United States Patent [19]

Wozniacki et al.

[11] **3,863,831**

[45] **Feb. 4, 1975**

[54] **SHIPPING CARTON**

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[73] Assignee: **International Paper Company**, New York, N.Y.

[22] Filed: **Aug. 15, 1972**

[21] Appl. No.: **280,881**

[52] **U.S. Cl.** ..... **229/23 R**, 217/40, 217/42, 229/6 A, 229/DIG. 11, 229/DIG. 14

[51] **Int. Cl.** **B65d 13/04**

[58] **Field of Search** ..... 229/23 R, 23 BT, 23 A, 229/6 A, DIG. 14, DIG. 11, DIG. 2; 217/40, 42

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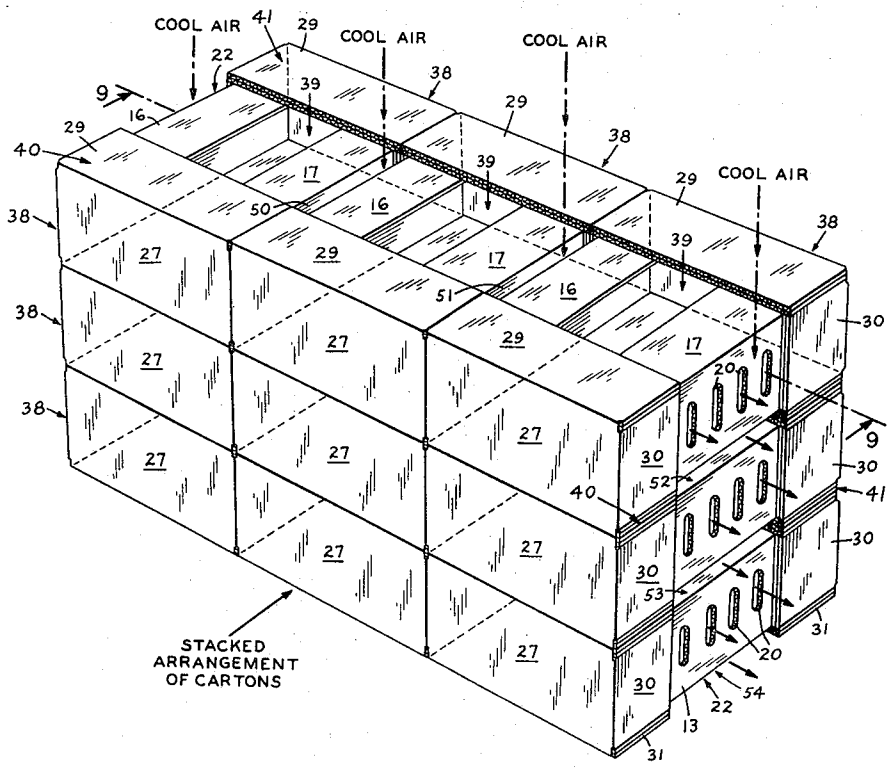
Primary Examiner—William I. Price
Assistant Examiner—Stephen P. Garbe
Attorney, Agent, or Firm—Lawrence W. Flynn

[57] **ABSTRACT**

A shipping carton for ventilating and/or cooling the carton contents during transit and/or cold storage comprising a body section open at each end, closure means for each open end and means attaching said closure means to the body section which wrap around the outer surface of the body section adjacent each open end to form on said body section a peripheral projection which defines on the outer surface of the body section an area which is recessed with respect to the projection. This recessed area is apertured in order to ventilate and cool the contents of the carton.

When a plurality of the cartons are stacked for shipment, the peripheral projections of adjoining cartons are aligned to thereby provide in the stacked shipping arrangement interconnected vertical and horizontal channels which extend throughout the shipping arrangement. The recessed areas of adjoining cartons cooperate to create these channels which surround the apertured portion of the body section and thus communicate with the carton apertures.

24 Claims, 10 Drawing Figures



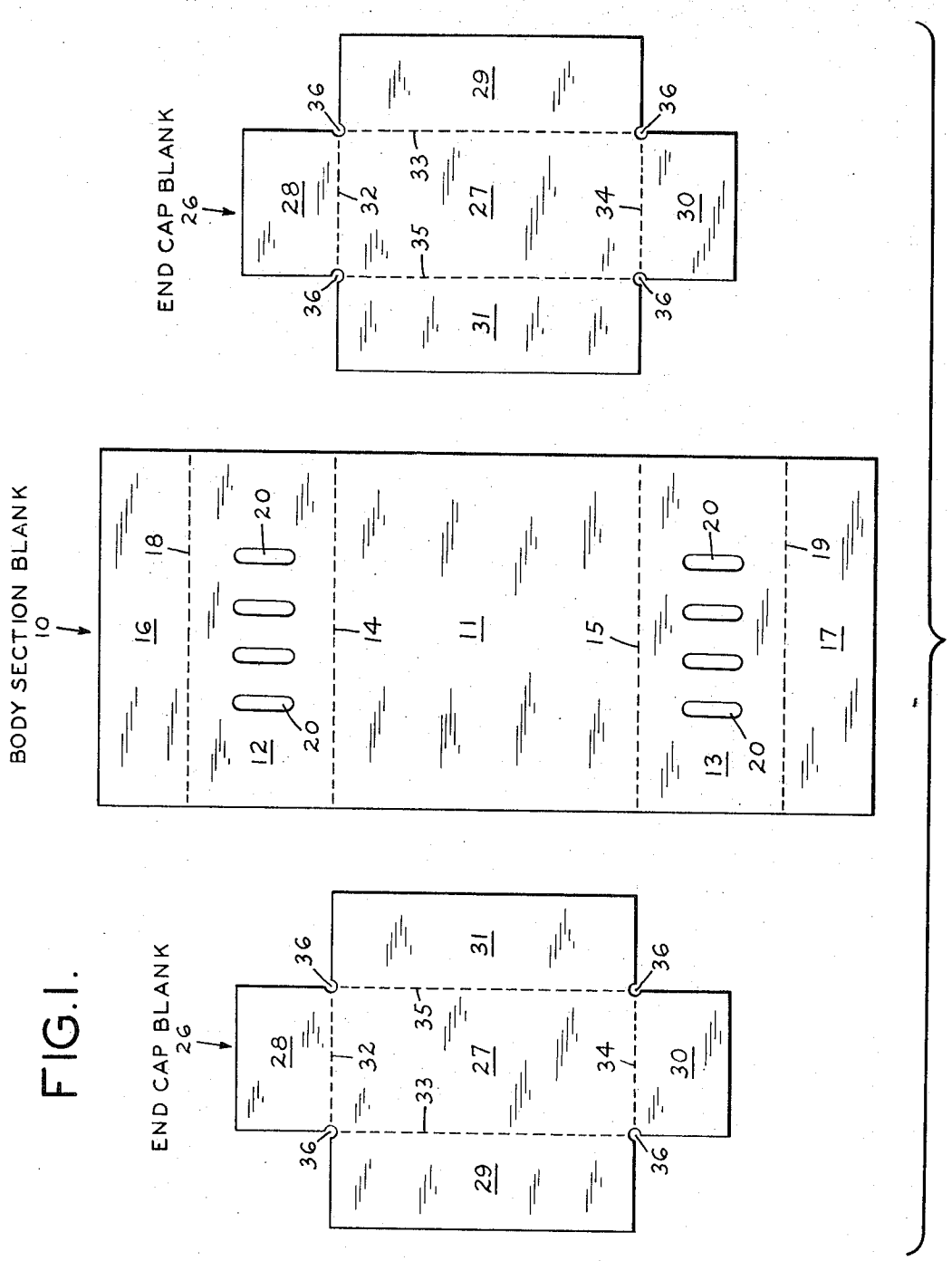

END CAP BLANK
26
BODY SECTION BLANK
10
END CAP BLANK
26
28
32
33
35
27
34
30
29
31
36
12
13
11
14
15
16
17
18
19
20

FIG. 1.

