



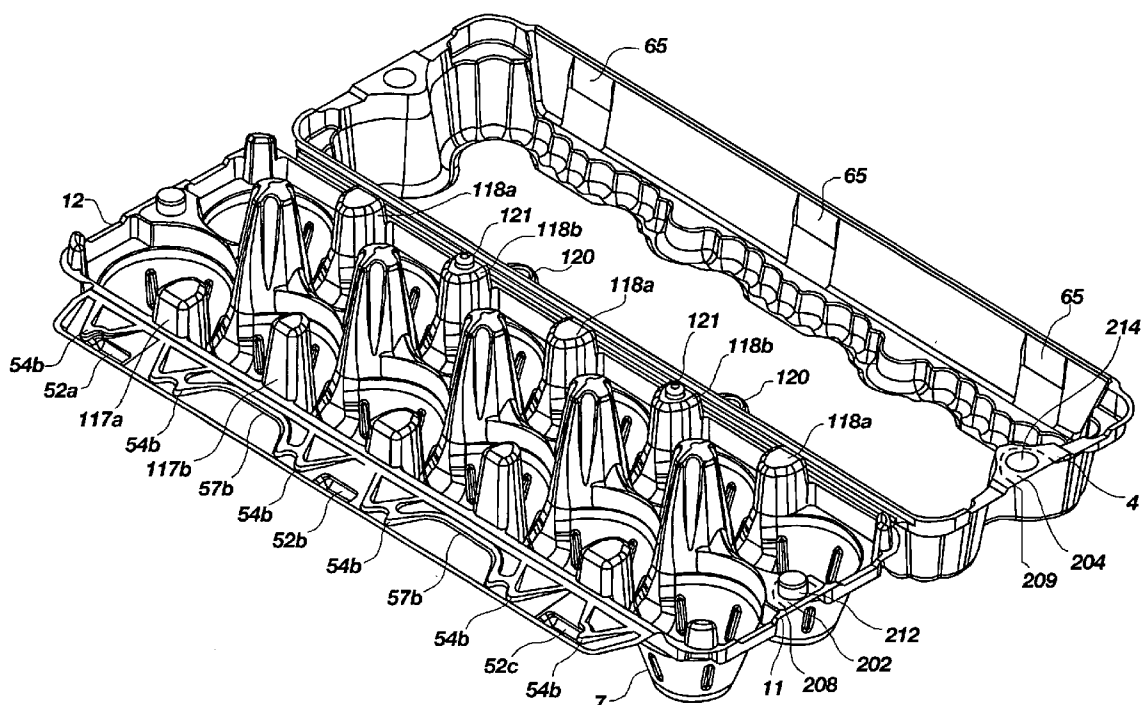
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(19) **United States**(12) **Patent Application Publication**
Marshall(10) **Pub. No.: US 2006/0060493 A1**(43) **Pub. Date: Mar. 23, 2006**(54) **TAMPER RESISTANT SEALS FOR
TRANSPARENT OR OTHER EGG CARTONS****Publication Classification**(76) Inventor: **Craig Marshall**, Upper Sandusky, OH
(US)(51) **Int. Cl.**
B65D 85/32 (2006.01)
(52) **U.S. Cl.** **206/521.1; 206/521.8**

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SEATTLE, WA 98101 (US)(57) **ABSTRACT**

A tamper proof seal for egg cartons that is particularly suitable for transparent egg cartons is described. The seal is typically located on the side rims of the tray and lid. The seal is comprised of first contact area on the tray rim and a second contact area on the lid rim. The first and second contact areas are mechanically engaged or bonded together to form a sealed area between the lid and the tray that prevents the lid from being opened from the tray. A tear-away section on the tray and lid rim surrounds the sealed area. The tear-away section allows the sealed area to be easily removed from the egg carton by tearing-away the sealed area from the rim thereby allowing the egg carton to be opened.

(21) Appl. No.: **10/936,154**(22) Filed: **Sep. 7, 2004****Related U.S. Application Data**(63) Continuation-in-part of application No. 10/778,669,
filed on Feb. 12, 2004.

