Oct. 11, 1966 R. E. PAIGE 3,278,108

PAPERBOARD BOX

Filed Jan. 19, 1966 2 Sheets-Sheet 1

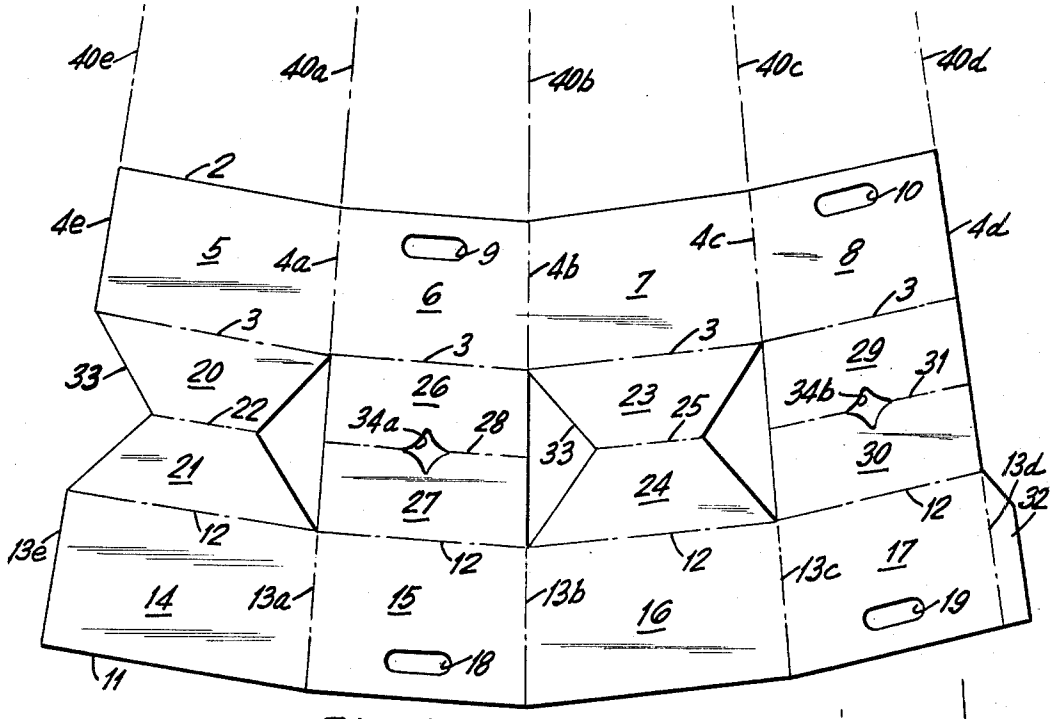


FIG. 1

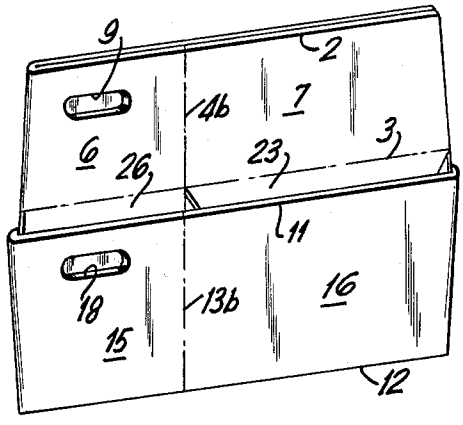


FIG. 2

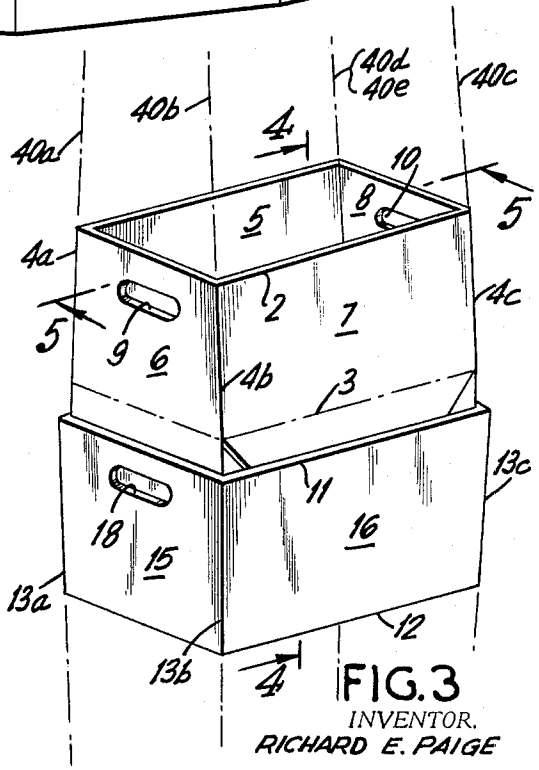


FIG. 3

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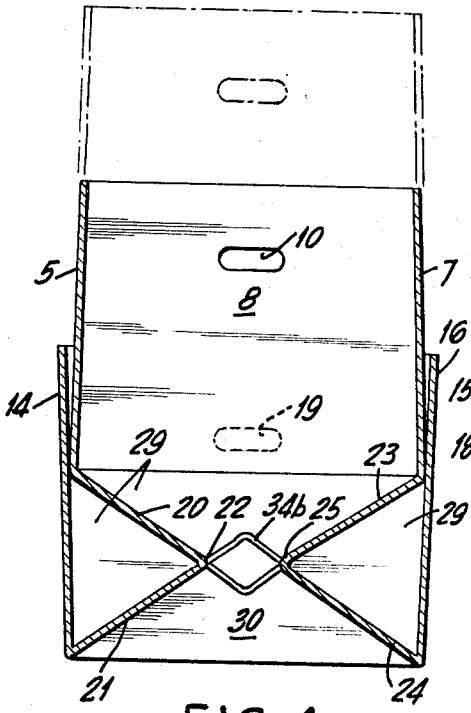


FIG. 4

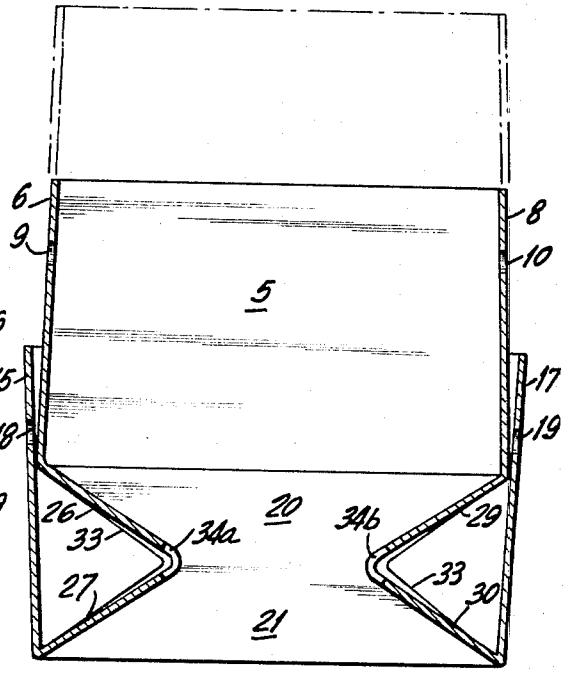


FIG. 5

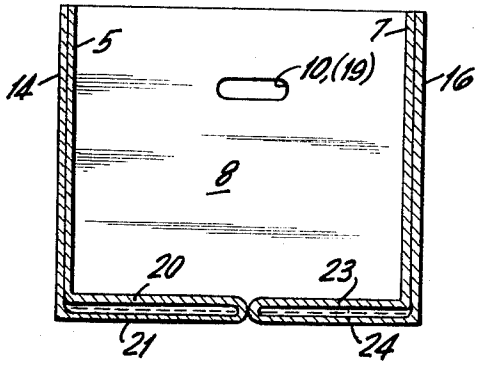


FIG. 6

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PAPERBOARD BOX

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5 Claims. (Cl. 229—37)

This invention is directed to a construction for a double walled box formed from a single blank of foldable sheet material such as solid or corrugated paperboard.

There has been a need for many years for an economical box which can be shipped in a flat form and readily erected by the user. The box must be strong and sturdy during its use, re-usable many times, and yet readily collapsible for storage or shipment. For example, in a factory a "tote box" is used to carry parts from place to place. They must sometimes bear the weight of heavy loads. Since the number of such boxes in use varies, they must be stored. It is desirable that such boxes be constructed so that they may be collapsed for storage or shipment and re-erected when needed.

It is an objective of this invention to provide a one-piece construction for a double walled box which one man may easily erect and easily collapse and which is strong and yet economical.