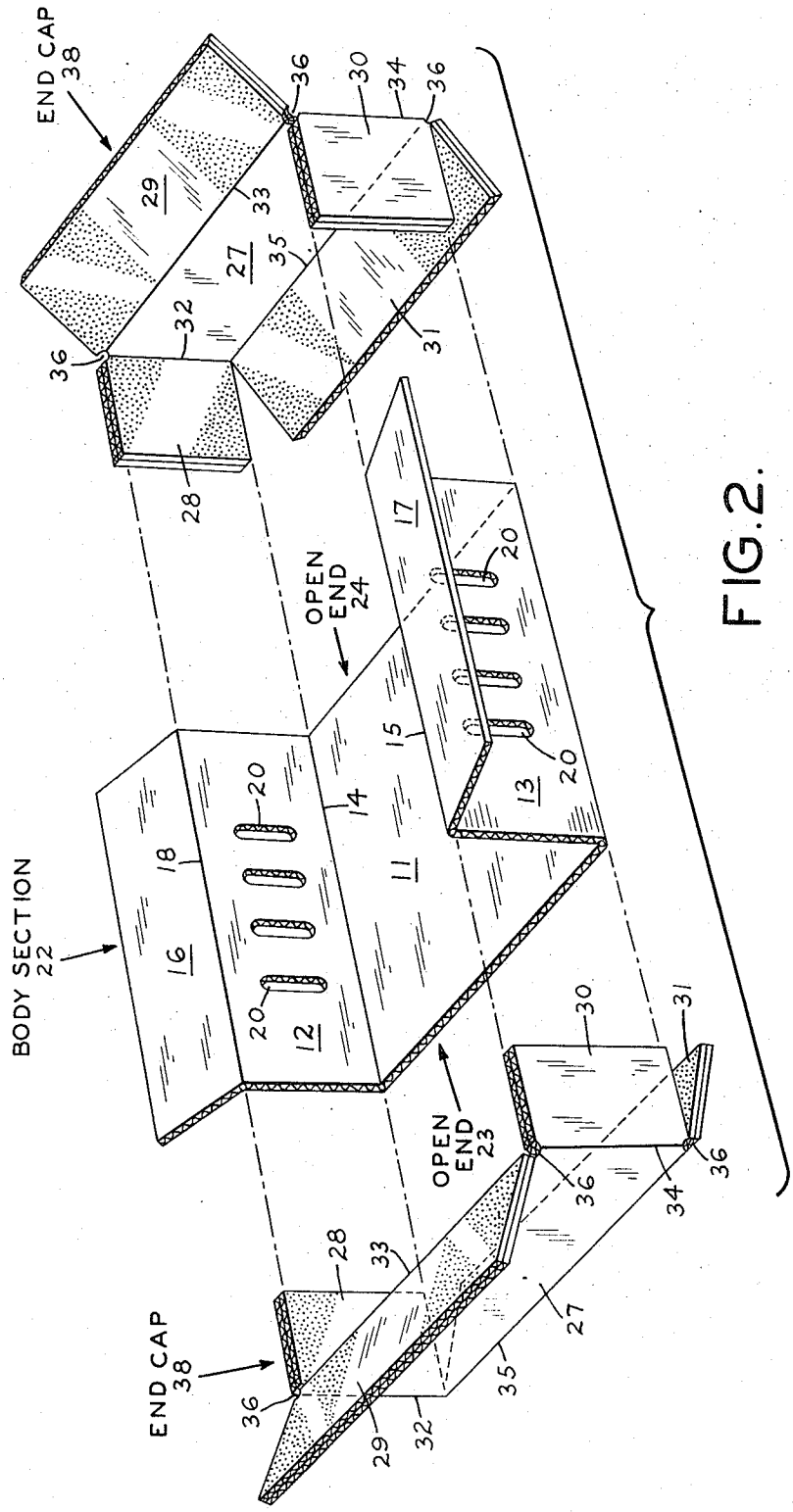

END CAP
38
BODY SECTION
22
OPEN END
24
OPEN END
23
END CAP
38
29
27
28
30
31
32
33
34
35
36
11
12
13
14
15
16
17
18
20

FIG. 2.

FIG. 3.

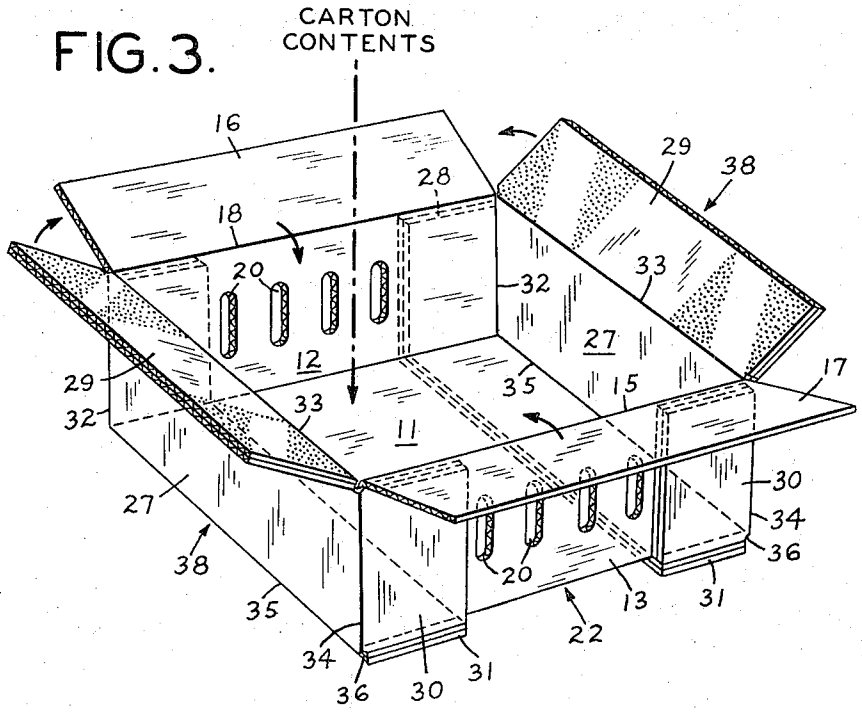

CARTON CONTENTS
16
18
28
29
38
20
32
33
27
12
35
15
17
29
32
33
11
30
34
36
27
38
20
13
31
35
22
34
36
30
31

FIG. 4.

