July 26, 1960 A. E. RANDLES, JR 2,946,497

CARTON

Filed May 14, 1957

3 Sheets-Sheet 1

FIG_1

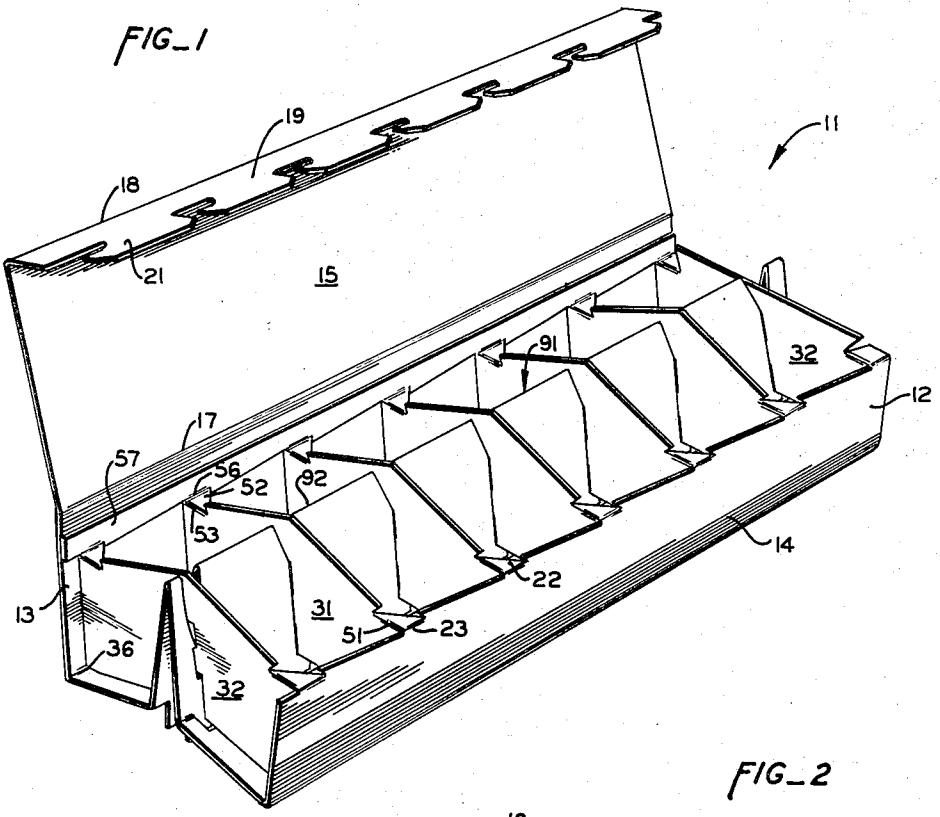

FIG_2

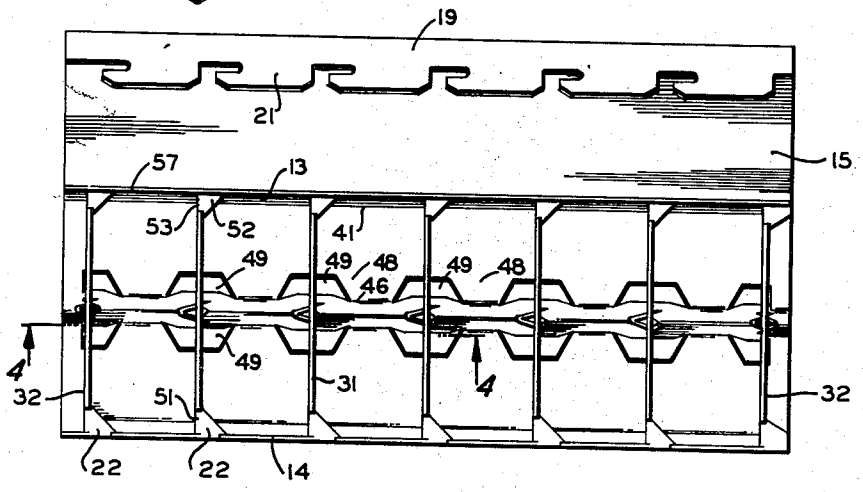

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FIG_3

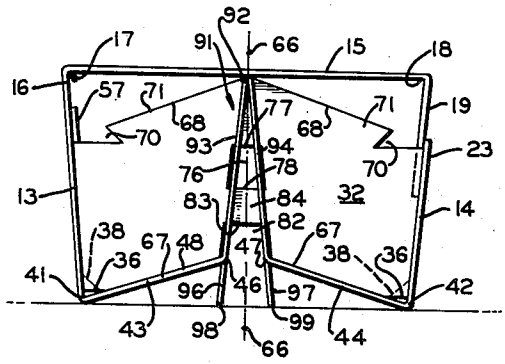

FIG_4

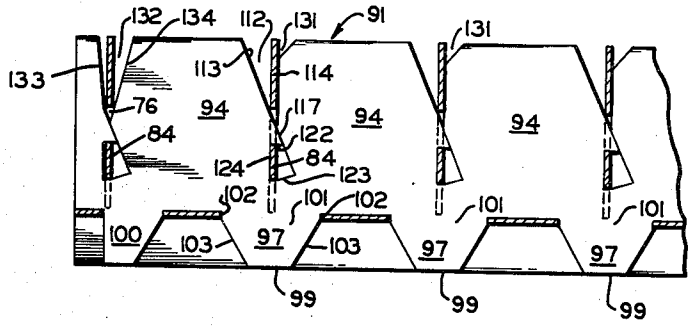

FIG_5

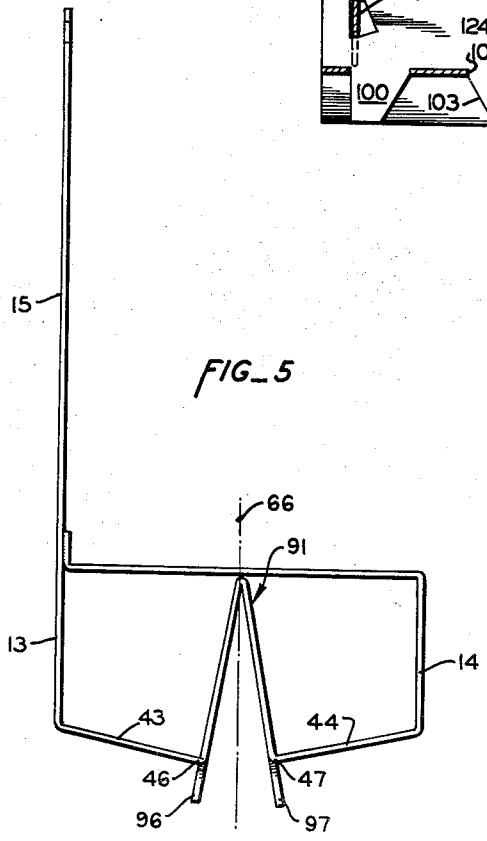

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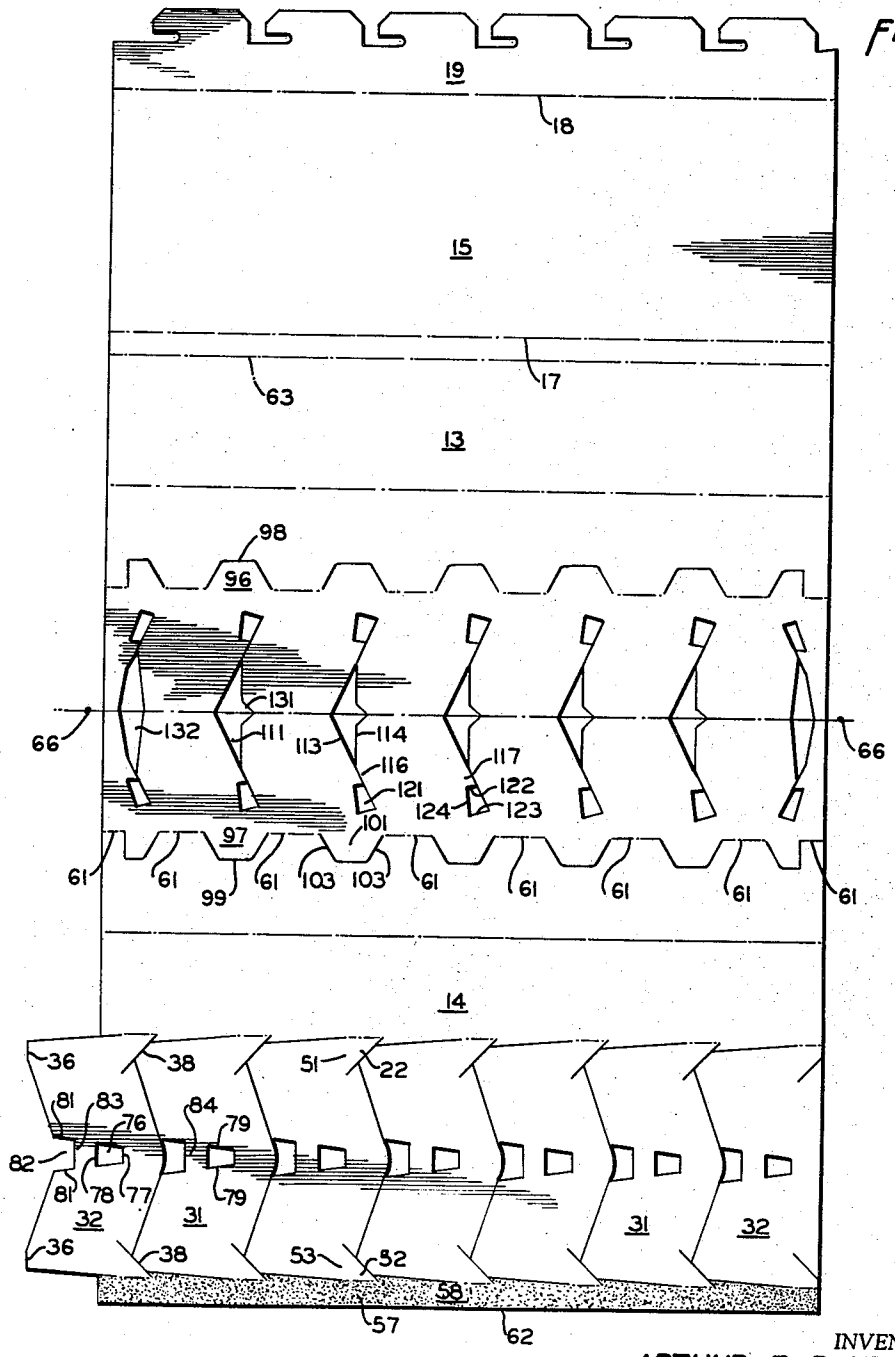
FIG_6



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2,946,497

CARTON

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1 Claim. (Cl. 229—28)

The invention relates to improvements in collapsible cellular cartons and, more particularly, to cartons of the kind widely used to package eggs and comparably shaped fragile objects.

One of the major losses in the chain of distribution of eggs, and other fragile items, ts that occasioned by breakage. Especially where eggs are involved, breakage of even one egg in a carton often entails the re-packaging and down-grading of eggs located in subjacent cartons, this particularly being true in present-day cartons having apertures in the bottoms adjacents the outer edges. The contents of the broken egg, in other words, flow through the apertures, as located in currently used cartons and spill onto the carton or cartons below, making re-packaging necessary.

