STACKABLE, NESTABLE, INTERLOCKING CONTAINER

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This invention relates to stacking and nesting containers. More particularly, the invention relates to a stackable, nestable container of substantially uniform thickness throughout which can be integrally formed from a single piece of sheet material as well as being fabricated by injection molding techniques and the like. While the present invention specifically contemplates the use of plastic material such as polyethylene, polypropylene, polystyrene, and acrylonitrile-butadiene-styrene copolymers, its application is nevertheless not to be thus limited.

Specifically, the present invention is directed to a stackable and nestable container having a length approximately equal to twice its width and having upwardly and outwardly sloping side and end walls, said side and end walls and bottom wall having a unique configuration to be described more fully hereinafter so that identical containers may not only be nested and conventionally stacked but also may be interlocked together in a multitude of stacked arrangements to form very stable stacked configurations.

It has become necessary to transport fruits and vegetables distances quite removed from whence they are grown and harvested. In order to reduce the amount of physical damage suffered by such produce, particularly the more fragile produce such as tomatoes, it is generally necessary to transport the produce in containers having a capacity of about a bushel or two or more or less.

The shipping boxes generally employed, however, suffer from one or more serious shortcomings. Those made of insubstantial material such as cardboard cannot be stacked to a sufficient height and are difficult to clean. Wood and metal construction materials do permit stacking but they not only add to the weight of such containers but also increase their cost.

In the interest of space economy, substantially full containers are stacked one upon another during transportation and nested together when empty for their return to the harvesting area. Such containers which are capable of stacking and nesting the currently available. These containers, however, are stacked one upon another with each stack being a separate entity within itself. When such containers are stacked to a height of say three or more containers, the stacks are quite unstable and during transportation rock and vibrate frequently topple, or at least subject the contents thereof to a constant rocking motion which has an adverse affect on the content, particularly if the contents are so-called soft fruits and vegetables such as tomatoes. The present shipping container is particularly suitable for construction from lightweight, low-cost materials, i.e., heat formable plastics. The instant container has a unitary integral construction not possible with wood materials and very costly with metallic materials. Most importantly, however, the present container not only permits conventional stacking and nesting but allows containers to be "interlocked" or cross stacked with identical containers thereby producing very stable unitary stacks of containers. This cross-stacking feature, not obtainable with conventional containers, is particularly suitable for containers used for shipping soft fruits and vegetables since stacks of such containers are significantly more stable, i.e., the respective containers and stacks do not weave and rock due to motion of the truck, box car or the like. It will be appreciated that there is likewise no lateral or forward shifting of superimposed containers of the present invention since each container and stack, in effect, is interlocked via cross stacking with other containers and stacks. It will also be appreciated that when separate stacks of the instant container are so "interlocked" the stack so formed is a stable unitary stack itself. Another important feature of the present container is that stable stacks can be formed from any number of containers and the stacking arrangement can be adapted to fit any particular floor or pallet space. That is, the containers can be stacked in a long single stack as in a brick-on-brick pattern or may be stacked in a square pattern or may be stacked in a rectangular pattern.

It is therefore a primary object of the present invention to provide a nestable and stackable container having a unitary construction. It is another object of the present invention to provide a nestable and cross-stackable container especially suitable for shipping produce. It is still another object to provide a nestable and cross-stackable container which is capable of facile manufacture and economical production by mass production methods from plastic materials.

These and other objects will become apparent to one skilled in the art from the following disclosure and drawings.

The invention is described in greater detail and the best mode presently contemplated of carrying out the present invention is illustrated in the attached drawings wherein:

FIGURE 1 is a perspective view of the container;
FIGURE 2 is a plan view of the container;
FIGURE 3 is a side view of two containers in normal nesting position;
FIGURE 4 is a side view of two containers in the usual or customary stacked position;
FIGURE 5 is an end view of several containers in one cross-stacked position;
FIGURE 6 is a partial cross-sectional view of stacked containers of FIGURE 5 taken on the line 6—6 thereof;
FIGURE 7 is a side view of several containers in an alternate cross-stacked position;
FIGURE 8 is a partial cross-sectional view of stacked containers of FIGURE 7 taken on the line 8—8 thereof;
FIGURE 9 is side view of several containers in a preferred three-container tier arrangement;
FIGURE 10 is a side view of a container in partial cross-section of a preferred container configuration;
FIGURE 11 is a cross-sectional view of the container of FIGURE 10 taken on line 11—11 thereof;
FIGURE 12 is a cross-sectional view of the container of FIGURE 10 taken on line 12—12 thereof;
FIGURE 13 is an end view in partial cross-section of two containers of FIGURE 10 stacked position;
FIGURE 14 is an end view of a modified end wall; and
FIGURE 15 is a cross-sectional view on line 15—15 of FIGURE 14.

