March 28, 1967 J. R. PUENTE 3,311,257

STACKABLE TOTE BOX

Filed Nov. 29, 1963 2 Sheets-Sheet 1

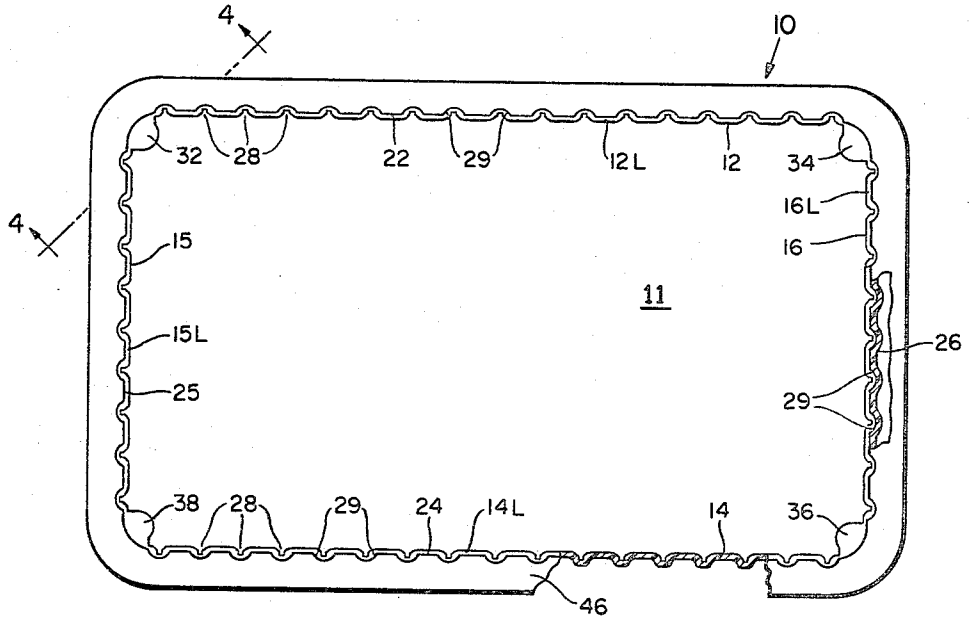


FIG. 1

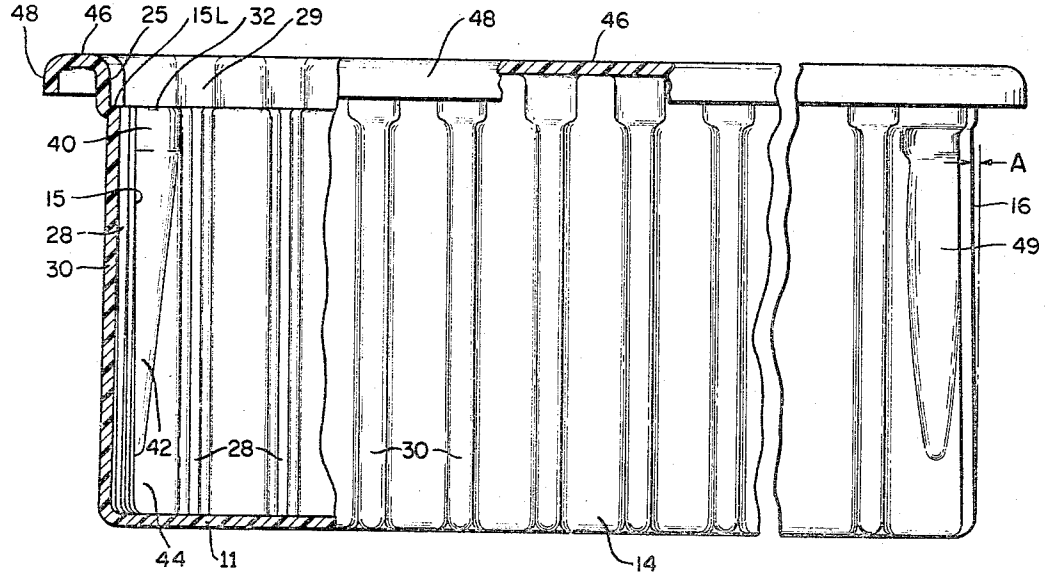


FIG. 2

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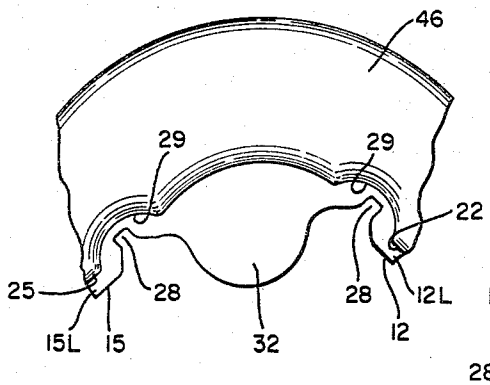