Breakage ordinarily occurs because of the concentration of weight of overlying cartons on one or more eggs in subjacent cartons, the concentration being caused by improper orientation of an egg in its compartment or by an egg's being oversize and thus bearing the thrust of the weight above it. To circumvent this situation it has been necessary to keep the carton stacks to a small height even though such stacking is often an inefficient utilization of space.

It is therefore an object of the invention to provide an egg carton in which breakage is substantially eliminated.

It is another object of the invention to provide an egg carton which can be stacked to a height substantially greater than that permitted with presently used cartons.

It is yet another object of the invention to provide an egg carton in which pairs of eggs in transversely adjacent compartments are held apart by resilient walls each spaced from the other, so as to provide maximum protection against breakage resulting from lateral forces.

It is still another object of the invention to provide an egg carton which is relatively economical to make and is susceptible of quick erection by automatic machinery.

It is yet another object of the invention to provide an egg carton which lends itself to ease of stacking.

It is a further object of the invention to provide an egg carton whose blank can be cut in one piece and which does not require a separate glue strip.

It is still a further object of the invention to provide an egg carton whose blank makes maximum utilization of the paper stock.

It is yet a further object of the invention to provide an egg carton in which the carton cover is not only supported on its opposite edges but along its longitudinal centerline as well.

It is yet another object of the invention to provide an egg carton in which the gravital thrust of a stack of cartons is exerted directly downwardly through a succession of central rib members in such a fashion that weight concentration on particular eggs is substantially eliminated.

It is a yet further object of the invention to provide an egg carton in which the fluid from an egg, if broken, is largely, if not entirely, confined to the carton, and, therefore, does not flow downwardly so as to damage the subjacent cartons.

It is another object of the invention to provide a generally improved egg carton.

