended claims.

What is claimed is:

1. A tray comprising a bottom having the shape of a rectangle, side walls projecting upwardly from the edges of said bottom, a rectangular lip formed at the upper edge of said side walls, said lip having higher portions and lower portions arranged in a pattern around said tray and arranged to interlock with portions of a like tray when two like trays are placed lip to lip to form a closed receptacle, some of said higher portions being laterally inward and some laterally outward relative to said receptacle, each said higher and lower portion extending generally parallel to its associated side of said rectangle, from each of the corners of said rectangular lip in the same hand direction along an adjacent side there being one of said higher portions extending a predetermined length from said corner, the side parallel to each said adjacent side having a lower portion laterally opposite said one higher portion and of said predetermined length, said pattern including on opposite parallel sides of said rectangle such complementary positioning of said higher and lower portions, whereby in closed-receptacle-forming position there being two of said higher portions abutting each other at a plurality of positions along each side of said rectangle in a direction at right angles to said portions so as to positively prevent displacement of said trays in said position by a lateral push, and all parts of said tray constructed and arranged to nest with a like tray in like orientation.

2. A tray as defined in claim 1 wherein said pattern is invertibly complementary on either side of a center line through said tray parallel to opposite sides of said rectangle so that said portions interlock when one of said trays is rotated relative to another like tray about their common vertical central axis to either of two positions 180 degrees apart.

3. A tray as set forth in claim 1 wherein the coacting trays are square and wherein said patterns are invertibly complementary on either side of perpendicular center lines through said trays diagonally across the corners of said trays whereby said higher and lower lip portions interlock when one of said trays is rotated relative to the other about their common vertical central axis to any one of four positions 90 degrees apart.

4. A tray comprising a bottom having the shape of a rectangle, side walls projecting upwardly from the edge of said bottom, a lip formed at the upper edges of said side walls, said lip arranged to coact with the lip of a like tray when two like trays are placed lip to lip to form a closed receptacle, the outside surface of said bottom having projecting areas and means defining areas recessed relative to said projecting areas in a pattern arranged to interlock with like areas of a like tray when two like trays are placed bottom to bottom in stacked relation,

from each of the corners of said rectangular bottom in the same hand direction along an adjacent side there being one of said projecting areas at a predetermined distance from said corner, the side parallel to each said adjacent side having a laterally opposite recessed area complementary to said projecting area, said pattern composed of such complementary projecting and recessed areas when two like receptacles are placed bottom to bottom, in stacked relation there being pairs of said projecting and recessed areas having major portions of their edges abutting each other at a plurality of positions whereby to positively prevent displacement of said trays in said position by a lateral push in any direction, and all parts of said tray constructed and arranged to nest with a like tray in like orientation.

5. A tray as defined in claim 4 wherein said pattern is invertibly complementary on either side of a center line through said tray parallel to opposite sides of said rectangle so that said areas interlock when one of said trays is rotated relative to another like tray about their common vertical central axis to either of two positions 180 degrees apart.

6. A tray as defined in claim 4 wherein the coacting trays are square and wherein said patterns are invertibly complementary on either side of perpendicular center lines through said trays diagonally across the corners of said trays whereby said projecting and recessed areas interlock when one of said trays is rotated relative to the other about their common vertical central axis to any one of four positions 90 degrees apart.

7. A tray as defined in claim 1 wherein said higher portions are linear ribs arranged on each side of said rectangular lip along two lines parallel to said associated side, and said higher portions being alternately on the inner and outer of said two lines respectively progressively along said side.

8. A tray as defined in claim 1 wherein said higher and lower portions of said lip comprise angled lip portions inclined away from the upper edges of said side walls and generally aligned along each side of said lip, said lip portions alternately angled upwardly and downwardly progressively along a given lip side and said lip portions of the same length measured along a side of said rectangle with adjacent of said lip portions being joined by connecting lip portions, said upwardly angled lip portions of one tray snugly fitting against said downwardly angled lip portions of a like tray when two like trays are placed lip to lip to form a closed receptacle in which position said interfitting lip portions and connecting lip portions shed water falling upon said receptacle, and said upwardly and downwardly angled lip portions of one tray lying parallel to like parts of another like tray when two like trays are nested.

9. A tray as defined in claim 1 in combination with a shallower auxiliary tray having side walls of less depth than the walls of said first named tray and having lip portions adapted to interlock with the lip portions of said first named tray in lip to lip relation whereby said shallower tray forms a cover for said tray, and the lip portions of said shallower tray adapted to nest with lip portions of said first named tray whereby in said nested position said shallower tray forms a generally horizontal partition in said first named tray.

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