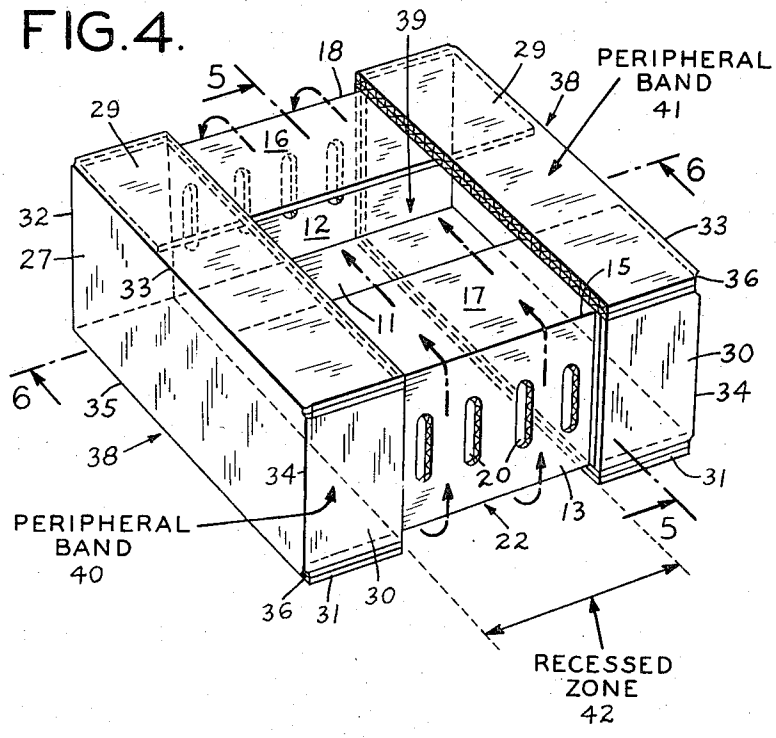

39
18
29
PERIPHERAL BAND 41
5
38
29
16
6
32
12
33
27
33
15
36
17
11
30
6
35
34
38
34
20
31
PERIPHERAL BAND 40
13
5
22
36
31
30
RECESSED ZONE 42

FIG.5.

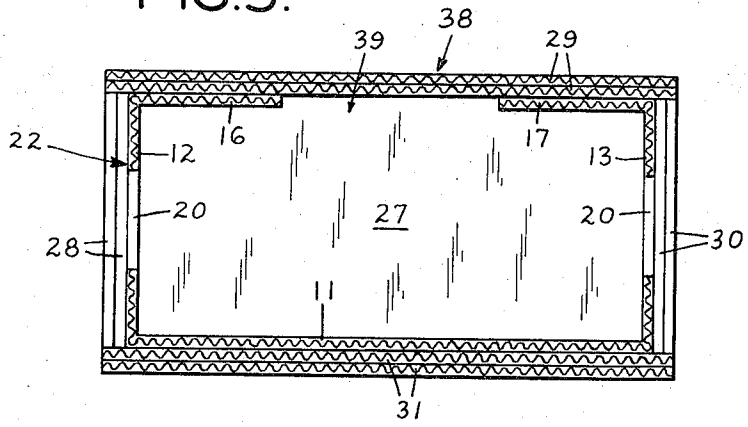


FIG.5A.

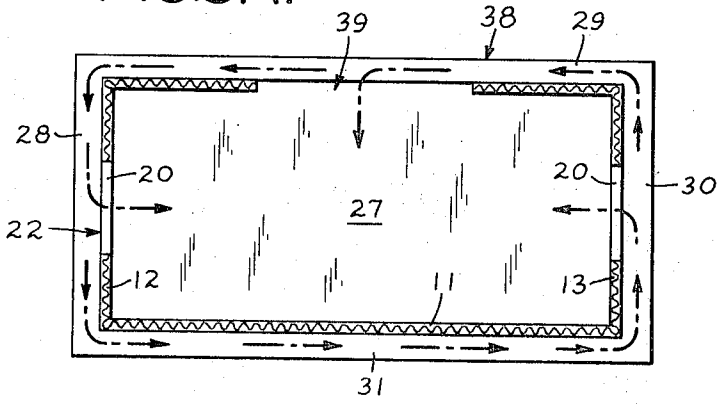


FIG.6.

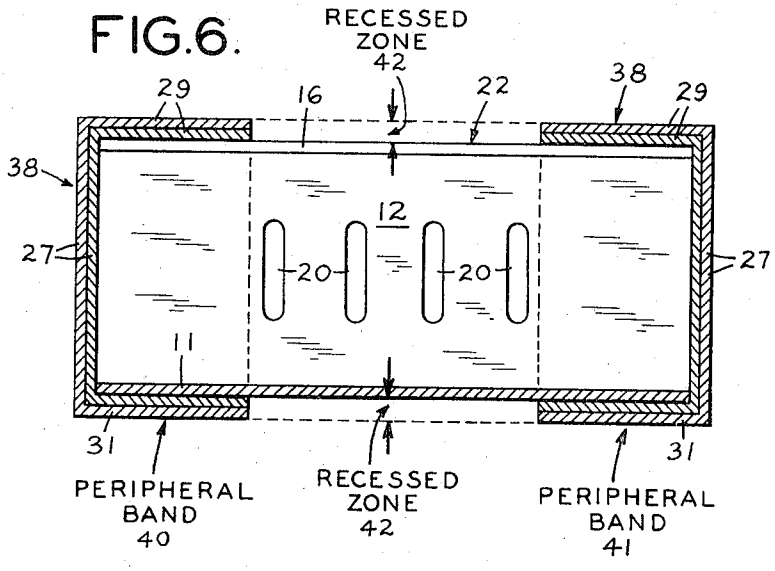


FIG.7.

