United States Patent

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[54] **CONTAINER DIVIDERS HAVING IMPROVED STACKING STRENGTH**
2 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **206/65,** 229/15; 217/30
[51] **Int. Cl.** **B65d 1/36,** B65d 5/48, B65d 81/05, B65d 85/00
[50] **Field of Search** 217/36, 31, 22; 220/22; 229/42; 206/65; 229/15, 14, 29-E; 52/664, 668

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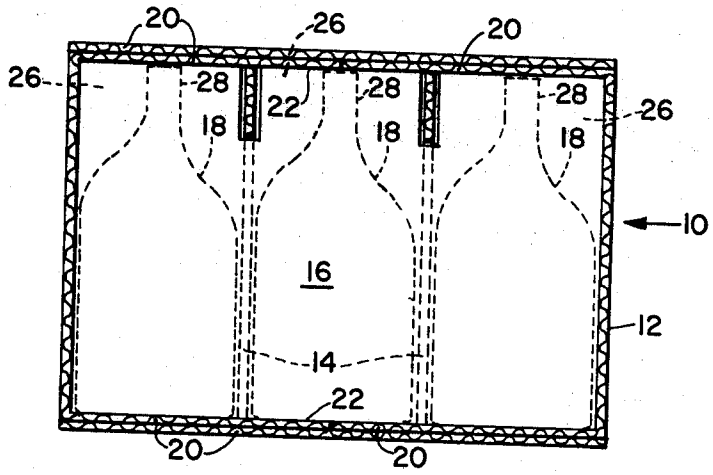
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ABSTRACT: A technique for improving the stacking strength of divider-equipped containers without incurring any additional materials cost. Such improvement is realized by dimensioning the slot lengths of interlocking sheet dividers so that slots opening at the lower side of the dividers are substantially longer than those opening at the upper side.



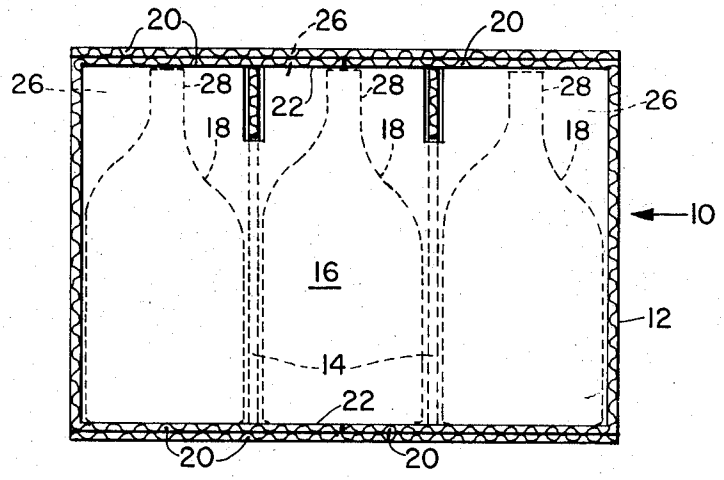


Fig. 1

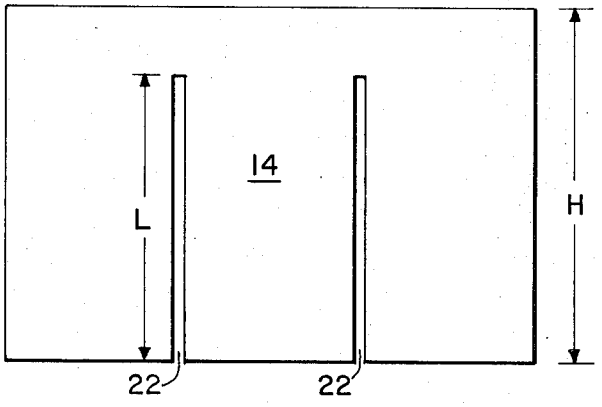


Fig. 2

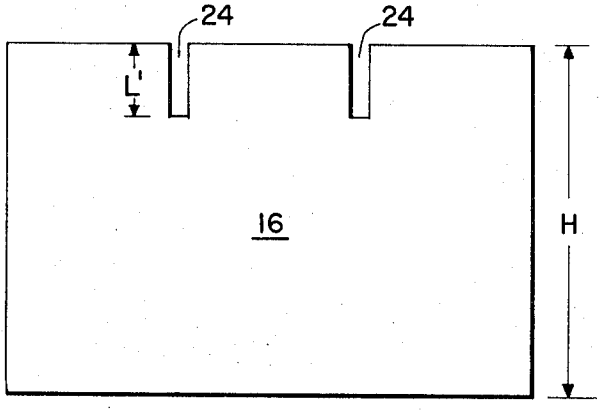


Fig. 3

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CONTAINER DIVIDERS HAVING IMPROVED STACKING STRENGTH

BACKGROUND OF THE INVENTION

In the art of packaging, vertical interlocking dividers are conventionally employed. These slotted partitions are assembled in an orthogonal system to form cellular compartments in which plastic bottles, or a multiplicity of like articles, can be shipped. Such an arrangement provides two primary advantages. The individualized compartments prevent the packaged articles from coming into contact with and damaging one another. Secondly, the vertical dividers provide a certain amount of stacking support to the containers.