Other objects, together with the foregoing, are attained in the embodiment described in the following description and shown in the accompanying drawings in which:

Figure 1 is a perspective of the egg carton of the invention, the cover being shown in open position;

Figure 2 is a plan of the carton shown in Figure 1;

Figure 3 is an end view, the cover being shown in closed, or locked position;

Figure 4 is a section to an enlarged scale, the plane of section being indicated by the line 4—4 in Figure 2;

Figure 5 is an end view of the carton in a stage of partial assembly, the view emphasizing the rigid structure of the center rib, or truss member;

Figure 6 is a plan of the blank from which the carton is constructed.

While the carton of the invention is susceptible of numerous physical embodiments depending upon the environment and requirements of use, a considerable number of the herein shown and described embodiment has been made and used and has performed in an eminently satisfactory manner.

The carton of the invention, generally designated by the numeral **11**, resembles the customary dozen-egg capacity carton in that it comprises an elongated box-like body **12** bounded on opposite sides by a high wall **13**, or cover carrying wall, and a low wall **14**, or cover locking wall.

A cover **15** is foldably connected to the upper edge **16** of the high wall **13** and is swingable about a fold line **17**. Likewise foldable about a scored line **18** adjacent the distal end of the cover **15** is a locking flap **19**, the flap **19** being provided with a plurality of hooks **21** adapted latchably to engage with a plurality of triangular shaped gussets **22**, or hinges, extending inwardly, at longitudinally spaced intervals, from the upper margin **23** of the low wall **14**.

Dividing the box into a longitudinal series of compartments is a plurality of transverse partitions **31**, each of the partitions being substantially identical to the other except that the opposite end partitions **32** differ from the interior partitions in a small but important fashion. Whereas the lower outermost corners **36** of the end partitions **32** are trimmed or clipped but a small amount, if at all, the corresponding corners of the interior partitions are clipped to a significant extent, as indicated by the numeral **38**, and shown most clearly in Figures 3 and 6. The purpose in treating the interior partitions as indicated is that in the event an egg were to break, the fluid from the egg is enabled readily to flow along the outermost bottom corners **41** and **42** of the walls **13** and **14**, respectively, without hindrance from intervening partitions. Upon coming against either of the end partitions **32**, however, the smallness of the clipped portion effectively prevents further movement of the fluid. In other words, the different treatment accorded the partitions encourages free longitudinal flow within the box but entrapment adjacent each end.

The reason, in turn, why free longitudinal flow along the inner corners **41** and **42** is permitted, and encouraged, is that, unlike most egg cartons heretofore used, each of the bottom panels **43** and **44** is uninterrupted by any apertures for a substantial portion of its dimension measured inwardly from the respective corners **41** and **42** toward the inner corners **46** and **47**, or knees, respectively, of the bottom panels. As appears most clearly in Figure 2, the distance between the corner **41**, for example, and the imaginary longitudinal envelope line, designated **48**, defining the outermost boundaries of the bottom

panel apertures **49** is substantial, the distance being approximately three-fourths of the total bottom panel dimension measured between the corner **41** and the knee **46**. As a consequence of this arrangement and owing as well to the upward and inward slope of each of the bottom panels, the fluid from a broken egg in any particular compartment does not overflow and spill downwardly through the aperture **49** onto the subjacent carton; instead, the fluid moves longitudinally, ordinarily dividing with portions flowing toward opposite ends of the carton. The generous channels or orifices provided at the outer corners of the interior partitions encourages this longitudinal flow. Upon encountering an end partition, however, additional endwise flow is halted. The fluid, in other words, is trapped within the carton, the harm confined to the carton itself.

As can be seen most clearly by reference to Figures 1, 2 and 6, each of the transverse partitions, including the end partitions **32**, originally forming part of a partition panel **50** and on one side is hingeably secured to the triangular hinge **22**, or locking gusset, the fold line being indicated by the numeral **51**, and on the other side is foldably mounted on a corresponding hinge **52**, or gusset, the scored fold line being designated by the numeral **53**. Each of the hinges **52** is foldably mounted, about a scored line **56**, on an elongated member termed an attaching strip **57**, or glue strip, the member **57** having been secured firmly to the high wall, at its appropriate location, prior to erection of the carton.

It will be noted, incidentally, by reference to Figure 6, that the glue strip **57** is indicated as having disposed thereon an adhesive **58**, for example, an adhesive of the pressure-sensitive type. Prior to erection, approximately the lower third of the blank, as it appears in Figure 6, is folded upwardly about an interrupted score line or fold axis generally designated by the numeral **61**. This folding operation locates the bottom margin **62** of the glue strip in the location indicated in outline and designated by the numeral **63**, such location being the correct one as subsequent erection of the carton is effected.