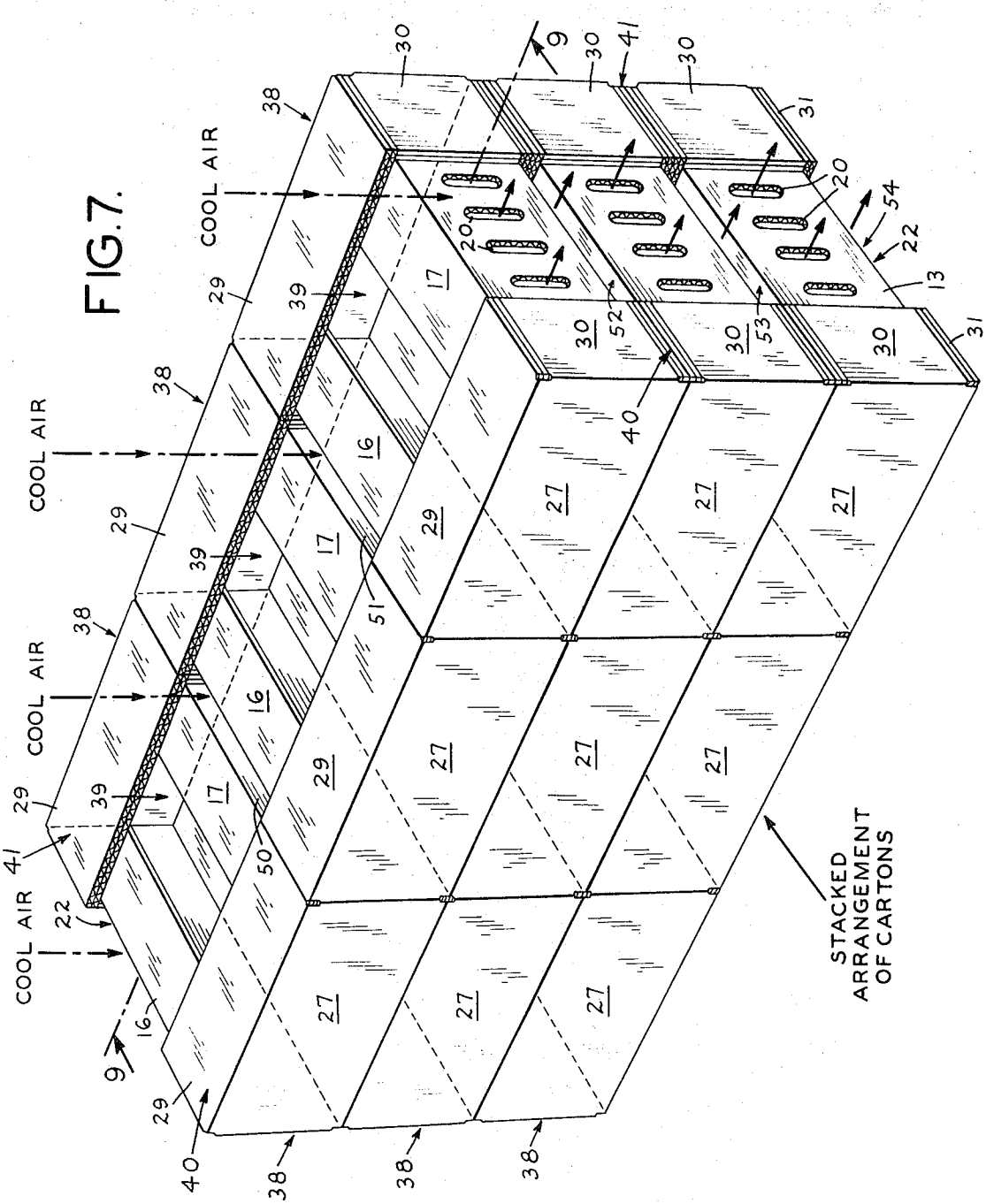

COOL AIR
COOL AIR
COOL AIR
COOL AIR
STACKED ARRANGEMENT OF CARTONS
9
9
30
31
38
39
40
41
50
51
52
53
54
20
22
27
29

FIG.8.

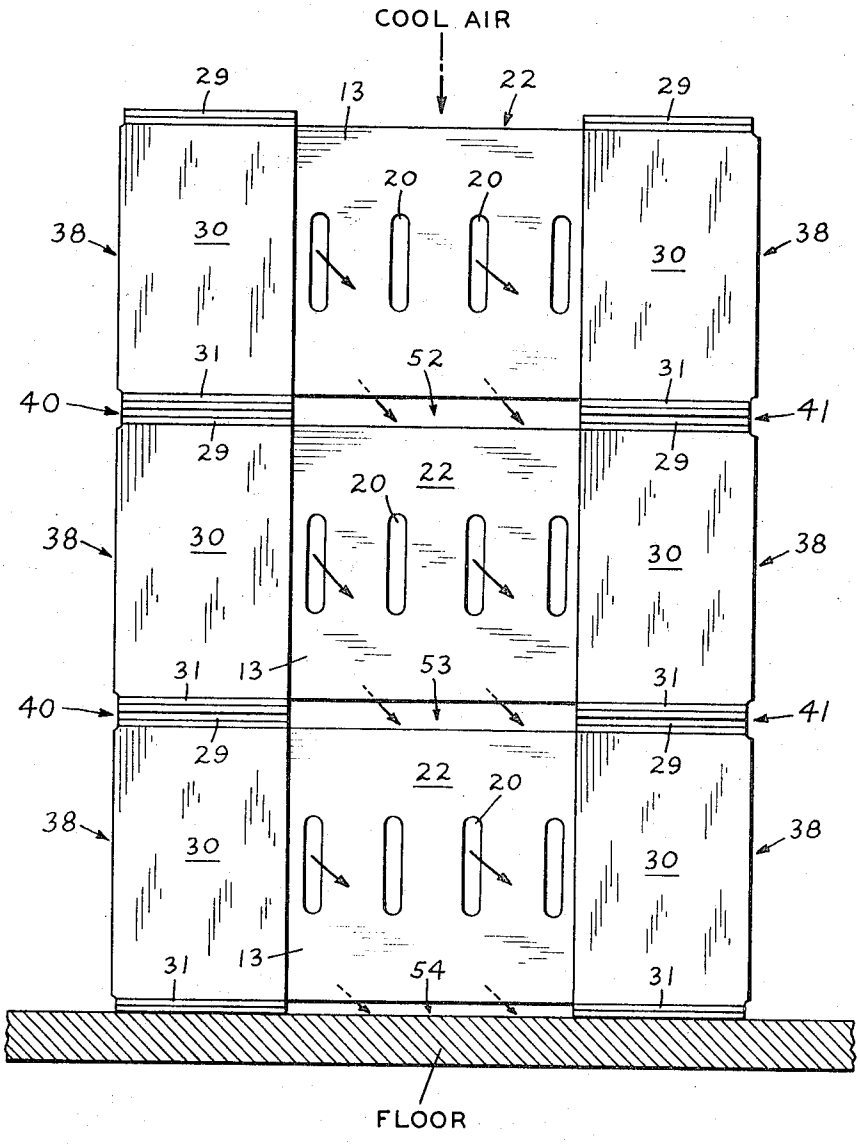
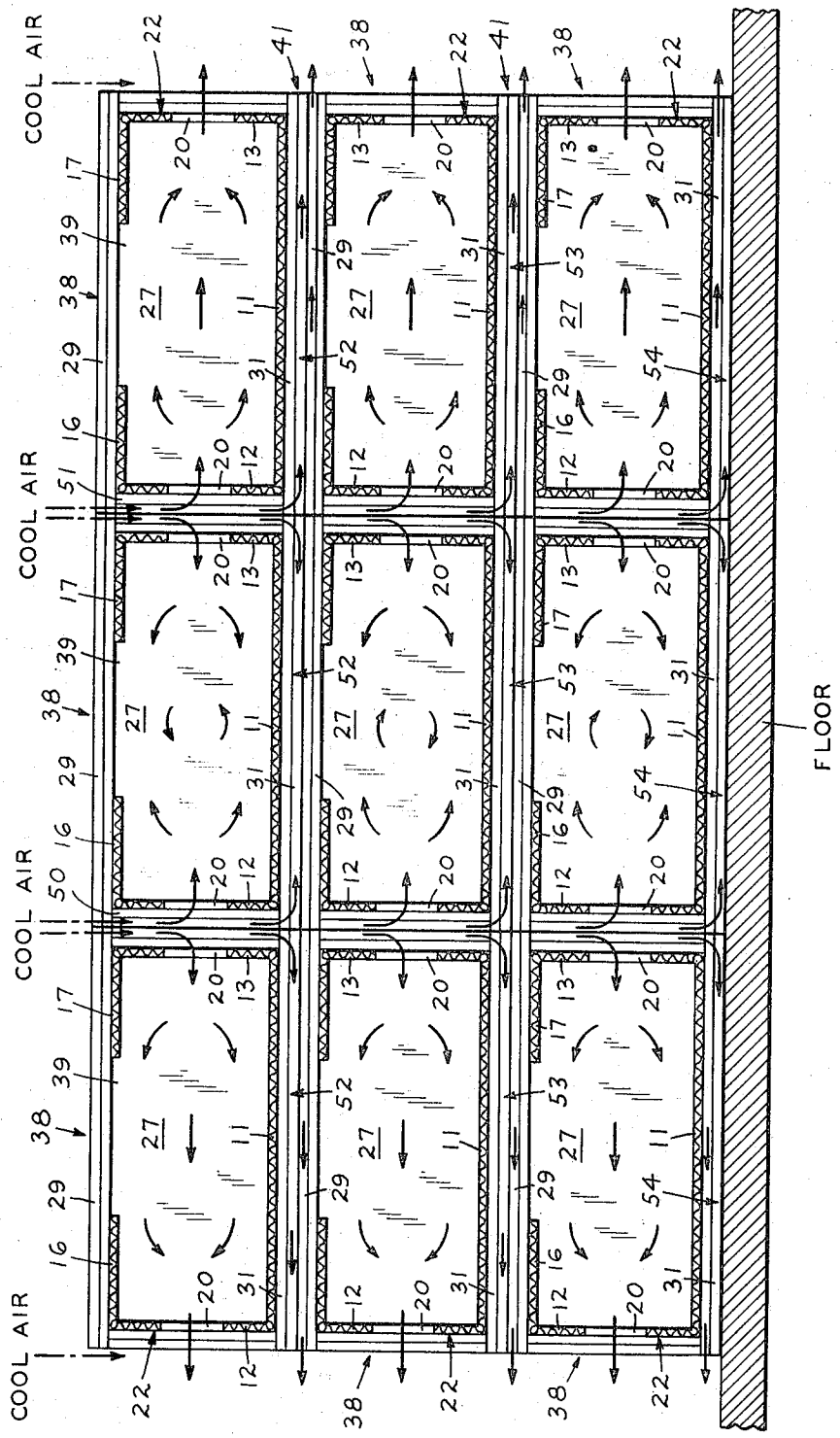

