Nov. 26, 1968 J. X. DESFORGES 3,412,920

FIBREBOARD CARTON

Filed Dec. 26, 1967

FIG. 1

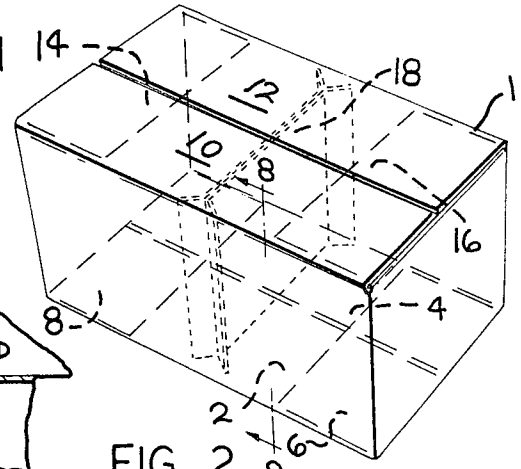


FIG. 8

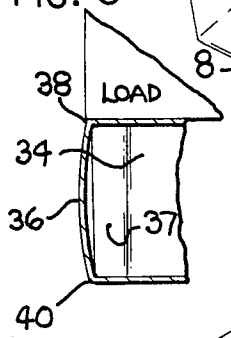


FIG. 2

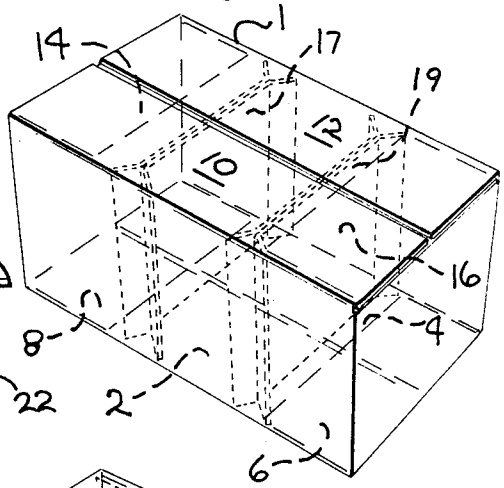


FIG. 7

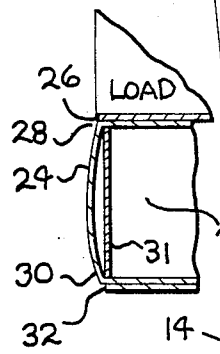
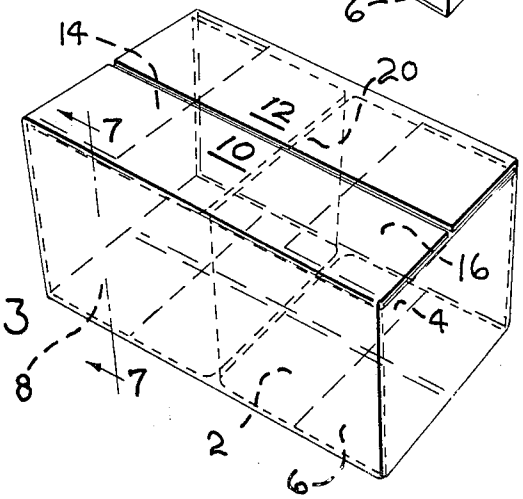


FIG. 3



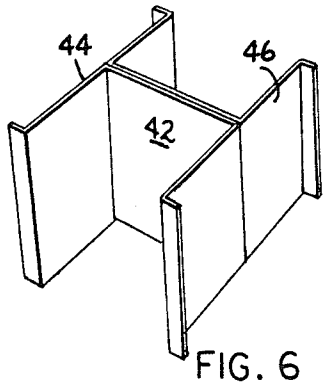


FIG. 6

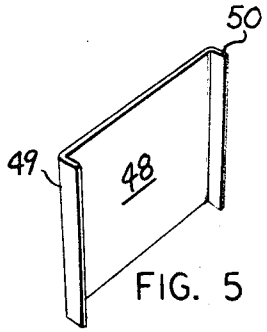


FIG. 5

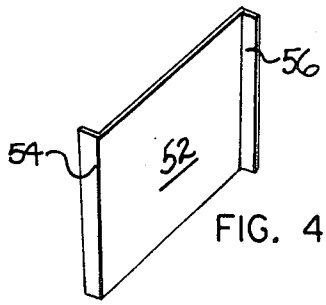


FIG. 4

INVENTOR
JEAN X. DESFORGES
BY W. A. Schaich &
Thomas A. Meehan
ATTORNEYS

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FIBREBOARD CARTON

Jean X. Desforges, Toledo, Ohio, assignor to Owens-Illinois, Inc., a corporation of Ohio

Continuation-in-part of application Ser. No. 621,555, Mar. 8, 1967. This application Dec. 26, 1967, Ser. No. 705,874

12 Claims. (Cl. 229—15)

ABSTRACT OF THE DISCLOSURE

A regular slotted carton formed from a sheet of crushable material with a vertically extending inner pack member located between the non-abutting edges of the innermost pairs of top and bottom closure flaps and extending between the outermost top and bottom closure flaps. The height of the inner packs member slightly exceeds the distance between the outermost top and bottom closure flaps.