FIG. 3

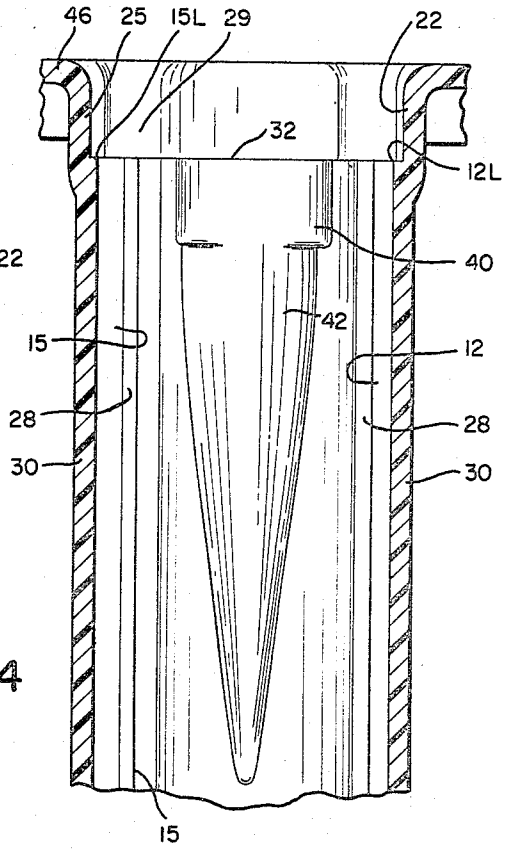


FIG. 4

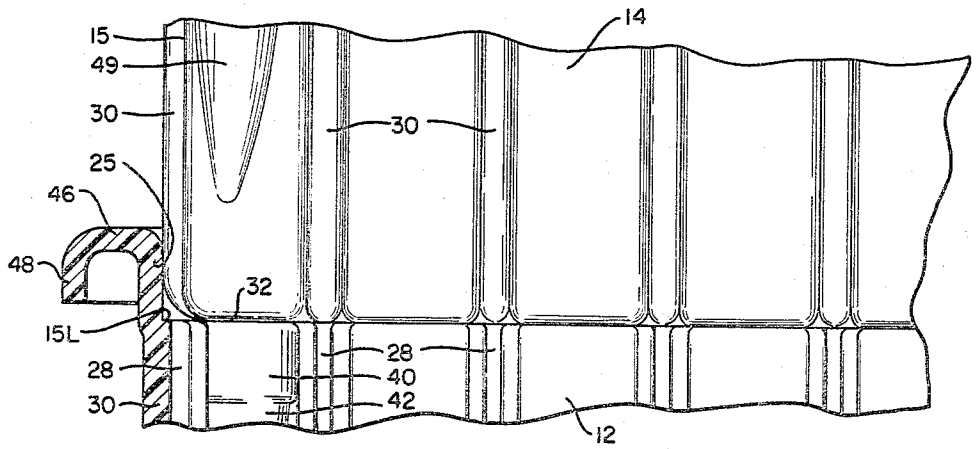


FIG. 5

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STACKABLE TOTE BOX

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4 Claims. (Cl. 220—97)

This invention relates to a box. More particularly, the invention relates to a stackable tote box.

In many industries, it is a common practice to store parts and small articles in boxes that can be carried easily by a single worker, whether empty or loaded, and that can be stacked, one on top of the other, for storage in a minimum space. In many cases, such boxes are often loaded, stacked on pallets, and moved about an industrial establishment, from place to place, loaded on pallets that can be handled conveniently by a fork lift truck.

Such tote boxes, while seemingly simple in structure, must meet rigid specifications in order to be satisfactory for their intended purposes. Such a box must be light in weight, but must have sufficient strength, when at the bottom of a stack of loaded boxes, to support the weight of the entire stack.

One object of the present invention is to provide a practical tote box that is light in weight but that is unusually sturdy.

Another object of the invention is to provide a new and improved tote box that can be stacked with other tote boxes of similar construction and that has unusual strength characteristics to permit stacks to be made several tote boxes high, without the danger of collapse caused by strength failure of the lowermost box.

A related object of the invention is to provide a new and improved stackable tote box that forms exceptionally stable stacks that resist sidewise movement of one box relative to another.

A further object of the invention is to provide a new and improved tote box structure that will provide unusually stable seating of one tote box within another on which it rests.

Still another object of the invention is to provide a new and improved tote box that is easily cleaned, that is resistant to wear, corrosion, and breakage, and that requires very little maintenance.