COOL AIR
29
13
22
29
20
20
38
30
30
38
31
52
31
40
41
29
29
20
22
38
30
30
38
31
13
53
31
40
41
29
29
22
20
38
30
30
38
31
13
54
31
FLOOR

FIG.9.



SHIPPING CARTON

BACKGROUND OF THE INVENTION

This invention relates to ventilated shipping cartons and more particularly to ventilated shipping cartons for transporting produce such as fruit, vegetables or the like which for any of a variety of reasons must be cooled or maintained at a certain temperature during transit.

It is known that many fruits and vegetables continue to respire and generate heat at different rates even after they have been harvested. This creates a problem when the produce must be shipped over long distances during which this heat continues to build up in the produce. The shipment of California produce to East Coast markets is a prime example of this. Certain fruits such as, for example, grapes, plums, cherries, apricots and nectarines are known to give off appreciable amounts of heat during transit. It is imperative that this heat be removed during transit and the produce maintained at a given temperature or else the produce will rot and spoil.

In normal practice, the produce is papckaged and then shipped in refrigerated railway cars or trucks which remove this heat and maintain the produce at a controlled temperature during shipment. Cold air from the transit refrigeration unit must be able to circulate easily through all of the produce load to remove the heat and thereby reduce the produce temperature to, and maintain it at, a desirable transit temperature. Poorly vented produce containers or shipping arrangements can prevent effective refrigeration from taking place.

In large loads of inadequately vented shipping containers, cold air from the refrigeration unit is largely prevented from moving down through a load of produce. Instead, much of the air moves around the load or seeks other more direct routes in returning to the refrigeration unit for further cooling. Air that by-passes the load of produce is not warmed by heat from the load and returns to the refrigeration thermostat with a false signal that the return air is cold and that the product temperature has been lowered to near the thermostat setting. Consequently, the thermostat then signals the refrigeration unit to provide even less refrigeration and air circulation to the load with subsequent adverse results.

In many cases, the produce is pre-cooled prior to loading it in transit vehicles and is then simply maintained at its pre-cooled temperature by the refrigeration unit of the vehicle. In other cases, the produce is not pre-cooled and is either cooled to a given temperature, or maintained at a given temperature, using the refrigeration unit of the transit vehicle.

When large loads of produce involving perhaps hundreds of cartons of fruit or vegetables are being transported, it is essential that the stacking arrangment used provide adequate channels whereby the refrigerated air can effectively permeate the stacking arrangement and remove sufficient heat to cool substantially all of the produce in the stack. Unless this occurs, hot spots can occur with resulting spoiling of the produce. It is generally known, therefore, that in loading produce cartons for transit, some spacing arrangement must be provided between them to create channels in the stacking arrangement through which the refrigerated air can

move. A variety of techniques have been used for this in the past, none of which are entirely satisfactory.

At the present time, the wooden lug box is widely used for the shipment of produce. This box is the common, slatted box with elongated apertures between the wood slats often seen in retail produce markets. To provide effective refrigeration of such boxes during shipment, a common practice is to place vertical and horizontal strips of wood between adjoining vertical and horizontal layers of these boxes to space them apart and thus provide the required channels for refrigerating the stacked boxes. These strips are commonly called "gates" or "car strips." Such spacer strips and other techniques used to space the cartons for shipment are generally referred to as "dunnage." The installation of dunnage is expensive and time-consuming. For example, the wood represents an added cost, and a substantial amount of labor is required to emplace the vertical and horizontal wooden strips. The boxes themselves do not have sufficient dunnage to achieve the required spacing. In addition to the dunnage problem associated with such boxes, they are generally more expensive than boxes prepared from other materials such as, for example, corrugated paperboard.

With the aforementioned disadvantages of the prior art in mind, it is a general object of this invention to provide an inexpensive but strong shipping carton which eliminates the dunnage requirements of prior art cartons yet still provides adequate ventilation and cooling for the produce during transit.

It is another object of this invention to provide a shipping carton having self-contained dunnage of such type as to virtually assure the maintenance of adequate channeling throughout a shipping arrangement, regardless of carelessness in assembling the arrangement or shocks to which the arrangement is subjected during transit.

It is another object of this invention to provide a ventilated shipping carton having self-contained dunnage as well as high end-to-end, torque and stacking strength.

It is still another object of this invention to provide a shipping carton having a smooth interior containing no sharp edges or rough surfaces against which the produce can rub, thus eliminating the need for packing materials such as liners, curtains or the like normally used in conventional cartons.

It is a further object of this invention to provide a ventilated shipping carton which is made from corrugated paperboard which has adequate strength and ventilation characteristics as well as self-contained dunnage which is also made from corrugated paperboard.

It is a still further object of this invention to provide a shipping carton in which carton bottom sag is reduced by providing firmer support for each end of the load bearing panel of the carton.

These and other objects of this invention will be apparent to one skilled in the art from a consideration of this entire disclosure including the accompanying drawings.

SUMMARY OF THE INVENTION

The above objectives are accomplished, in accordance with this invention, by providing a shipping carton having a body section for holding the carton contents which is at least partially open at opposed ends

thereof and means closing each of these open ends which further include portions for spacing the carton from adjoining cartons in a shipping arrangement containing a plurality of such cartons. These spacing portions provide substantially vertical and horizontal channels in the shipping arrangement which are maintained throughout transit to provide access for the refrigerated air to substantially every carton in the arrangement.

More particularly, each open end of the body section is covered by a closure panel which includes means for attaching the closure panel to the body section. These attachment means engage the outer surface of the body section adjacent the open end of the body section and form thereon a zone of peripheral projections which space the remainder of the carton, on all sides, from adjoining cartons in a stacked arrangement of the cartons. In such an arrangement, the peripheral projections of adjoining cartons will normally be aligned. These projections in turn define on the outer surface of the body section a peripheral zone or area which is recessed with respect to these projections. This recessed zone is apertured to provide communication between the interior and exterior of the body section.