Related applications

This application is a continuation-in-part of the application of Ser. No. 621,555, filed on Mar. 8, 1967, which in turn is a continuation-in-part application of Ser. No. 583,912 filed on Oct. 3, 1966.

Specification

This invention relates to a fibreboard carton. More particularly, this invention is concerned with a fibreboard container that has exceptional stacking strength.

The container of the subject invention is especially convenient to use and has exceptional strength properties. Likewise, the container of this invention has an inner member which, in addition to acting as a partition, gives the carton of this invention exceptional stacking strength.

As has been discussed above, the container of this invention is unique in that it has exceptional stacking strength. Stacking strength is very desirable in cartons which are subject to warehouse storage. This high stacking strength allows a greater number of cartons to be stacked upon each other and hence permits more effective use of warehouse space or the same number of cartons stacked upon each other at lower container cost.

The primary object of this invention is the manufacture of a superior carton.

Another object of this invention is the manufacture of a superior carton which has outstanding stacking strength.

Finally, the objects of this invention include all the other novel features which will be obvious from the specification and claims at hand.

In the drawing

FIG. 1 is a top perspective view of the carton of this invention which utilizes the subject inner packing.

FIG. 2 illustrates how a plurality of inner packs can be utilized in accordance with this invention.

FIG. 3 is a top perspective view of a conventional carton and inner pack assembly.

FIGS. 4–6 illustrate other embodiments of inner packs which may be used in the practice of the present invention.

FIG. 7 demonstrates what happens when a conventional carton and inner pack assembly is loaded.

FIG. 8 illustrates what happens when the carton and inner pack of this invention is loaded.

Referring to FIG. 1, this figure illustrates a conventional regular slotted carton which incorporates bottom side flaps **2** and **4**, bottom end flaps **6** and **8**, top side flaps **10** and **12**, and top end flaps **14** and **16**.

For purposes of this invention, a regular slotted carton is defined as a carton which has four side walls, a bottom which is formed from two opposing end flaps and two opposing side flaps and a top which is formed from two

opposing end flaps and two opposing side flaps. In accordance with this invention, the innermost set of flaps must be non-abutting. This invention is especially significant when the carton is formed from a sheet of material which is readily crushable between compressive loads applied normally of the sheet, e.g., corrugated fibreboard.

In FIG. 1, carton **1** has end flaps **6**, **8**, **14** and **16** which are non-abutting. The carton utilizes an inner pack member **18**. Inner pack member **18** extends vertically between the top and bottom edges of the carton side walls and is of a height exceeding the vertical spacing between the outermost or end closure flaps **2**, **4**, **10** and **12**. It can be seen that before inner pack **18** can effect the structural integrity of the composite carton, only the corrugated board of side flaps **2**, **4**, **10** and **12** need be crushed. Precrushing is achieved when box outer flaps are closed due to inner member height exceeding the vertical spacing between the outer flaps. Accordingly, when inner pack **18** takes effect, the deflection of the side walls of the carton is minimal. That is to say, that the number of layers of corrugated board which have to be crushed and the amount of crushing which must take place before the inner pack takes effect is directly related to the degree in which side walls have to be deformed before the inner pack offers support. The degree to which the side walls are deformed is in turn directly related to the residual strength retained by the side walls.

In accordance with this invention, the height of inner pack member **18** exceeds the vertical spacing between the outermost or end closure flaps **2**, **4**, **10** and **12** by from about .0625 to about .1875 inches or a more preferred range is from about .100 to about .150 inches with a most preferred figure being .125 inches. When a load is applied, inner pack **18** imbeds itself in each set of flaps **2** and **4** and **10** and **12** by an amount which is equal to 50% of the amount by which the height of inner pack **18** exceeds the distance between flaps **2**, **4**, **10** and **12**.

FIG. 2 illustrates carton **1** having a plurality of inner packs **17** and **19**.

FIG. 3 shows a conventional carton inner pack arrangement in which the height of inner pack **20** is less than the vertical spacing between outermost closure flaps **2**, **4**, **10** and **12** by approximately twice the thickness of one of flaps **6**, **8**, **14** and **16** (assuming such flaps to be of the same thickness). It can, therefore, be readily understood that inner pack **20** is positioned in such a way that it is spaced within both the end and side flaps **2–16**. Accordingly, the corrugated board of both these side flaps **2**, **4**, **10** and **12** and end flaps **6**, **8**, **14** and **16** have to be crushed before inner pack **20** can take full effect.