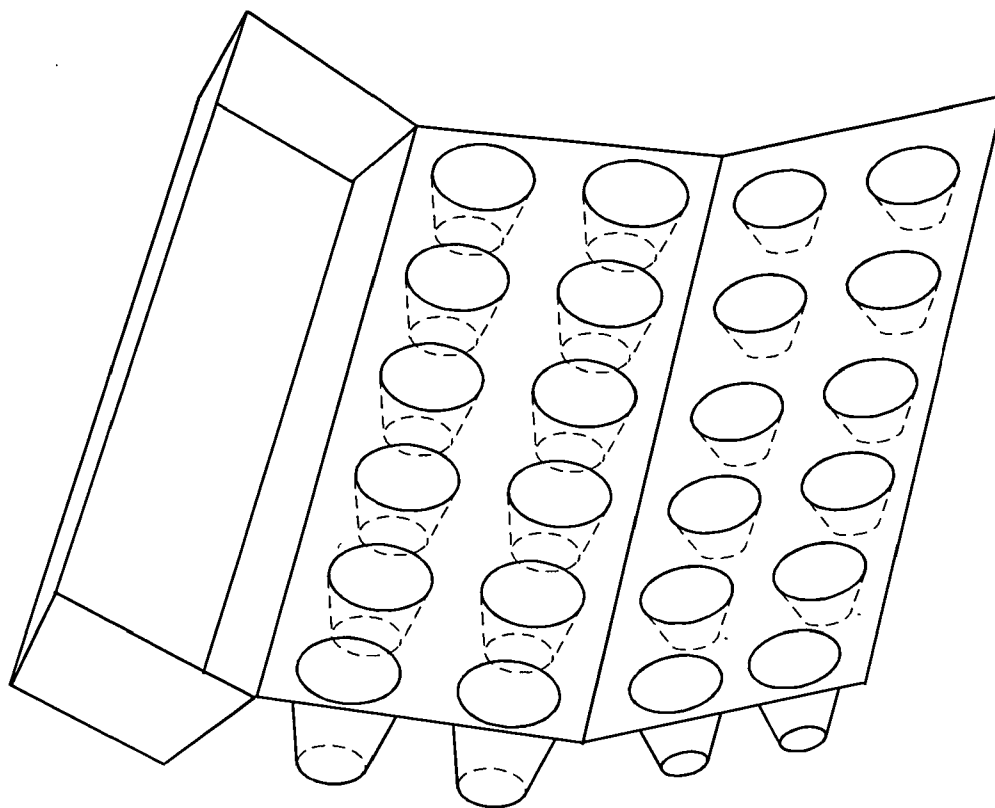


FIG. 1
(PRIOR ART)

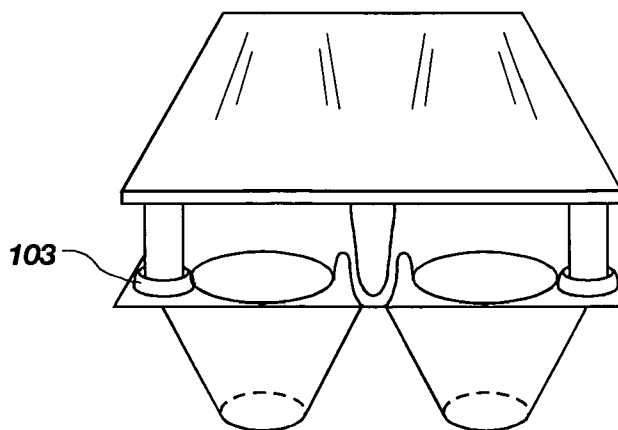


FIG. 2
(PRIOR ART)