Referring now to FIGURES 1 to 8 of the drawings, the nestable and cross-stackable container A of FIGURES 1 and 2, containers A and B of FIGURES 3 and 4, and containers A, B, C, D and E of FIGURES 5, 6, 7 and 8 are all identical. Since all containers are identical, like parts are identified throughout by like referenced numerals, therefore, in the following description reference will be made to one of the containers A, B, C, etc., only whenever a cooperative relationship of two or more containers are involved in the description.

Referring more particularly to FIGURES 1 and 2 of the drawing, an integrally formed open top rectangular container A having an over-all length approximately twice the over-all width measured at the widest portions thereof including the head, and formed from a single sheet of plastic, metal or the like comprises a bottom or bottom wall 10 integrally connected to upwardly diverging side
walls 11 and 12, and upwardly diverging end walls 13 and 14. For convenience, end wall 13 may be designated as front wall 13 and end wall 14 may be designated as rear wall 14, although it will be appreciated that the respective end walls may be reversed without altering the utility or structure of the present container. Midway between end walls 13 and 14 and transversely to the longitudinal axis of the container, bottom wall 10 is upwardly indented or deformed to form an inverted trough 15 having a front wall 15a and rear wall 15b. Said trough 15 midway between side walls 11 and 12 is downwardly indented or deformed to form trough or notch 16. End wall 14 is inwardly deformed or indented to form an upwardly tapered post 17 having side walls 18 and 19 and a flat inner wall 20 which is displaced inwardly of the container relative to the main portion of the end wall 14 but substantially parallel thereto. Inwardly tapered side walls 18 and 19 and inner wall 20 rise upwardly from bottom 10 to an elevation somewhat below head 40 terminating in a shelf or ledge 21 which is parallel to bottom 10. Head 40 is continuous and extends around the entire upper edge of the side and end walls of the container providing reinforcement and handle means.

In the center of end walls 13 and 14 at their upper extremity thereof in bead 40 are notches 22 and 23, respectively, each having a width of approximately the width of groove 16 measured transversely of the container and having a depth approximately equal to groove 16.

Side wall 11 at its upper extremity thereof in bead 40 contains notch 26 located approximately one-quarter the total length of side wall 11 from end wall 13. Another notch 27 is similarly located in side wall 11 one-quarter the distance along side wall 11 from end wall 14. Side wall 12 contains corresponding notches 24 and 25. Notches 22, 23, 24, 25, 26 and 27 are identical, i.e., they have the same width and depth, which as noted hereinbefore is the same as groove or notch 16 located in bottom groove 15. It will be appreciated that the distance between notches 24 and 25 and between notches 26 and 27 on their centers is essentially approximately equal to the total width of a container.

Adjacent end or rear wall 14, side walls 11 and 12 are outwardly deformed to form upwardly diverging troughs 28 and 29, respectively. The bottom wall portions of troughs 28 and 29 are designated as 28a and 29a, respectively. Immediately adjacent troughs 28 and 29 and forwardly thereto, side walls 11 and 12 at their upper extremity are stepped horizontally outward a short distance and then upward a short distance connecting with bead 40 to provide shoulders, ledges or shelves 30 and 31 in side walls 11 and 12, respectively. Shelves 30 and 31 extend forwardly from troughs 28 and 29 to a point which is short of the trough 15 measured vertically from trough side wall 15b. Adjacent to end or front wall 13, side walls 11 and 12 are stepped horizontally outward a short distance and then upward a short distance connecting with bead 40 to provide shoulders, ledges or shelves 32 and 33 in side walls 11 and 12, respectively.

Immediately adjacent shelves 32 and 33, side walls 11 and 12 are outwardly deformed to form upwardly diverging troughs 34 and 35 inside walls 11 and 12, respectively. The bottom wall portions of troughs 34 and 35 are designated 34a and 35a, respectively. The total width of trough 34 and shelf 34b or of trough 35 and shelf 33b measured along side walls 11 and 12, respectively, is less than the distance from the respective end wall to a point on each side wall vertically above trough side wall 15b. It is therefore obvious that each side wall has a trough and an adjacent shelf in the side wall thereof on either side of trough 15.

It will be appreciated that the side walls 11 and 12 and end walls 13 and 14 are adapted to receive the corresponding walls of a superimposed identical container in nesting relationship as shown in FIGURE 3.