In accordance with the objectives of the present invention, I have provided a blank formed from a single piece of corrugated or solid paperboard. The blank has a plurality of upper panels joined by fold lines, an equal number of intermediate joining panels, and an equal number of bottom panels joined by fold lines. The upper panels form the walls of the inner box, the intermediate panels form the bottom of the box, and the bottom panels form the walls of the outer box. At least one set of panels, and preferably all three sets, are sides of a truncated pyramid; that is, their fold lines and sides are taken along lines which, if extended, would meet a finite point. The blank is erectable to form a double walled box construction whose joined panels forming the inner shell easily fit within those forming the outer shell.

Due to the layout of the blank in the form of a truncated pyramid, the inner and outer shells are tapered. This permits the outer shell to accommodate the thickness of the walls of inner shell in so precise a manner that squeezing and crushing are eliminated. The inner shell telescopes with the outer shell so that, when the user wishes to pull out the inner box to collapse the structure for storage, there is little or no resistance to such collapsing.

Other objectives will be apparent from the description set forth below of a preferred embodiment of my invention taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a top plan view showing the blank pattern of the preferred embodiment of the present invention. The angular relationships of the blanks are exaggerated in the drawings for clarity in the description.

FIGURES 2–6 show the erection of the preferred embodiment of the box utilizing the blank of FIGURE 1.

FIGURE 2 is a perspective view showing the blank of FIGURE 1 as preassembled and folded flat for shipment.

FIGURE 3 is a perspective view showing the first step in erection of the box and indicating the pyramidal shape of the box sections.

FIGURE 4 is a cross-sectional view taken along the line 4—4 of FIGURE 3.

FIGURE 5 is a cross-sectional view taken along the line 5—5 of FIGURE 3.

FIGURE 6 is a cross-sectional view of the box after its erection.

In my Patent 2,577,588, granted December 4, 1951, I disclose a construction of an open top double walled box which is preassembled at a box factory and shipped in flat form to the user who then erects the box without the need of glue or fasteners. The blank for this box is made from a single blank of material and comprises a rectangle with the outer panels of the eventual box positioned along one edge and the inner panels positioned along the opposite edge. In the central portion of the blank, joining these groups of panels, are panels which form the bottom of the box. The blank is folded so that the extreme end edges of the outer panels are joined at the box factory by suitable means such as an overlying flap or tape. The user receives the blank in its flat and joined form and erects the box by opening the folded and joined blank into a rectangular tube. He then telescopes the upper portion of the tube (the inner shell), which comprises the inner panels, downwardly into the outer shell, which is defined by the outer panels, at the lower portion of the tube. This causes the central panels to fold over and form a double walled box with a double bottom. It is possible to squeeze the inner box into the outer box because even though the walls are upright, as opposed to tapered walls of my present invention, the corrugated board of which the box is made is about 85% air, having only $^{33}/_{1000}$ of an inch of actual paper in said corrugated board. The inner box is constricted at the corners and the air crushed out so that the outer box can be forced over the inner box as a tight fit.

The purposes for which the box of Patent 2,577,588 were intended did not encompass its reuse. The principle intended use was the storage of out-of-date office and legal records and the box was used with the one set of contents for many many years. The need for pulling this tightly wedged box apart was rare.

In my Patent 2,843,308 I disclose an improvement of this box in which the bottom is caused to interlock by means of openings cut into certain of the panels forming the bottom. The box of my Patent 2,843,308 served the same function as to the box of my Patent 2,577,588, except that the bottom was stronger due to the extension into the sides of the bottom panels. A box full of paper weighs about sixty pounds, and if the bottom is not strong, it will collapse.

In both of my prior patents, those panels forming the inner box are the same dimensions as those forming the outer box and the thickness of paper of the box is not accounted for. Considerable effort is required to force the cardboard to compress enough to permit the inner shell to telescope within the outer shell. The erected box is difficult to collapse back to its flat form.

In order to collapse or knock down the box, one man must grasp the hand holds of the outer shell with the bottom facing his chest while another man reaches into the open top and grasps the hand holds of the inner shell. They must then pull strongly in opposition until the tight wedging of the box sections is overcome and the shells pulled apart.