FIGS. 4, 5 and 6 illustrate other inner pack embodiments of the subject invention. It can be seen that there are a large number of inner pack designs that can be utilized in accordance with this invention. The only real requirement for the inner pack is that it be of such a size and design that it can be positioned on the abutting flaps and not on the non-abutting flaps of the carton in question and be of a height exceeding the vertical spacing of the outer flaps.

Specifically, FIG. 6 illustrates an inner pack **42** which is formed from one or two pieces of an inexpensive load-bearing, sheet-like material, e.g., corrugated fibreboard. This inner pack has opposing flanged disposed U-shaped end portions **44** and **46** which, when positioned back to back, form a flanged H-shaped inner pack. Still another inner pack **48** is U-shaped and has flange members **49** and **50**. Still another inner pack **52** is Z-shaped and has flange portions **54** and **56** which are formed by folding the main body portion of inner pack **52**.

FIGS. 7 and 8 illustrate the deflection problem as discussed above.

FIG. 7 shows a carton **22** of conventional design wherein side wall **24** is significantly deflected and weakened in that corrugated layers **26–32** must be crushed before the inner pack **31** can contribute significantly to the load-bearing properties of the container comprising the combination of the carton **22** and the inner pack **31**. By the time layers **26–32** have been crushed sufficiently to significantly load inner pack **31**, carton **22** will have lost much of its load-bearing capabilities due to the deflection of side wall **24**.

In contrast, FIG. 8 illustrates a carton **34** wherein the deflection of side wall **36** is minimal before an inner pack **37** would render support. In this case only a portion of two layers of corrugated board **38** and **40** need be crushed before the inner pack **37** offers support. Thus, both carton **34** and inner pack **37** are able to contribute simultaneously to the load-bearing capabilities of the container and the container is capable of sustaining much higher compressive loads than a container constructed as in FIG. 7 with elements of comparable size, quality and structural properties.

It is understood by one skilled in the art that the corners are the strongest point of a carton; accordingly, in accordance with the most preferred aspect of the subject invention, the width of the carton in question should be some equal multiple of the length. Most preferred ratios are 1 to 2 and 2 to 3. When these ratios are utilized in conjunction with one or two inner packs, the corners of cartons can always be positioned over a portion of the container which is supported by an inner pack so as to achieve a maximum stacking strength.

It is to be noted that while the preferred embodiments of the container of this invention have been illustrated, there are various modifications that would be apparent to a person skilled in the art. Also, it is obvious to vary the dimensions and relative size of the panels of the container to suit a particular application.

The container of this invention can be formed from any fibreboard or paperlike product. However, it is prefered that the container at hand be formed from corrugated board. The particular weight, corrugate flute, etc., of the corrugated board utilized will depend on the environment in which the carton will be subsequently utilized.

The following examples will illustrate the subject invention. These examples are given for the purpose of illustration and not for purposes of limiting this invention.

EXAMPLE 1

Regular slotted cartons having the inside dimensions of 15⁄16 x 9⅞ x 10 3⁄16" were made from 200 lb. test C-flute kraft corrugated board. U-shaped inner packs similar to the inner pack as is illustrated in FIG. 5 were prepared from 200 lb. test corrugated board as described above. The vertical height of the inner pack was 10 5⁄16 inches. This vertical height allowed the inner pack to just abut against the abutting flaps of the carton in question. The cartons in question were then assembled and two of the above-described inner packs were placed in an opposing fashion on the inner periphery of the cartons in such a fashion that they abutted against the abutting flaps of the carton. The cartons were then loaded into a Tinius Olsen compression tester as manufactured by Tinius Olsen Testing Machine Co., Willow Grove, Pa. The failure of the cartons in question in total pounds is as represented in Table I.

Table I

Carton No.:	Failure load, pounds
1	1,355
2	1,255
3	1,260
4	1,265
5	1,285
Average	1,284

A new set of cartons were then made for purposes of testing compression strength in stack. These cartons were identical to the cartons as described above. The cartons were cross-stacked three high, each tier being at 90° to the next tier. The stacking strength of the cartons was then tested as described above in a Tinius Olsen compression tester. The average stacking strength of the supporting cartons was 702 lbs. or 55% of the average strength of single cartons.

EXAMPLE 2

Similar cartons were then prepared in accordance with the description given in Example 1. However, in this case the height of the inner packs was 10 7⁄16". This height exceeded the vertical height between the abutting flaps by .125". Upon closing, the inner pack imbedded into the top and bottom abutting flaps. The average single and stacking strength compression values of the cartons in question is shown in Table II.