To establish the interlocking feature, the slots of the intersecting dividers are oppositely disposed. At each junction, the slot of one opens upwardly while that of the other opens downwardly. Generally these slots are of equal length (i.e. about half the inside height of the container). Therefore the slot length ratio (the ratio of the length of the downwardly opening slots to the length of the upwardly opening slots) is 1:1. The total length of the aligned slots is equal to the height of the dividers.

It has been found that conventionally formed dividers usually fail to increase the container stacking strength to the full extent to be expected in view of the edgewise compressive strength of the dividers. This shortcoming is due to the fact that the sections of the dividers intermediate the upwardly opening slots frequently are held in a deflected condition following the loading of the objects into the container compartments. At high speed production rates it is virtually impossible to avoid conditions which are responsible for such deflection.

Presently, if the stacking strength of even a portion of the packed containers is insufficient, the packaging components are redesigned. The walls of the container, the dividers, or the packaged objects themselves are changed to construct them of stronger, usually more expensive, materials. However, since the added cost does not reflect an improvement to the product packaged in the container, but only serves to help prevent damage thereto, it represents a cost which, if possible, should be eliminated. Desirably, package cost should be minimized to an extend consistent with the provision of adequate protection. Such protection is of paramount import in connection with the packaging of plastic bottles or similar like articles in which the wall thicknesses are reduced, insofar as is possible, to reduce the quantity of expensive material from which these are constructed. Any container failure during shipping subjects such articles to the possibility of stress cracking or irreparable indenture, either of which is a serious quality defect.

Also, if a package has a stacking strength greater than that required, the substitution of less expensive materials should be attempted if this can be accomplished without jeopardy to the article. This cannot be done, however, unless the stacking strength is consistently at least as great as that required for adequate protection of the articles.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide additional flexibility in the design of package dividers whereby the same materials may provide an improved and consistent stacking strength.

It is yet another object of this invention to increase the case strength and article protection offered by interlocked, slotted, package dividers by designed variation of the slotting ratios thereof.

SUMMARY OF THE INVENTION

Briefly stated, in accordance with one aspect of this invention, an improved divider is provided for use in a container for packaging a multiplicity of articles of similar configuration. These articles are separated one from the other by means of vertically extended partitions which comprise said divider. The individual partitions are assembled in an orthogonal system to form cellular compartments within which said articles are received. The slots in the intersecting partitions are in alignment, with those of one partition opening downwardly and telescoped over an unslotted portion of the other partition. The slot of the other partition opens upwardly and is telescoped over an unslotted portion of the first partition. These dividers have a uniform height along substantially their full length which is sufficient to impart stacking strength to said container and the combined length of the aligned slots is substantially equal to the height of the partitions. The lowermost portions of the articles to be separated by the divider are configured so as to retain the lowermost portion of said partitions in place while the uppermost portions of the articles are of reduced size. The improvement of this divider comprises slotting the partitions in such a way so as to improve the stacking strength of the packed containers by making the lengths of the downwardly opening slots on said partitions substantially greater than the lengths of the aligned upwardly opening slots.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the following description taken in connection with the accompanying drawing in which:

FIG. 1 is a vertical sectional view of a packed container showing assembled within the container the interlocking, vertical partitions and their respective slots;

FIG. 2 is an elevational view of an interlocking divider member having elongated downwardly opening slots; and

FIG. 3 is an elevational view of an interlocking divider member having shortened upwardly opening slots.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention will be described herein with relation to packaging plastic bottles or the like. It will be evident, however, that the improved divider arrangement may be used in a container for packaging of any of a number of similar articles, the lower portions of which are configured so as to restrain the lowermost portions of the vertical partitions from lateral movement.

Referring now to FIG. 1 of the drawings, there is shown in vertical cross section a packed container, generally indicated by reference numeral 10, employing the present invention. The packed container 10 comprises an outer container 12, dividers 14, extending parallel to one pair of sidewalls of the container, dividers 16 interlocked with and oriented perpendicularly to dividers 14 and extending parallel to the other pairs of sidewalls of the container, and plastic bottles 18 received within the cells formed by dividers 14 and 16. In the illustrated embodiment the bottles 18 are packed nine to the container, three bottles 18 per row by three rows long and therefore two each of dividers 14 and 16 are required. If larger quantities of bottles 18 are to be placed in each container 10 the number of dividers 14 and/or 16 will be correspondingly increased.