A carton of the present improved character is formed of a single blank of foldable sheet material such as corrugated solid paperboard, which is scored and cut as indicated in FIGURE 1. Substantially parallel to the top long edge **2** is a series of transverse score lines **3**. These lines, in conjunction with the longitudinal score lines *4a*, *4b* and *4c*, define a series of four substantially rectangular sections or panels **5**, **6**, **7** and **8**. The panels **5** and **7** are equal in size to each other. The panels **6** and **8** are also equal in size to each other, but may be more narrow than the panels **5** and **7**. The panel **6** has an opening **9** to form a hand hold, and the

panel **8** is provided with the similar opening **10**. These panels **5**, **6**, **7** and **8** are at the top of the blank and form the four sides of an inner tubular shell.

A series of transverse score lines **12** are parallel to the bottom edge **11** of the blank. Score lines **12**, in conjunction with longitudinal score lines **13***a*, **13***b* and **13***c*, define a second series of panels **14**, **15**, **16** and **17**. The longitudinal score lines **4***a* and **13***a* lie along common imaginary line **40***a*. Similarly, lines **4***b* and **13***b* lie along line **40***b* and lines **4***c* and **13***c* lie along line **40***c*. The panels **14** and **16** are wider than the panels **5** and **7**, and the panels **15** and **17** are wider than **6** and **8**. The panel **15** has an opening **18** and the panel **17** has a similar opening **19**. These panels **14–17** form the four sides of the outer tubular shell. The shell formed from the inner panels **5–8** is capable of fitting within the shell formed from the outer panels **14–17**.

Between the score lines **3** and **12** the blank is cut and scored to define a series of adjacent foldable connecting strips which comprise the floor or bottom of the erected carton. One connecting strip or portion consists of the sections **20** and **21** which are hinged along the center fold line **22**. The sections **20** and **21** are trapezoidal in shape, the long base of the trapezoid **20** coinciding with the long bottom edge of the panel **5**, and the long base of the trapezoid **21** coinciding with the long bottom edge of the panel **11**. A similar set of sections **23** and **24** are formed between the panels **7** and **16**, the sections **23** and **24** being hinged along the center fold line **25**.

The connecting strip between the panels **6** and **15** is substantially rectangular and consists of the sections **26** and **27** which are hinged centrally at **28**. A similar strip, consisting of the sections **29** and **30** hinged centrally together at **31**, is positioned between the panels **10** and **17**. Recesses **34***a* and **34***b*, cut into the fold lines **28** and **31**, respectively, perform the function of interlocking the various panels **20**, **21** and **23**, **24** with panels **26**, **27** and **29**, **30** to form the bottom, as will be described below.

The dimensions of the various panels and of the final box depends upon the use for which the box is intended. In one embodiment, the box is 12 inches wide, 15 inches deep and 10 inches high. Due to the precise measurements made possible by the truncated pyramid shape of the blank and the definite thickness of the corrugated (which ranges from ⅛ of an inch for B flute, to 3/16 of an inch for A flute) the box can be so closely planned that the inner walls of the box may slide with ease into the outer walls of the box without crushing. The collapsing of the box for reuse may easily be done by one person instead of two as with the previous forms of my box.

In the embodiment of FIGURE 1, the panels **5–8** are rendered smaller than panels **14–17** by laying out the blank with its fold lines **4***a*, **4***b* and **4***c* and **13***a*, **13***b* and **13***c* along lines **40***a*, **40***b*, **40***c*. The lines **40***a*–**40***e* meet at a distant finite vanishing point (not shown). The blank is laid out as an arcuate segment with an extremely long radius. In a common size of the erected box, namely, one about a cubic foot in volume, the vanishing point or radius is fixed at 125 feet distant. This slight taper is greatly exaggerated in the drawing of FIGURE 1, and the other figures, for clarity. It is this slight taper which allows the inner panels **5–8** to be smaller than panels **14–17**. The convergence of the lines **4***a*–**4***e* and **13***a*–**13***e* shown, again exaggerated, in FIGURE 3, showing the box when opened, but before it is fully erected.

After the blank has been scored and cut in the factory, as indicated in FIGURE 1, it is folded upon itself along the lines **12**, and is then folded transversely along the lines **4***a*–**4***c* and **13***a*–**13***c*. The hinged attachment flap **32** (on the end of panel **17**) is brought into overlapping engagement with the free edge of the panel **14**. This flap is then secured to this free edge by gluing, stapling, etc., and the resultant structure assumes the flattened condition shown in FIGURE 2. A similar flap may be used to fasten the free edges of the inner shell, if a stronger carton is desired. This completes the manufacturing procedure, which is relatively simple and inexpensive. In its flat condition shown in FIGURE 2, the carton may be stacked with others, packaged, readily transported, and stored.