Table II

Carton No.:	Failure load, pounds
1	1,405
2	1,405
3	1,490
4	1,360
5	1,425
Average	1,417

Average stacking compression failure, 787; retention, 56%.

It is to be noted that a significant increase in the single compression strength and stacking compression strength retention was achieved in the cartons of this example as opposed to the cartons of Example 1. These increases are on the order of 10%.

EXAMPLE 3

Cartons were prepared in accordance with the description given in Example 1. A Z-shaped inner pack similar to the inner pack illustrated in FIG. 4 was prepared in accordance with the description given in Example 1, the height of the inner pack being 10 5⁄16". Again, this height just allowed the inner pack to abut against the abutting flaps. The cartons in question were assembled and a single inner pack was placed in the center thereof. The single compression strength and stacking compression strength of the cartons in question is as shown in Table III.

Table III

Carton No.:	Failure load, pounds
1	1,165
2	1,185
3	1,090
4	1,165
5	1,085
Average	1,138

Average stacking compression failure, 1,025; retention, 90%.

EXAMPLE 4

Cartons were prepared in accordance with the description given in Example 1. Z-shaped inner packs as described in Example 3 were then prepared, the height of the inner packs being 10 7⁄16". This height exceeded the vertical height between the abutting flaps by .125". The cartons in question were then assembled and a single inner pack placed in the center thereof. Upon closing, the inner pack imbedded into the top and bottom abutting flaps. The average single and stacking strength compression values of the carton in question is shown in Table IV.

Table IV

Carton No.:	Failure, load, pounds
1	1,220
2	1,255
3	1,185
4	1,240
5	1,250
Average	1,230

Average stacking compression failure, 1,092; retention, 89%.

It is to be noted that a significant increase in the single compression strength and stacking compression strength retention values was achieved in the cartons of this example as opposed to the cartons of Example 3. The increases in strength were on an order of 10%.

Also, Examples 3 and 4 illustrate that if the inner pack is placed in such a manner that it is positioned directly over the corner portion or inner pack portions of other cartons in the same stack, a significant increase in the stacking retention strength is achieved.

What is claimed:

1. A regular slotted carton having:
(A) four sidewalls,
(B) a bottom portion which is formed from two abutting flaps and two non-abutting flaps,
(C) a top portion which is formed from two abutting flaps and two non-abutting flaps, and
(D) an inner pack which is biased solely against the abutting flaps, the vertical height of the supporting edges of the inner pack which are in contact with the abutting flaps being greater than the vertical spacing between the abutting flaps.

2. The carton assembly of claim 1 wherein the inner pack comprises a flanged H-shaped member, the flanges of which abut against the side walls of the carton.

3. The carton of claim 2 wherein the ratio of the length of the container to the width of the container is 2 to 3.

4. The carton assembly of claim 1 wherein the inner pack comprises at least one U-shaped fibreboard member, the flanges of the U-shaped member being positioned against the side walls of the carton.

5. The carton assembly of claim 1 wherein the inner pack comprises at least one Z-shaped fibreboard member, the flanges of the Z-shaped member being positioned against the side walls of the carton.

6. The carton assembly of claim 1 wherein said four side walls, said bottom flaps and said top flaps are formed from a unitary sheet of relatively stiff material, which material is readily crushable between compressive loads applied normally of the sheet.

7. The carton assembly of claim 6 wherein said material is corrugated fibreboard.

8. A container comprising, in combination: a regular slotted carton formed from a unitary sheet of corrugated fibreboard and having four side walls joined in a tubular configuration, a top closure comprising an innermost pair of non-abutting closure flaps and an outermost pair of closure flaps, and a bottom closure comprising an innermost pair of non-abutting closure flaps and an outermost pair of closure flaps; and a vertically extending inner pack member disposed within the carton between the non-abutting edges of the pairs of non-abutting top and bottom closure flaps, the vertical height of the inner pack exceeding the vertical spacing between the outermost pairs of top and bottom closure flaps by an amount of from about .0625 to about .1875 inch.

9. The carton assembly of claim 8 wherein the inner pack comprises at least one Z-shaped fibreboard member, the flanges of the Z-shaped member being positioned against the side walls of the carton.

10. A container in accordance with claim 9 wherein said material is corrugated fibreboard and the vertical height of the inner pack exceeds the vertical spacing between the outermost pairs of top and bottom closure flaps by an amount of from about .100 to about .150 inch.

11. A container in accordance with claim 9 wherein said material is corrugated fibreboard and the vertical height of the inner pack exceeds the vertical spacing between the outermost pairs of top and bottom closure flaps by about .125 inch.

12. The carton of claim 9 wherein the ratio of the length of the container to the width of the container is 1 to 2 and a single inner pack is utilized.

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DONALD F. NORTON, *Primary Examiner.*