The container 12 while illustrated as constructed of corrugated container board, can be made of any suitable material. The top and bottom closures comprise closure flaps 20 extending from the sidewalls of the container. The flaps 20 are folded inwardly in overlapping relation and secured by gluing or the like in a conventional manner. Since the container 12 in the drawing is square in horizontal section, the distal edges of each of the pairs of oppositely disposed flaps 20 abut and present inner surfaces 22 which are effectively continuous. If the container 12 was rectangularly shaped, the distal edges of closure flaps 20 attached to the narrow pair of sidewalls would normally be separated. In this event, it is desirable to use a filler pad between such distal edges, or other means to result in substantially planar inner surfaces 22 in order to equally

distribute stacking loads, as is well known to those skilled in the art.

The dividers **14** and **16** shown in FIGS. **2** and **3** can also be constructed of corrugated container board or other suitable materials. Dividers **14** are each provided with two downwardly opening slots **22** having a length L and a width which approximates the thickness of divider **16** so that divider **16** can be received therein. Dividers **16** are each provided with two upwardly opening slots **24** having a length L' and a width which approximates the thickness of divider **14** so that divider **14** may be telescoped therein. The number of slots in each divider is equal to the number of other dividers with which that divider will be interlocked. The spacing between the slots is dependent on the desired cell size.

Dividers **14** and **16** each have a height H which is substantially equal to the sum of the lengths, L and L', of slots **22** and **24** and to the inside height of the container **12** intermediate the inside surfaces **22**. The length of each of the dividers **14** and **16** approximates the length of the inner sidewalls of the container **12** which it parallels.

The dividers **14**, **16** are assembled in an orthogonal fashion to form cellular compartments **26** for the bottles **18** by aligning slots **22** of dividers **14** with corresponding slots **24** of dividers **16** and telescoping the dividers so that each slot embraces the aligned unslotted portion of the other, as shown in FIG. **1**. This is a conventional operation the procedures for which are well known to those skilled in the art.

The length L of the downwardly opening slots **22** is substantially greater than the length L' of the upwardly opening slots **24**. In this connection, the slot length ratio of L to L' should fall in the range from about 2:1 to about 7:1, preferably about 3:1, for reasons which will be apparent from the description hereinafter contained.

When the above-described dividers are interlocked and placed in the container **12**, nine individual cellular compartments **26** are formed. The sidewalls of each cellular compartment conform as closely as is practical to the base portion of bottles **18** to be received therein. The bottles **18** are thereby restrained from free movement in the horizontal direction. For example, where the base of the bottle **18** comprises curved surfaces, the side surfaces of each cell **26** are preferably tangent thereto. By "base portion" is meant the lowest third or so of the bottle **18**. Due to such construction and relationship, not only are the bottles **18** prevented from shifting, but the bottles **18** retain the lowermost portions of dividers **14** and **16** in the exact position desired, i.e., coplanar with the intermediate portions of the dividers.

As will be noted in FIG. **1**, the dividers of the present invention are intended for use with articles, e.g. bottles **18**, the uppermost portions of which are of reduced size. In the illustrated embodiment, the upper portion **28** of the bottle **18**, whose height is approximately equal to or less than the height H of dividers **14**, **16**, is spaced inwardly from the side surfaces of the dividers defining each cell **26**. This means that the upper portion **28** of bottles **18** cannot be employed in maintaining the uppermost portions of the dividers **14**, **16** coplanar with the intermediate portion of the dividers.

Whereas the prior art discloses dividers whose uppermost portions deflect easily and as a consequence thereof the stacking support provided the container by said dividers is not as great as it should be in view of the materials used, the propensity of the uppermost portion of the dividers of the present invention to deflect is substantially reduced. The uppermost portions intervening the upwardly opening slots of conventional dividers are readily moved and held in a deflected condition under the handling and packaging techniques in use in industry. Moreover, this deflection is increased upon application of any stacking load to the divider. In use, the total deflection directly influences the amount of support provided the container by the dividers. The smaller the deflection, the greater the stacking strength provided by the divider. The greater the deflection, the smaller the stacking strength provided the container by the divider. Thus, it is primarily due to the propensity of such uppermost portions to deflect that conventional dividers fail at loads far below the loads they are potentially capable of supporting. The present invention shortens the moment arm of such portions (which is equal to the length L' of the upwardly opening slots of dividers **16**) so that its propensity to deflect is greatly reduced and the amount of support provided thereby greatly increased.