Another object of the invention is to provide an improved tote box that has improved structural features that increase its strength and resistance to breakage, and that are so designed as to facilitate and make more convenient the manual handling of the box.

Still another object of the invention is to provide an improved construction for a stackable tote box that can be fabricated by mass production, vacuum molding techniques, from a variety of synthetic plastic materials.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims. To these and other ends, the invention resides in certain new structural features for a tote box, all as will hereinafter be more fully described, the novel features being pointed out in the claims at the end of this specification.

In the drawings:

FIG. 1 is a top plan view, partly broken away to show two different portions of the wall structure in section, of a tote box that is constructed in accordance with a preferred embodiment of this invention;

FIG. 2 is a fragmentary view thereof, on an enlarged scale, partly in vertical section and partly in side elevation, the side elevation being partly broken away;

FIG. 3 is a fragmentary top plan view, on an enlarged scale, of one corner of the box;

FIG. 4 is a fragmentary section, on an enlarged scale, taken on the line 4—4 of FIG. 1, looking in the direction of the arrows, and

FIG. 5 is a fragmentary view, on an enlarged scale, partly in section and partly in side elevation, showing the bottom of one box that is stacked on and engaged in another, similar box, like numerals being used to refer to like parts of the two boxes.

Referring now in detail to the drawings by numerals of reference, the numeral **10** denotes generally a tote box that is constructed in accordance with a preferred embodiment of this invention. This box is formed, preferably by vacuum forming techniques, from a suitable synthetic plastic material such as for example, one of the styrene blends such as an acrylonitrile-butadiene-styrene copolymer, a polyolefin such as polyethylene, and the like.

The box is formed to have an integral, unitary body including a bottom **11**, a pair of side walls **12** and **14**, and a pair of end walls **15** and **16**. The side walls and end walls are substantially identical in structure except that the side walls, in the preferred embodiment of the tote box that is illustrated in the drawings, are longer than the end walls.

Each of the walls of the box is laterally and outwardly offset, adjacent its upper end, at a predetermined distance from the bottom of the box, to provide a generally horizontal ledge, that is identified in the drawings by the numerals **12L**, **14L**, **15L**, and **16L**, respectively, and outwardly enlarged wall portions that are referred to in the drawings respectively by the numerals **22**, **24**, **25** and **26**.

Each of the walls is formed in its internal surface with a series of generally upright, uniformly-spaced, generally funnel-shaped grooves **28** that are continued above the respective ledge portions of each wall as curved grooves **29**. Each of the walls is also formed in its external surface with a series of generally upright ribs or ridges **30**, opposite the grooves. The grooves in confronting wall surfaces confront each other to permit the insertion of panels therein (not shown) to permit the subdivision of a box into a plurality of separate compartments.

Because the walls are grooved, portions of the ledge on the respective walls, **12L**, **14L**, **15L**, and **16L** respectively, are discontinuous and, in effect, the ledge is made up of a plurality of short portions, each of which has a relatively small area, but the total area of which is substantial.

The box is formed in each of its four corners with shoulders **32**, **34**, **36**, and **38** respectively. The surfaces of these shoulders are disposed at the same elevation as the ledge surfaces. The structures of each of these four shoulders are substantialy identical, and a typical shoulder structure will be described by describing the structure of the shoulder **32**.

The portion of the box body that forms the horizontally-extending shoulder **32** is integral with a generally cylindrical collar **40** that has a generally upright axis, and whose wall is integral with the portions of the two box walls that are curved toward each other as they approach the corner of the box. The collar **40** is gradually and smoothly reduced, at its lower end, and is united with a supporting web portion **42** that is shaped generally like a part of a cone and that is smoothly joined to the walls of the box adjacent the corner of the box, where the box walls are curved toward each other. From the lower extremity of the web portion **42**, to the bottom **11** of the box, the adjacent walls of the box meet in a smoothly curved corner portion that is generally indicated in FIG. 2 by the numeral **44**.

The box is also formed with a continuous peripheral lip **46** that projects outwardly of the box about the upper ends of the side and end walls respectively. A flange **48** is

disposed to depend downwardly from the outer peripheral edge of the lip **46** and to extend continuously around the box.

Tote boxes that are constructed in accordance with the present invention may be made by thermoforming techniques, and preferably, by vacuum forming techniques. Vacuum forming usually involves heating a sheet of thermoplastic material until it can be shaped easily, and then forming it with a contoured mold member or members, to have the desired shape. Because of the inherent characteristics of this technique, the thickness of the box is usually not uniform, necessarily, throughout; and where the box is contoured so that a part of the box body projects inwardly, such as the web portion **42**, the outer surface of the box body is recessed, as is designated generally by the numeral **49** in FIGS. 2 and 5.