In a stacked arrangement of the cartons, the apertured portion of the body section is suspended between the peripheral projections at each end of the carton and is effectively spaced from any portion of the adjoining carton by the contact of the peripheral projections with those of adjoining cartons. The recessed zone of the body section of each carton cooperates with the recessed zone of the adjoining cartons to create intercommunicating vertical and horizontal channels throughout the shipping arrangement, portions of which surround the apertured portion of the body section and communicate with the carton apertures. When refrigerated air is passed through these channels, it is effectively distributed throughout the entire shipping arrangement and through the interior of each carton to insure effective ventilation and cooling of each carton in the arrangement.

It has been found that in order to provide adequate distribution of aperture area in the recessed zone of the carton to effectively cool the entire carton contents and avoid isolated hot spots in the carton interior, it is desirable for the area of the recessed zone of the body section to occupy at least about 33 percent of the surface area of the body section, including that disposed beneath said projections. On the other hand, to facilitate proper carton alignment and spacing in a shipping arrangement involving numerous cartons, it has been found desirable for the area of the recessed zone to not exceed about 75 percent of the surface area of the body section, including that disposed beneath said projections. Stated another way, it is desirable that the peripheral projections provide sufficient flat area for the cartons to remain aligned when the shipping arrrangement is subjected to impact or other shocks, as well as to provide for easy assembly of the shipping arrangement without the need for a fastidious alignment of the projections. Another reason for generally not permitting the recessed area to exceed 75 percent is that carton sag may result. The recessed area is suspended between and supported by the peripheral projections. Since the distance between these projections normally increases as the recessed area increases, the length of the unsupported recessed area will likewise increase, with greater probability of its sagging under a heavy load.

Since only the recessed portion of the carton's body section is normally accessible to the refrigerated air in a shipping arrangement, the carton apertures are provided in this recessed portion. It has generally been found that to provide minimal adequate ventilation and cooling, the total area of the apertures should occupy at least about 10 percent of the surface area of the recessed area. On the other hand, an excessive aperture area could cause the box to lose too much of its "end-to-end" strength thus rendering it vulnerable to collapse on impact. Moreover, if the carton was apertured on its bottom, excessive apertures could create a sag problem by weakening the bottom panel. Thus, it has been found that the area of ventilation apertures should not exceed abouot 50 percent of the surface area of the recessed zone of the body section.

It will be appreciated, of course, that the above mentioned percentages of recessed area and aperture area are a function of the carton proportions and accordingly will vary as these proportions vary. The term "surface area" when used in conjunction with the body section or recessed zone of the carton means the inner surface area of the respective portion of the carton.

Certain embodiments of the carton of this invention were described by F. G. Mitchel, et al. in an article entitled "Cooling Trials With Plastic Tray Pack Nectarines In Various containers," *California Agriculture*, September 1971, pages 13–15. This article discusses some of the problems encountered in ventilating and refrigerating produce during shipment and details favorable experimental results obtained with the cartons of this invention as compared to various other types of shipping cartons.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the three blanks used to prepare a preferred embodiment of the shipping carton of this invention.

FIG. 2 is a perspective view showing the blanks of FIG. 1 in a partially assembled position, with the three components of the carton not yet joined together to form a single carton.

FIG. 3 is a perspective view of the assembled carton of FIG. 2 with its top open to facilitate the loading of the carton.

FIG. 4 is a perspective view of the assembled carton of FIG. 3; the arrows show gas flow around the carton.

FIG. 5 is a sectional view taken generally along the line 5—5 of FIG. 4.

FIG. 5A is a view identical to FIG. 5 except a portion thereof is shown schematically in order to better illustrate the recessed zone of the carton and the encircling channel for gas flow (arrows) provided by said recessed zone.

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 4.

FIG. 7 is a perspective view of a stacked shipping arrangement employing a plurality of the cartons of FIG. 4.

FIG. 8 is a side elevational view of the shipping arrangement of FIG. 7.

FIG. 9 is a sectional view taken generally along the line 9—9 of FIG. 7, and is intended to illustrate schematically the flow pattern of cool air (arrows) through the horizontal and vertical flow channels created in the

shipping arrangement of FIG. 7 by the cooperating recessed zones of adjoining cartons.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The Individual Carton

A preferred embodiment of the shipping carton of this invention is depicted in FIGS. 1–6. The carton is conveniently prepared from three blanks, as shown in FIG. 1. The central body section blank 10 comprises an unapertured bottom panel 11 and two apertured wall panels 12 and 13, each of which is foldably attached to opposed edges of bottom panel 11 by score lines 14 and 15, respectively. Shortened top flaps 16 and 17 are foldably attached to wall panels 12 and 13, respectively, along respective score lines 18 and 19.

Wall panels 12 and 13 contain a plurality of vertically elongated ventilation apertures 20 which are circular at each end thereof. These apertures are generally disposed centrally between score lines 14–18 and 15–19, respectively. The number and geometric configuration of apertures 20 can vary depending upon the type and degree of carton ventilation required.

As shown in FIG. 2, body section blank 10 is assembled by folding panels 12 and 13 upward along score lines 14 and 15 to form a rectilinear body section 22 whose opposed ends (shown generally at 23 and 24) are open because only two wall panels (12, 13) were provided instead of the four wall panels normally encountered in most cartons. Body section 22 can, of course, take on any geometrical form which is required to accommodate the contents of the carton, or for other reasons. Top flaps 16 and 17 are folded outwardly, as shown in FIG. 2, to provide access to the interior of body section 22 from the top of the carton.

Returning to FIG. 1, two identical end cap blanks 26 are provided for closing the open ends 23, 24 of body section 22 to retain the carton contents therein during transit. Each blank 26 comprises a central closure panel 27 and four extension panels 28, 29, 30 and 31, each of which is foldably attached to an edge of panel 27 by score lines 32, 33, 34 and 35, respectively. Each corner of panel 27 is provided with a relief cut-out 36 which allows extension panels 28–31 to be folded substantially vertically away from panel 27, to form an end cap member 38 for open ends 23, 24 of body section 22 (see FIG. 2). Cap members 38 can be joined to body section 22 in any convenient manner such as by coating the inner surface of panels 28, 30 and 31 with an adhesive (as represented by the dotted area in FIG. 2) and then applying cap member 38 externally over the outer surface of body section 22 until the edges of wall panels 12, 13 engage closure panel 27. It is thus seen that open ends 23, 24 of body section 22 are closed by panel 27 of cap member 38 and that panel 27 is held in place by panels 28, 30 and 31 which form a U-shaped band around panels 11, 12 and 13 of body section 22.

FIG. 3 shows the carton with the two cap members 38 affixed to each end of body section 22 with top flaps 16 and 17, as well as extension panels 29 of cap member 38 folded outwardly to facilitate the loading of produce or other contents into the carton. As soon as the carton is loaded, flaps 16 and 17 are folded inwardly to cover the carton contents and extension panels 29 are then folded on top of flaps 16 and 17 and affixed thereto in any convenient manner such as by the application of an adhesive to the inner surface of panel 29 (as represented by the dotted area in FIG. 3). The carton is thus sealed and ready for shipment. Because flaps 16 and 17 are shortened, there is provided a view space 39 for quickly checking the condition of the contents. Of course, in certain cases, flaps 16 and 17 could be eliminated or replaced by a single top flap. In certain other cartons, the view space can be eliminated by proper sizing of the top flap or flaps.