Actual tests prove the in-use efficacy of this invention. Top to bottom container compression tests were performed on a standard compression testing machine following the fixed procedure established by the American Society for Testing Materials. The test was standard compression test D 642 [American Society for Testing Materials: ASTM Standards on Paper and Paper Products and Shipping Container, p. 73 (1962)] with the exception that the container closure flaps were not sealed. The container (measuring 20 inches long, 11-½ inches high, and 9 inches wide) was packed with 12 bottles, 3 rows, 4 bottles per row (the necks of the bottle were cut off so that the bottles could not contribute to the compressive strength). The bottles were separated by conventional dividers made from the same material as the container, "C" flute cardboard. However, the slot length ratio was varied from test to test, covering a range extending from the conventional 1:1 up to a maximum of 7:1. The results of the test on dividers having the conventional slot length ratio of 1:1 were used as standard or the control. Table **1** below reveals the improvement in stacking strength achieved by such variation of the slot length ratio.

TABLE 1

Slot Length Ratio (1/1'):	Stacking strength (percent improvement)
1:1	(1)
2:1	+5
3:1	+22. 5
4:1	+12
5:1	+14
6:1	+11
7:1	+2. 5

[1] Standard (conventional).

The slot length ratio of the present invention ranges from about 2:1 to about 7:1 and for greatest benefit preferably is about 3:1. When the slot length ratio is below about 2:1, i.e., about a conventional slot length ratio of 1:1 or less the previously described problem of deflection is experienced.

However, as the slot length ratio gets larger than conventional, e.g., about 2:1 or greater, the propensity to deflect decreases and an average improvement in stacking strength is experienced using identical materials.

It is noted that as the slot length ratio gets larger than 3:1, the corresponding improvement in stacking strength (over conventionally slotted dividers) attendant to successive increases in slot length ratio above the conventional 1:1 is not as great. This pattern of reduced stacking strength improvement, as the slot length ratio gets larger than about 3:1 is thought to be due to the susceptibility of the divider **14** to tearing and handling damage. The damage results in weakening of the compressive strength of that portion of dividers **14** immediately above slots **22**. As that portion gets smaller with slot length ratios greater than 3:1, the more severe the weakening under identical handling conditions. When the slot length ratio exceeds 7:1, the compressive strength of the portion is so weakened that the stacking strength provided thereby is no greater and sometimes even less than when the slot length ratio is the conventional 1:1.

If desired, the present invention can be employed to improve the stacking strength of containers housing a plurality of layers of objects, each layer of which is received in a cellular divider structure conforming to the above description, wherein the slot length ratios lie in the aforesaid range of from

about 2:1 to about 7:1, preferably 3:1. In this case the layers are preferably separated by separator sheets of cardboard or the like, the sum of the cumulative heights of the dividers and of the thicknesses of the separator sheets, if used, being equal to the inside height of the container. Thus, the divider structure for each layer is adapted to impart stacking strength to the container and each is provided with slot length ratios designed to achieve the benefits of the present invention.

Many modifications of the above invention may be used and it is not intended to limit the invention to the particular embodiment shown and described. The terms used in describing the invention are used in their descriptive sense and not as terms of limitation.

I claim:

1. A stackable, divider-equipped package comprising a container having a parallelepipedal configuration and at least one layer of objects, said layer comprising vertically extending generally imperforate, planar dividers, said dividers being slotted and interlocked in an orthogonal system to form a cellular structure, each cell of said cellular structure having an object therein, said objects being similarly shaped and similarly oriented within said container, said container having at least two spaced, planar support surfaces between which said layer is located, the planes of said support surfaces being substantially horizontal, said slots in intersecting dividers being in alignment with that of one divider opening downwardly and telescoped over an unslotted portion of the other divider and the slot of said other divider opening upwardly and telescoped over an unslotted portion of said one divider, the length of each said divider being generally equal to the inside length of the side of said container disposed in a vertical plane substantially parallel to the plane of said divider, said dividers each having a uniform height along substantially its full length, said height of said dividers being substantially equal to the vertical distance between said support surfaces within said container, said length of said aligned slots combining to approximately equal the height of said dividers, said objects having their lowermost portions sized and configured to retain the lowermost portions of said dividers in substantially fixed orthogonal relationship substantially coplanar with the intermediate portions thereof, said objects having their uppermost portions sized and configured to preclude said uppermost portions of said objects from similarly retaining the uppermost portions of said dividers, each of said objects being supported by the lowermost of said horizontal spaced supports, said dividers having slot-length ratios in the range of from about 2:1 to about 7:1, whereby the stacking strength of said package is improved.

2. The package of claim 1 in which the slot length ratio is about 3:1.