When the upper container is to be stacked in the conventional manner rather than nested, it is turned in end-for-end relationship as shown in FIGURE 4. The shelves or shoulders of an underneath container stackably support bottom edge portions of a superimposed container. Specifically, the bottom wall portions 41, 28a, 29a, 34a, and 35a of superimposed container A are stackably supported by tier 31 of which shelves 31, 32, 33, 31 and 30, respectively, of underneath container B. This five-point support provides excellent stability even when containers are stacked to a height of six or more.

While the instant container can be conveniently nested or conventionally stacked in superimposed fashion, the significant utility of the present container lies in its ability to be cross-stacked, and in effect, "interlocked" with identical containers in a multitude of arrangements to provide an even more stable stack. This stable stack as noted hereinbefore offers significant advantages to shippers of soft produce both during transportation via truck, box car or the like or during handling on pallets on storing, loading or unloading.

A simple cross-stacking arrangement is illustrated in FIGURES 5 and 6 wherein two containers A and B are positioned side-by-side longitudinally so that the heel or head 40 of an inferior container is in contact with or about its length with head 40 of a superior container. Container C as well as container D (not shown) are positioned side-by-side in like arrangement as containers A and B but with their longitudinal axes perpendicular or transverse to the longitudinal axes of containers A and B. In other words, the second or uppermost tier of containers C and D are inclined 90° relative to the first or lower tier of containers. Thus, when such containers are stacked several tiers high, the longitudinal axes of respective containers are parallel in alternate tiers.

Referring more particularly to FIGURE 5 wherein container C is cross-stacked with and on top of containers A and B, it will be seen that the portion of bottom wall 10 of container C adjoining end wall 14 is supported by 42 sets upon shelf 32 of container B. That portion of bottom wall 10 adjoining the forward side wall 15a of container C is supported by 43 engages and sets upon shelf 33 of container B. In a like manner, that portion of bottom wall 10 adjoining the rearward side wall 15b of container C is supported by 44 engages and is supported by shelf 25 of container A and that portion of bottom wall 16 of container A adjoining end wall 13 thereof and supported by 45 engages and supported by shelf 30. It will be noted that groove 15 of container C having a width of approximately twice the width of bead 40 engages the side wall beads of containers A and B thereby locking them together and preventing their separation. In this manner a superimposed container C is substantially supported at four optimum points, i.e., at the ends and middle thereof, and interlocked with two underneath containers A and B.

Referring to FIGURE 6 it will be seen that superimposed containers stacked as shown in FIGURE 5 are interlocked by still another means. Thus, notch 16 of groove 15 of superimposed container C engages notch 25 of container A. It will be noted that at the same time notch 16 of groove 15 of container A also engages, i.e., sets into, notch 24 of container B (not herein shown). It is readily apparent to one skilled in the art that notch 16 of each and every container in every tier above the bottom tier engages at least one and most instances two or more notches 23, 24, 25, 26 and 27 depending, of course, upon the particular stacking order and arrangement. It will be appreciated that any one of containers A, B, or C can be rotated 180° (end-for-end) without disturbing the support or interlocking features of the present container.

Still another advantageous cross-stacking arrangement is illustrated in FIGURES 7 and 8 wherein in containers C, D and E are cross-stacked upon contain-
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Thus, the underneath bottom wall portion 35a of container D is supported by shelf 32 of container A; underneath bottom wall portion 39a of container D is supported by shelf 30 of container B; underneath bottom wall portion 34a of container D (not shown in FIGURES 7 and 8); underneath bottom wall portion 28a of container D (not shown in FIGURES 7 and 8) is supported by shelf 31 of container B (not shown in FIGURES 7 and 8); and the bottom or underneath portion of groove 15 of container D rests upon and is supported by the upper portion of bead 40 of containers A and B.

It is seen that superimposed containers are interlocked via groove 15. Referring to FIGURE 8, it will be further seen that superimposed containers stacked as shown in FIGURE 7 are interconnected by still another means. Note that each of the grooves 16 of superimposed container D engages notch 22 of container A and notch 21 of container B (not shown). It is readily apparent to one skilled in the art that each of the grooves 16 of each and every superimposed container engages the end wall notches 21 and 22 of two adjacent abutting containers. Of course, when a combination of cross-stacking as shown in FIGURE 5 and stacking brick-on-brick as shown in FIGURE 7, notch 16 may additionally engage one or two side wall notches 24, 25, 26 and 27.

Containers C and E are shown in brick-on-brick stacking. It will be appreciated by one skilled in the art that containers C and/or E may be rotated 90° to cross-stack with a second vertical stack located behind the stack illustrated in FIGURE 7. It will be further appreciated that containers A, B, and D may be reversed end-to-end with or without prejudice to the stacking stability and configuration.