As appears most clearly in Figures 1 and 3, each of the partitions is symmetrical about a median vertical axis **66**, or median longitudinal plane. The lower edges **67** of the partition are carefully cut so as to conform with the slope of the corresponding bottom panels **43** and **44** and the upper edges **68** slope upwardly and inwardly to form a peak **69** touching the adjacent lower surface of the cover **15** in closed position thereof. A pair of notches **70** is created by virtue of the folding of the partition at right angles to the adjacent horizontal triangular hinges **22** and **52**. Adjacent each of the notches **70** is a tip portion **71** added somewhat to the beam strength adjacent the upper edges **68** of the partition.

Symmetrically disposed in the central portion of each of the partitions is an upper isolated notch **76**, or aperture whose shape appears most clearly in Figure 6, the aperture conforming in shape to a truncated isosceles triangle, and being bounded by an upper wall **77**, parallel lower wall **78** and a pair of inclined side walls **79**.

Co-linear with each of the side walls **79** is a pair of inclined boundary walls **81** of a lower and generally truncated triangular notch **82**, the upper wall **83** of the notch **82** being parallel to and spaced from the adjacent notch wall **78**, a band **84** separating the two walls.

The foregoing notches or apertures **76** and **82** as well as the intermediate band **84** serve, in conjunction with cooperating elements in a longitudinally disposed rib member, generally designated by the numeral **91**, to hold the transverse partitions in firm vertical attitude.

The rib member acts, however, not only as a partition securing element but also as a brace or strut or truss member serving to support the cover **15** against the downward thrust of superposed cartons and to transmit this weight onto subjacent cartons in efficiently distributed fashion. This is to say, that the weight impressed on the strong, stiff apex **92** of the triangular or inverted V-shaped rib panels **93** and **94** is passed down each of the panels **93** and **94** and is in turn, transmitted to supporting tabs **96** and **97** terminating in lower edges **98** and **99**, respectively, which are co-terminous or coplanar with respect to the corner edges **41** and **42** of the carton. The carton weight is consequently divided between the corners **41** and **42** and between the tab edges **98** and **99**, any severe concentration of thrust being thereby avoided.

Preferably, each of the interior supporting tabs is somewhat stubby to provide the required beam strength and resistance to bending or buckling. The two end tabs **100**, on the other hand, are ordinarily modified to some degree to reflect the reduced thrust condition there obtaining. Stiffness of the supporting tabs is augmented by provision of substantial root lines **101**, the tabs tapering downwardly, in converging fashion, from the opposite ends **102** of the root portions **101** along a pair of tab edges **103** to the bottom edge **99**, as appears most clearly in Figure 4.

The tabs are cut from a portion of the material forming the bottom panels of the carton. Cuts or slits in the blank are suitably provided so that when the carton is erected and the tabs are disposed in their normal or extended attitude, the plurality of correspondingly configured apertures **49** in the bottom panels are created, the apertures **49** having previously been mentioned in connection with the flow of fluid from a broken egg, it having been stated that since the apertures **49** are located very close to the central rib, and also at an elevated position, the likelihood of escape of fluid through the apertures **49** is extremely small.

Cooperating with the transverse partition elements and serving to lock the transverse partitions in a secure fashion is a plurality of cuts and notches in the material symmetrically disposed around the longitudinal median axis or plane **66**. A plurality of interior triangular apertures **111** form, when the opposite rib panels **93** and **94** are folded into triangular contour, a registering pair of triangular notches **112**, as appears most clearly in Figure 4. Each of the notches includes a sloping wall **113**, or edge, and a vertical edge **114**, the vertical edge serving to brace or support the adjacent portion of the transverse partition. Continuing the line of each of the edges **113** is a cut **116**, the cut **116** opening as carton erection takes place and permitting the passage through the cut of the band **84**. As soon as the band **84** completes the traverse through the cut, the inherent resiliency of the material causes the band to snap to the vertical attitude shown most clearly in Figure 4, the band then underlying a triangular tip **117** created by a roughly rectangular opening **121**, the opening **121** being bounded by an upper edge **122**, a lower edge **123**, and a vertical side edge **124**.