The outwardly enlarged portions of the side and end walls, at the upper part of the box, are proportioned to receive therein the lower end of a superjacent box of similar construction, as is shown in FIG. 5. The lower end of the superjacent box is formed so that portions of the bottom surface of this box engage on the ledge portions and on the shoulders of the lower box. Because a wide area of support is provided in this manner, about the entire perimeter of the lower box, the stacked boxes are very stable. Moreover, the load distribution on the lower box is very uniform, to take greatest advantage of the material that is available to form the body of the box.

The lip and flange, that extend about the perimeter of the box at its upper end, actually take a substantial part of the load on each box, and rigidify and strengthen the box. Much of the static load on a box, from a loaded box or boxes above it in a stack, is transmitted directly through its walls, and particularly through its external ridges, to a box or other support below it, so that the bottom of a box need carry only the load in that box.

While the walls of the box may be generally upright, several of the synthetic plastic sheet materials that are now available for thermoforming are higher in compression strength than in tensile strength. To take advantage of this characteristic of these materials, I often prefer, particularly when using such materials, to form the walls of the box with a negative draft. The use of a negative draft is illustrated, on an exaggerated scale, in FIG. 2 of the drawing, where the angle A is shown between the vertical and the end wall **16** of the box. The negative draft may amount to as little as one degree or may be greater. When the walls are formed with a negative draft by a thermoforming technique involving the use of a male mold member, compressed air may be employed to assist in the removal of the box from the mold member.

When one box is stacked upon another, the external ribs **30** of the upper box engage in the rounded, upright recesses **29** in the lower box. This contributes to the stability of a stack and also facilitates the proper seating of one box within another.

While I have shown the web portions **42**, that support the shoulders respectively, as being formed to serve somewhat like brackets, other supporting means for the shoulders can be used. For example, each shoulder could form the closed upper end of a generally semi-cylindrical member, extending from the bottom of the box up to the shoulder.

While the invention has been disclosed herein by reference to the details of a preferred embodiment thereof, therefore, it is to be understood that such disclosure is intended in an illustrative, rather than in a limiting sense, and it is contemplated that various modifications in the construction and arrangement of the parts will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

I claim:

1. In a stackable, open-top tote box formed of a synthetic plastic material and having a bottom, generally vertical side and end walls that are united to each other and to said bottom, and a continuous peripheral lip projecting outwardly of said box about its top edge, the improvement comprising: said side and end walls being laterally and outwardly offset near said top edge to form a generally horizontal, planar ledge for supporting a superjacent box; said side and end walls being formed to provide an inwardly projecting shoulder at each corner of said box, each of said shoulders being in the plane of said ledge to provide additional support for the said superjacent box; and said side and end walls being formed to provide a series of upright internal grooves and corresponding external ridges extending from top to bottom of said walls, the portions of said internal grooves extending above said ledge being adapted to receive the lower portions of external ridges of said superjacent box.

2. The tote box of claim **1** wherein said side and end walls have a negative draft.

3. An integrally formed container adapted to slidably receive vertically disposed compartment dividers, and stackable with other like containers, comprising:

a substantially rectangular, horizontally disposed bottom wall;

parallel side walls joined to and extending upward from said bottom wall;

parallel end walls joined to and extending upward from said bottom wall, and joined to said side walls;

the upper extremities of said side and end walls being stepped horizontally outwardly by at least the wall thickness to provide an inner shelf extending around the circumference of said container and adapted to stackably support a superimposed identical container, said side and end walls continuing vertically upwardly above said shelf and then extending horizontally outwardly and curving downwardly to form a hand grip around the circumference of said container;

said side and end walls being of substantially uniform thickness throughout, and at least one of said wall pairs having a plurality of pairs of vertical grooves being adapted to removably receive a divider, the exterior wall surfaces of said one wall pair having vertical ridges formed thereon corresponding to said grooves;

and the portions of said one wall pair extending above said shelf also having grooves formed in the interior wall surfaces thereof, aligned with respective ones of said first-named grooves, and adapted to receive said ridges of a stackably superimposed identical container.

4. A container as claimed in claim **3** wherein said grooves above said shelf are substantially wider, measured along the length of said shelf, than said grooves extending below said shelf.

References Cited by the Examiner

UNITED STATES PATENTS

D. 197,584	2/1964	Nascher	220—97
2,889,072	6/1959	Lapham	220—97
2,960,134	11/1960	Formas	220—97
3,172,562	3/1965	Nascher et al.	220—97

FOREIGN PATENTS

1,255,160	1/1961	France.
349,922	12/1960	Switzerland.

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