The process of setting up the box by the user is illustrated in FIGURES 2–6. The first step is to open the assembled blank into the position shown in FIGURE 3, in which each shell assumes a tubular configuration having a rectangular cross section. The outer shell consists of the panels **14–17**, its lower edge being defined by the lines **12**. The inner shell consists of the panels **5–8**, its lower edge being defined by the lines **3**. Connecting these edges are the strips which, in FIGURES 2 and 3, lie adjacent to the respective panels which they unite.

The final step is setting up the structure as illustrated in FIGURES 4 and 5 and consists in telescoping the inner shell into the outer shell. During this movement, each trapezoidal strip **20** and **21** and **23** and **24** doubles inwardly upon itself. The rectangular strips of sections **26–27** and **29–30** slide into positions between the folded halves of the adjacent trapezoidal strips and are overlapped. Ultimately, the four folded trapezoidal strips lie in the interengaged relation shown in FIGURE 6. In this position the sections connecting the outer and inner shells form the floor in the container and provide the floor with a double layer of corrugated board.

The cut-out recesses **34***a* and **34***b* along fold lines **28** and **31** accommodate the edges **33** of the inwardly folding panel sections **20**, **21**, **23** and **24**, as is shown in FIGURE 4. These panel sections thus interlock with panel sections **26**, **27**, **29** and **30** to form an interlocked double bottom.

Upon completion of the setting-up operation there will be a registry of the openings **9** and **18** in one of the sides of the carton, and a corresponding registry of the openings **10** and **19** in the opposite sides. Each pair of registering openings affords a hand grip with which the carton may be grasped for lifting of transporting.

In the embodiment shown in FIGURE 1, the outer shell tapers outwardly and the inner shell tapers inwardly. There is no tight contact between the shells until the inner shell is telescoped wholly within the outer shell. Thus the carton is easy to erect and disassemble.

In the embodiment described above, the blanks result in sufficient clearance between the unitary inner and outer shells to permit erection and knock-down of the boxes without the effort required to force identically sized box sections to telescope. The resultant ease of assembly and disassembly permits the boxes to be repeatedly set up without strain on the cardboard. The easy collapsing of the box makes possible new uses for the box. For example as a factory tote box for transporting small parts from one department to another, and storing them. After the parts are removed from the box, the boxes are pulled flat and in a comparatively small package shipped back for another load of parts.

Although a box having four sides has been described, it is obvious that the invention has application to any polygonal box of four or more sides, such as rectangular, square, hexagonal and octagonal boxes.

I claim:

1. In a collapsible carton, nested inner and outer tubular shells each of which comprises adjacent panels with longitudinal hinge connections, said shells being axially movable into a telescoped overlying relationship in which the telescoped shells define a set of double walled carton sides, and a series of foldable panels transversely hingedly connected between the adjacent end edges of said shells, said foldable panels being adapted to interlock in a com-

mon transverse plane to define the floor of the carton when said shells are telescoped, said longitudinal hinge connections of the outer shell having axes lying on converging lines which if extended would meet in a finite vanishing point below the floor of the carton, whereby the upper edge of said outer shell defines an interior perimeter of said inner shell.

2. The collapsible carton as claimed in claim **1** wherein the longitudinal hinge connections of the inner shell have axes lying along converging lines which meet in a finite vanishing point above the upper edge of the carton.

3. A single piece blank of paperboard for a double walled carton comprising a plurality of inner shell panels lying along one edge of the blank and defined by longitudinal score lines, a plurality of outer shell panels lying along the opposite edge of the blank and defined by longitudinal score lines, and a plurality of separated bottom forming panels extending between said inner and outer shell panels and defined therefrom by transverse score lines, said longitudinal score lines of said inner panels converging toward a finite vanishing point lying beyond said one edge of the blank.

4. The single piece blank of paperboard as claimed in claim **3**, wherein said longitudinal score lines of said outer shell panels lie along lines convering toward a finite vanishing point lying beyond said one edge of the blank.

5. The blank as claimed in claim **4**, wherein said longitudinal score lines of said inner and outer shell panels lie along common lines converging toward a finite vanishing point lying beyond the top edge of said blank.

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