It has been found that a particularly suitable stacking arrangement utilizing the instant containers is one wherein three containers are employed per tier. Such an arrangement is illustrated in FIGURE 9 wherein containers B and C (not shown) are placed adjacent to and at right angles to container A. Thus, the first or lowermost tier occupies an area of approximately one container in width and one and one-half container lengths in length, or an area of three containers. The second tier comprises three containers D, E and F (not shown, but parallel to D). Container D is positioned so that the longitudinal axis is parallel to the longitudinal axis of lower container B and perpendicular or transverse to the longitudinal axis of lower container B. Container E is also positioned so that the longitudinal axis is perpendicular or transverse to the longitudinal axis of lower container B and C (not shown).

It will be appreciated that the longitudinal axis of container E will be parallel to the longitudinal axis of container D and transverse to the longitudinal axis of container A. A third tier or layer would be identical to the first or bottom layer and a fourth tier would be of identical configuration as the second tier. In other words, alternate layers or tiers would be identical.

Referring more particularly to FIGURE 9, container D cross-stacks and interlocks with and upon containers A and B. In such a stacking arrangement it will be seen that end bottom wall portion 41 of container D engages shelf or shoulder 32 of transverse container A and bottom wall portion 44 of container D engages shelf or shoulder 33 of container B. In a like manner bottom wall portion 43 of container D engages end wall post shelf 21 of container B and bottom wall portion 29a of container D sets upon or

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provided with one or more inwardly projecting reinforcing grooves 50. Although grooves 50 are shown as inward indentations of end wall 13, outward indentations are also suitable.

I claim as my invention:

1. An integrally formed open-top rectangular cross-stacking and nesting container having a length approximately twice the width thereof comprising a bottom wall, upwardly and outwardly diverging side and end walls connecting with said bottom wall, said side and end walls terminating at their upper extremity in a continuous circumferential bead, one end wall being inwardly deformed to form an upwardly tapered post terminating in an inner shelf parallel to the bottom wall near the upper extremity of said one end wall and adapted to stackably support bottom wall portions of a superimposed identical container, said one end wall and other end wall each having bottom wall portions of a superimposed identical continuous bead thereof, said side walls at their upper extremity having notches in the bead approximately one-quarter the total length of said side wall in from the respective end walls, said side walls adjacent one end wall being outwardly deformed to form upwardly diverging troughs, immediately adjacent said troughs said side walls at their upper extremity being stepped horizontally outward and upward a short distance to provide an inner shelf to stackably support a superimposed identical container, said side walls adjacent the other end wall being stepped horizontally outward and upward a short distance to provide supporting inner shelves, immediately adjacent said inner shelves said side walls being outwardly deformed to form upwardly diverging troughs, said bottom wall in the middle thereof and transversely of the container being upwardly indented to form an inverted bottom trough midway between the container side walls being downwardly indented to form a notch adapted to engage preselected side and end wall notches when identical containers are superimposed in a cross-stacking arrangement.

2. An integrally formed open-top rectangular cross-stacking and nesting container having a length approximately twice the width thereof comprising a bottom wall, upwardly and outwardly diverging side and end walls connecting with said bottom wall, said side and end walls terminating at their upper extremity in a continuous circumferential bead, one end wall being inwardly deformed to form an upwardly tapered post terminating in an inner outwardly and downwardly sloping shelf near the upper extremity of said one end wall and adapted to stackably support bottom wall portions of a superimposed identical container, said one end wall and other end wall each having a notch in the center of their upper extremity in the continuous bead thereof, said side walls at their upper extremity having notches in the bead approximately one-quarter the total length of said side walls from the respective end walls, said side walls adjacent one end wall outwardly deformed to form upwardly diverging troughs, immediately adjacent said troughs said side walls at their upper extremity being stepped downwardly and outwardly a short distance and then vertically upward a short distance to provide a sloping inner shelf to stackably engage and support a superimposed identical container, said side walls adjacent the other end wall being stepped downwardly and outwardly a short distance then vertically upward a short distance to provide similar supporting sloping inner shelves, immediately adjacent said inner shelves said side walls being outwardly deformed to form upwardly diverging troughs, said bottom wall in the middle thereof and transversely of the container being upwardly indented to form an inverted bottom trough, said inverted bottom trough midway between the container side walls being downwardly indented to form a notch adapted to engage preselected side and end wall notches when identical containers are superimposed in a cross-stacking arrangement.

3. A container as in claim 2 wherein the other end wall contains at least one reinforcing groove.

4. A container as defined in claim 2 which is integrally formed of plastic material having a substantially uniform thickness throughout.

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