Referring to FIG. 4, it is seen that panels 28–31 of cap member 38 vertically extend from panel 27 so that cap member 38 forms a rectilinear cup-like member which externally fits over each end of body section 22. Panels 28–31 are affixed to the outer surface of body section 22 and form a peripheral band which slides over the outer surface of body section 22 at each open end to hold closure panel 27 in place. The two peripheral bands at each end of the body section, generally designated as 40 and 41, each form a peripheral projection on the outer surface of body section 22 which extends around the entire body section 22. These projections define on the outer surface of the body section 22 a zone, generally identified as 42, which also extends peripherally around the body section 22 but which is recessed with respect to peripheral bands 40 and 41. It is seen that the apertures 20 are provided in this recessed zone 42. As shown in the drawings, apertures 20 are provided only on opposed wall panels 12, 13. However, they could also be provided either on bottom panel 11 and/or top flaps 16, 17 or they could be provided on all of the panels which form the recessed zone. Preferably, however, only the wall panels 12, 13 are apertured.

As already discussed, it is desirable that recessed zone 42 occupy at least 33 percent but not more than 75 percent of the surface area of body section 22. Preferably, recessed area 42 occupies from about 40 to about 60 percent of the surface area of body section 22, and even more preferably from about 40 to 50 percent. It is equally desirable that the apertures in recessed zone 42 not occupy a total aperture area less than about 10 percent nor greater than about 50 percent of the surface area of the recessed area 42. Preferably, the apertured area occupies about 15 to 25 percent of the surface area of the recessed area 42.

The preferred fabrication material for both cap members 38 and body section 22 is corrugated paperboard, although other conventional and known fabrication materials can also be used. Corrugated paperboard is preferred because it has been found to provide the requisite strength requirements for a produce shipping carton and because it is relatively inexpensive and readily available. The body section 22 is preferably fabricated from single-wall corrugated paperboard typically having a thickness on the order of about one-eighth inch. For the strongest carton, the flutes of body section 22 should extend longitudinally between peripheral bands 40 and 41 as shown in FIG. 5. Cap members 38 are preferably fabricated from double-wall corrugated paperboard having a thickness in the range of about one-fourth inch. However, thicknesses in excess of one-fourth inch can also be used for cap members 38, and generally thicknesses in the range of between one-fourth inch and seven-sixteenths of an inch or even higher are acceptable. Cap member 38 is preferably fabricated so that the flutes of panels 28 and 30 extend from top to bottom in the carton, perpendicular to the

flutes of body section **22**, to impart added stacking strength, as shown in FIG. **2**.

The carton of this invention has extremely good strength characteristics and high torque resistance. Its stacking strength and end-to-end strength, for example, have been generally found to be quite satisfactory and generally comparable to previously used shipping cartons. The high strength of the carton is believed largely due to the fact that extension panels **28–31** are integral with enclosure panel **27** so as to provide very stiff corners in cap member **38.** Extension panels **29** and **31** are disposed so their outer edges are aligned with substantially the entire cross section of adjoining extension panels **28** and **30.** This provides added support strength for panels **29** and **31** when the carton is placed in a stacked shipping arrangement, and prevents panels **29** and **31** from collapsing inwardly into the carton contents.

As best seen in FIG. **4,** a recessed zone **42** is provided between peripheral end bands **40** and **41.** Since bands **40** and **41** extend about the entire periphery of the carton, the body section is similarly recessed about its entire periphery. The advantage of this, as will be discussed more fully hereinbelow, is that intercommunicating vertical and horizontal channels are provided in stacking arrangements using the carton of this invention. These channels distribute cool air to virtually every carton in the shipping arrangement.

The carton of this invention can be modified in accordance with various known techniques for improving the wet strength or other characteristics of the carton. This becomes important when the contents are to be shipped in a moistened condition. For example, it has found especially advantageous to improve the wet strength of the corrugated paperboard cartons of this invention in accordance with procedures such as those described in commonly assigned U.S. application Ser. No. 54,201, filed July 13, 1970, now issued as U.S. Pat. No. 3,695,219.

The surfaces of the corrugated paperboard used to prepare the carton of this invention can also be coated with any of a variety of known materials or compositions for imparting wet strength to the paperboard. For example, the surfaces can be coated with various types of waterproofing waxes in accordance with known techniques and procedures.

The Cartons In A Stacked Shipping Arrangement

The unique cooling and ventilation provided by the shipping carton of this invention, when placed in a multi-carton stacked arrangement for transit, is illustrated in FIGS. **7–9.** The Figures show three vertical columns and three horizontal columns of the carton in a shipping arrangement wherein the spacing peripheral bands **40, 41** of each carton in the arrangement are in alignment with the spacing peripheral bands **40, 41** of adjoining cartons in the shipping arrangement. This alignment of spacing bands **40, 41** provides a plurality of interconnected vertical and horizontal channels formed from the cooperating recessed zones of adjoining cartons, as best seen in FIG. **9,** which effectively circulate the cool air throughout the entire shipping arrangement.

Referring in particular to FIG. **9,** it is seen that cool air enters the shipping arrangement from the top and proceeds downwardly through the arrangement by means of vertical channels **50** and **51** which extend substantially throughout the entire shipping arrangement from top to bottom. Communicating with vertical channels **50, 51** are the wall apertures **20** of each individual carton in the arrangement and horizontal channels **52, 53** and **54** which also extend laterally throughout substantially the entire shipping arrangement. As the cool air enters channels **50, 51** from the top of the arrangement it passes downwardly into the shipping arrangement through the channels and then is diverted laterally, as indicated by the arrows in FIG. **9,** either through apertures **20** of adjoining cartons or through horizontal channels **52–54.** As the cool air passes through apertures **20** into the interior of the cartons, it contacts the contents and removes unwanted heat to maintain the produce at a desired cool temperature. Thus the contents of the cartons are cooled by air which enters and leaves through apertures **20** while the exteriors of the cartons are bathed in a stream of cool air which is flowing through vertical channels **50, 51** and horizontal channels **52–54.** Even though the bottom most horizontal layer of the shipping arrangement rests on the floor, the peripheral bands **40, 41** of these cartons provide a horizontal channel **54** under the body section of the cartons which insures a flow of cool air across the bottom of these cartons.

It is thus seen that the cool air cools both the inside and outside of virtually every carton in the shipping arrangement. There are, therefore, no isolated hot spots or pockets in the shipping arrangement which are not adequately cooled and which could otherwise cause rotting or spoiling of the produce.

After the cool air has effectively passed through the shipping arrangement by means of vertical channels **50, 51** and horizontal channels **52–54,** the heat associated with the produce has been removed with a consequent increase in the temperature of the cool air. The spent air is then returned to the refrigeration unit and thermostat at a higher temperature which is truly indicative of any need for further cooling in the shipping arrangement. Thus, the thermostat functions properly to insure cooling the recycled air to just the right temperature for effective cooling.

It can be seen from FIGS. **7–9** that peripheral bands **40, 41** of each carton serve several purposes. First, they join end closure panel **27** to body section **22** to close off the opposed open ends **23, 24** of central body section **22.** Secondly, by creating peripheral projecting bands **40, 41** on the surface of body section **22,** they provide carton spacing means or dunnage which forms an inherent part of the carton and thus eliminate the time and effort normally required to install vertical and horizontal wooden strips between adjoining columns of cartons in a conventional shipping arrangement.