With especial reference to Figures 3 and 4, it can be seen that the vertical dimension of the edge **124** is such that the cross-band **84** is securely confined and is maintained in vertical attitude and is restrained against vertical movement, the ledge **122** of the tip resisting upward motion. The cam or slope of the wall **123**, furthermore, urges the band into face to face abutment with the vertical wall **124**.

The vertical dimension of the opening **76** in the partition is such that the tip **117** fits in rather snug relation, as can be seen most clearly in Figure 4, this interlock serving, along with the abutment between the band **84** and its confining members, securely to position both the rib panels and the transverse partition. In sum, the rib panels lock the partitions, and the partitions the panels, the overall effect being to produce a carton of very great strength not only against vertical thrusts but horizontal or lateral forces as well.

It is sometimes found advisable, for convenience in

erection, that notches **131** in the upper corners of the rib panels adjacent the partitions be provided.

A slightly different treatment of the rib notches is afforded in the case of the end notches **132**, where, as appears in Figures 4 and 6, the end partition is disposed approximately half way between the edges **133** and **134** of the notch **132**. This structure lends itself to ease of assembly and in no way detracts significantly from the strength since at each end there is no thrust longitudinally from the end of the box, there being no egg compartments, obviously, outside the end partitions.

In addition to its outstanding rigidity, the carton of the invention lends itself admirably to convenience in storage and assembly. As previously stated, with the lower one-third, approximately, of the carton having been folded so that the edge **62** of the glue strip **57** is located at the line **63**, only two thicknesses of the material are involved. This is to be contrasted with the several thicknesses encountered in many of the presently used, partially assembled cartons. As a consequence of there being only two thicknesses, the flat cartons can be easily stored and shipped and, in addition, can be erected with great facility and speed, and are therefore especially adaptable for use with high speed automatic machinery.

In forming the erected box shown in Figure 1 from the single, die-cut sheet illustrated in Figure 6, the lower margin **62** is folded upwardly, about the fold line **61**, to coincide with the line **63**. Adhesion of the glue strip **58** is thereupon effected. Next, the combined high wall **13** and the bottom panel **43**, the combined rib panels **93** and **94**, the combined bottom panel **44** and the low wall **14**, and the partition panel comprising the seven partitions and the hinges, or gussets, are folded into substantially square hollow box form. This operation, as well as the succeeding steps of downturning the individual partitions into transverse attitude and of urging the triangular rib structure upwardly into engagement with the transverse partitions and the concurrent folding of the bottom panels **43** and **44** is preferably accomplished by high speed machinery of the kind shown and described, for example, in my co-pending application, Serial No. 729,448, filed April 18, 1958, for Carton Forming Machine. After interlocking of the triangular rib and the transverse partitions, the carton assumes substantially the form shown in Figure 1 and is prepared to be loaded with eggs, followed by closure and locking of the cover as appears in Figure 3.

I claim:

An egg carton comprising a single sheet of fibreboard material when erected and closed having a planar horizontal cover panel connected along a rear edge fold to a substantially vertical rear panel extending to a first bottom edge in a horizontal plane, said cover being disposed along its front edge at the upper edge of a substantially vertical front panel extending to a second bottom edge in said horizontal plane, a securing strip on said rear panel adjacent said rear edge fold, connectors extending from said upper edge of said front panel and from said securing strip, substantially vertical cross partitions depending from said connectors and extending transversely between said front panel and said rear panel, each of said cross partitions having a front edge and a rear edge and having a notch extending upwardly from the bottom thereof and having an opening with a bottom edge located above said notch, the forward edges of said notch and of said opening being in a first straight line and the rearward edges of said notch and of said opening being in a second straight line, said first line and said second line diverging downwardly from a point substantially in the plane of said cover panel, a pair of downwardly diverging planar central panels each lying substantially along a respective one of said lines and extending substantially from a fold substantially at said point to terminations in said horizontal plane, said central panels having cutouts to accommodate said cross partitions, hooks on said central panels extending into said opening and having bottom edges engaging said bottom edge of said opening, a first bottom panel connected to said front panel and merging with one of said central panels above the bottom thereof, and a second bottom panel connected to said rear panel and merging with the other of said central panels above the bottom thereof, the transverse dimension of said first bottom panel being substantially the same as that of the adjacent bottom edge of the cross partition between the front edge thereof and the forward edge of said notch and the transverse dimension of said second bottom panel being substantially the same as that of the adjacent bottom edge of the cross partition between the rear edge thereof and the rearward edge of said notch whereby said central panels are increasingly spaced apart from top to bottom of said carton and are held in diverging locations against the diverging front and rear edges of said opening and of said notch.

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