The dimensions of extension panels **28–31** also provide a relatively large area of contact between adjoining peripheral bands **40, 41.** For example, for the embodiment shown in the drawings, the panels **28–31** extend inwardly from panel **27** about 4–4 ½ inches. This is an advantage for several reasons. First, it makes initial stacking of the cartons easier because precise alignment of the peripheral bands is not required to insure the carton spacing which creates channels **50–54** throughout the shipping arrangement. It can be appreciated that if bands **40, 41** were very thin, initial preparation of the stack could be quite time consuming in order to obtain proper alignment of the bands. Secondly, the broadened area of surface contact allows for more slippage of the cartons in the arrangement

with respect to each other, upon subjection to impact or other disorienting forces, without bands **40, 41** becoming disengaged to the extent that channels **50–54** become blocked. If these bands were very thin, it can be seen that it would not take much impact to cause adjoining bands **40, 41** to disengage and block channels **50–54.** Thirdly, bottom panel **11** is considerably strengthened by reducing its unsupported central span by moving its two end support points closer together. This reduces undesirable sag of panel **11** under the weight of the carton contents.

An important advantage of the carton is that strengthened bands **40, 41** in conjunction with the ends of wall panels **12, 13** bear the weight of cartons above them in the stacking arrangement thus insuring that the suspended portion of central body section **22** is spared this weight bearing function.

As can now be appreciated, the shipping carton of this invention is equipped with self-contained dunnage and can be quickly and conveniently stacked into a shipping arrangement without the use of conventional dunnage. Moreover, there is the assurance that adequate channels for circulation of cool air through the arrangement will be maintained even if the arrangement is subjected to impacts during transit which cause some movement of the cartons. The carton of this invention is further enhanced by the fact that it can be fabricated from relatively inexpensive corrugated paperboard but yet has strength characteristics comparable to commonly used commercial cartons.

The specific and detailed information given above is intended as illustrative only and such modifications and alterations thereof as would be apparent to one skilled in the art are deemed to fall within the scope and spirit of the claims appended hereto.

What is claimed is:

1. A carton open at its top for loading comprising a central body section open at its top having a bottom panel and two side wall panels attached to opposed edges of the bottom panel; end wall panels at each end of the body section having attached thereto four extension panels; a first extension panel joined to the outer surface of the bottom panel in face-to-face relationship therewith, second and third extension panels joined to the outer surfaces of the two side wall panels in face-to-face relationship therewith; the first extension panel disposed beneath the bottom edges of the second and third extension panels with the second and third extension panels resting on the first extension panel; a movable fourth extension panel adapted to overlie the top edges of the second and third extension panels; the extension panels joined to the body section at each end thereof having between them an apertured zone in the body section occupying about 33 to 75 percent of the surface area of the body section.

2. The carton of claim **1** wherein the apertured zone occupies about 40 to 60 percent of the surface area of the body section.

3. The carton of claim **1** wherein the apertured zone occupies about 40 to 60 percent of the surface area of the body section and the apertured area occupies about 10 to 25 percent of the surface area of the apertured zone.

4. A carton open at its top for loading comprising a central body section open at its top having a bottom panel, two side wall panels attached to opposed edges of the bottom panel and at least one top panel attached to a side wall panel, said at least one top panel adapted to overlie the carton interior; end wall panels at each end of the body section having attached thereto four extension panels; a first extension panel joined to the outer surface of the bottom panel in face-to-face relationship therewith, second and third extension panels joined to the outer surfaces of the two side wall panels in face-to-face relationship therewith; the first extension panel disposed beneath the bottom edges of the second and third extension panels with the second and third extension panels resting on the first extension panel; a movable fourth extension panel adapted to overlie said at least one top panel and top edges of the second and third extension panels; the extension panels joined to the body section at each end thereof having between them an apertured zone occupying about 33 to 75 percent of the surface area of the body section.

5. The carton of claim **4** wherein a top panel is attached to each side wall panel.

6. The carton of claim **4** wherein a top panel is attached to each side wall panel, said top panels adapted to cover in combination only a portion of the top of the carton.

7. The carton of claim **4** wherein the apertured zone occupies about 40 to 60 percent of the surface area of the body section and the apertured area occupies about 10 to 25 percent of the surface area of the apertured zone.

8. A top loading carton comprising a central body section open at its top having a bottom panel and two side wall panels attached to opposed edges of the bottom panel; end wall panels at each end of the body section having attached thereto four extension panels; a first extension panel joined to the outer surface of the bottom panel in face-to-face relationship therewith, second and third extension panels joined to the outer surfaces of the two side wall panels in face-to-face relationship therewith; the first extension panel disposed beneath the bottom edges of the second and third extension panels with the second and third extension panels resting on the first extension panel; a fourth extension panel resting on the top edges of the second and third extension panels; the four extension panels forming at each end of the body section an exterior band about the periphery of the body section, the bands defining between them a recessed apertured zone about the periphery of the body section; said recessed zone occupying about 33 to 75 percent of the surface area of the body secction.

9. The carton of claim **8** wherein the recessed apertured zone occupies about 40 to 60 percent of the surface area of the body section.

10. The carton of claim **8** wherein the recessed apertured zone occupies about 40 to 60 percent of the surface area of the body section and the apertured area occupies about 10 to 25 percent of the surface area of the apertured zone.

11. A stacking arrangement comprising a plurality of cartons, as individually described in claim **10,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

12. A top loading carton comprising a central body section having a bottom panel, two side wall panels attached to opposed edges of the bottom panel and at

least one top panel attached to a side wall panel along only one edge; end wall panels at each end of the body section having attached thereto four extension panels; a first extension panel joined to the outer surface of the bottom panel in face-to-face relationship therewith, second and third extension panels joined to the outer surfaces of the two side wall panels in face-to-face relationship therewith; the first extension panel disposed beneath the bottom edges of the second and third extension panels with the second and third extension panels resting on the first extension panel; a fourth extension panel overlying the said at least one top panel and resting on the top edges of the second and third extension panels; the four extension panels forming at each end of the body section an exterior band about the periphery of the body section, the bands defining between them a recessed apertured zone about the periphery of the body section; said recessed zone occupying about 33 to 75 percent of the surface area of the body section.

13. The carton of claim **12** wherein a top panel is attached to each side wall panel.

14. The carton of claim **12** wherein a top panel is attached to each side wall panel, said at least one top panel covering only a portion of the top of the carton.

15. A stacking arrangement comprising a plurality of cartons, as individually described in claim **14,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

16. The carton of claim **12** wherein the recessed apertured zone occupies about 40 to 60 percent of the surface area of the body section.

17. A stacking arrangement comprising a plurality of cartons, as individually described in claim **16,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

18. The carton of claim **12** wherein the apertured area occupies about 10 to 50 percent of the surface area of the recessed apertured zone.

19. The carton of claim **12** wherein the recessed apertured zone occupies about 40 to 60 percent of the surface area of the body section and the apertured area occupies about 10 to 25 percent of the surface area of the apertured zone.

20. A stacking arrangement comprising a plurality of cartons, as individually described in claim **19,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

21. The carton of claim **12** wherein the extension panels are adhesively joined to the body section.

22. A stacking arrangement comprising a plurality of cartons, as individually described in claim **21,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

23. A stacking arrangement comprising a plurality of cartons, as individually described in claim **8,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

24. A stacking arrangement comprising a plurality of cartons, as individually described in claim **12,** said cartons disposed in an arrangement wherein the exterior bands of a carton abut the exterior bands of one or more adjoining cartons to provide channels in the arrangement communicating with the apertured recessed zone of the central body section of the cartons.

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