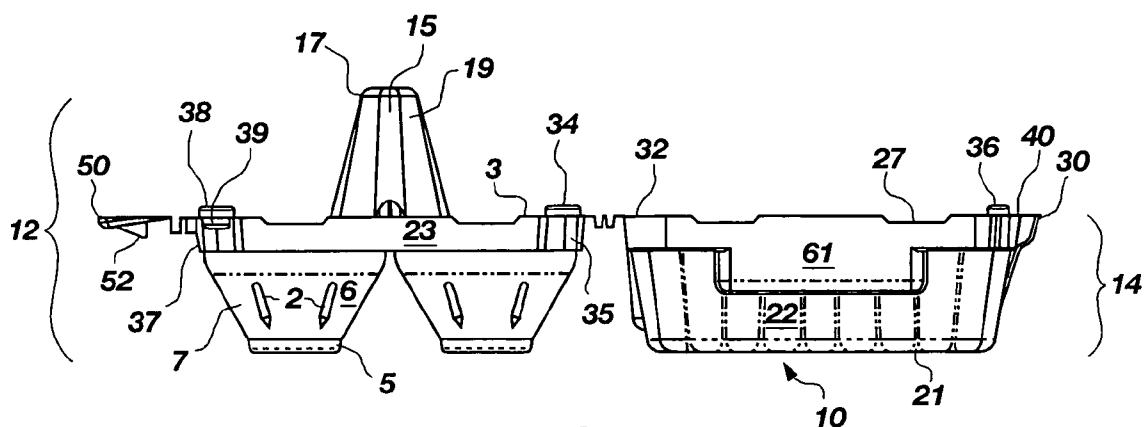


FIG. 3

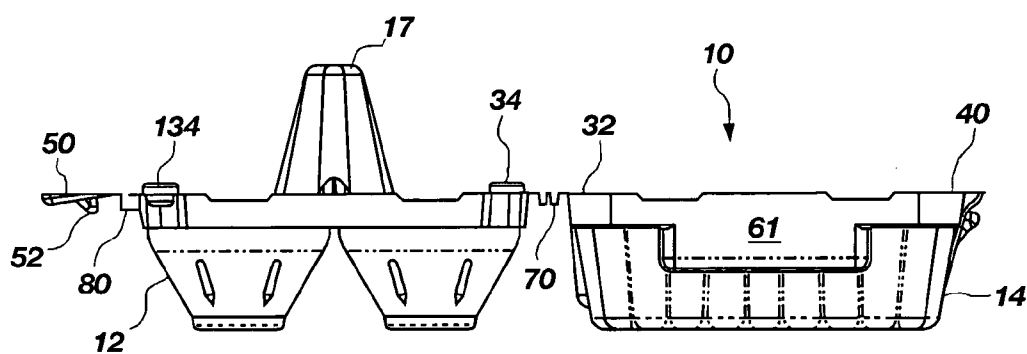


FIG. 4

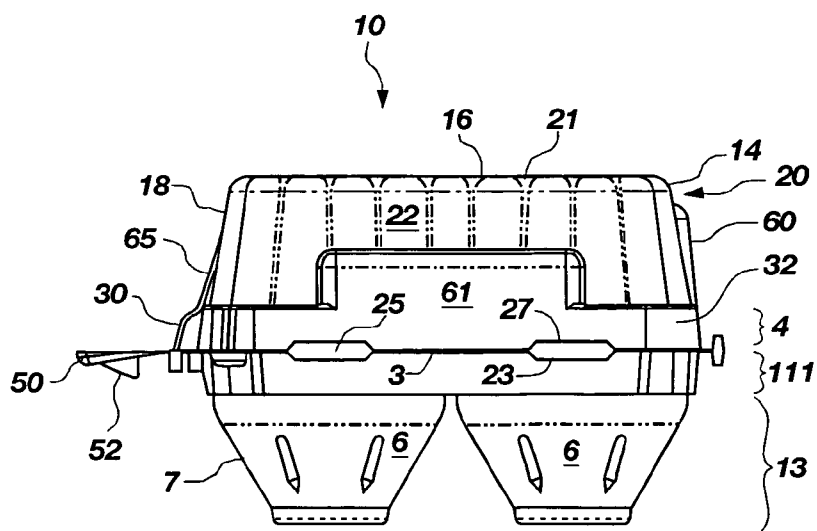


FIG. 5

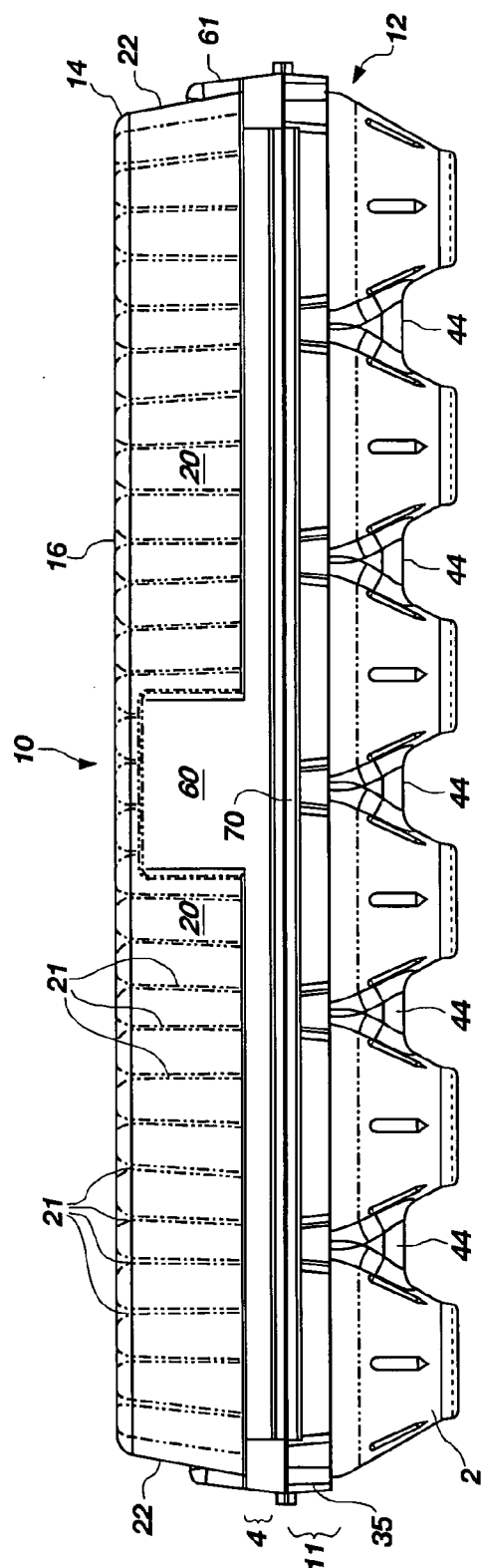


FIG. 6

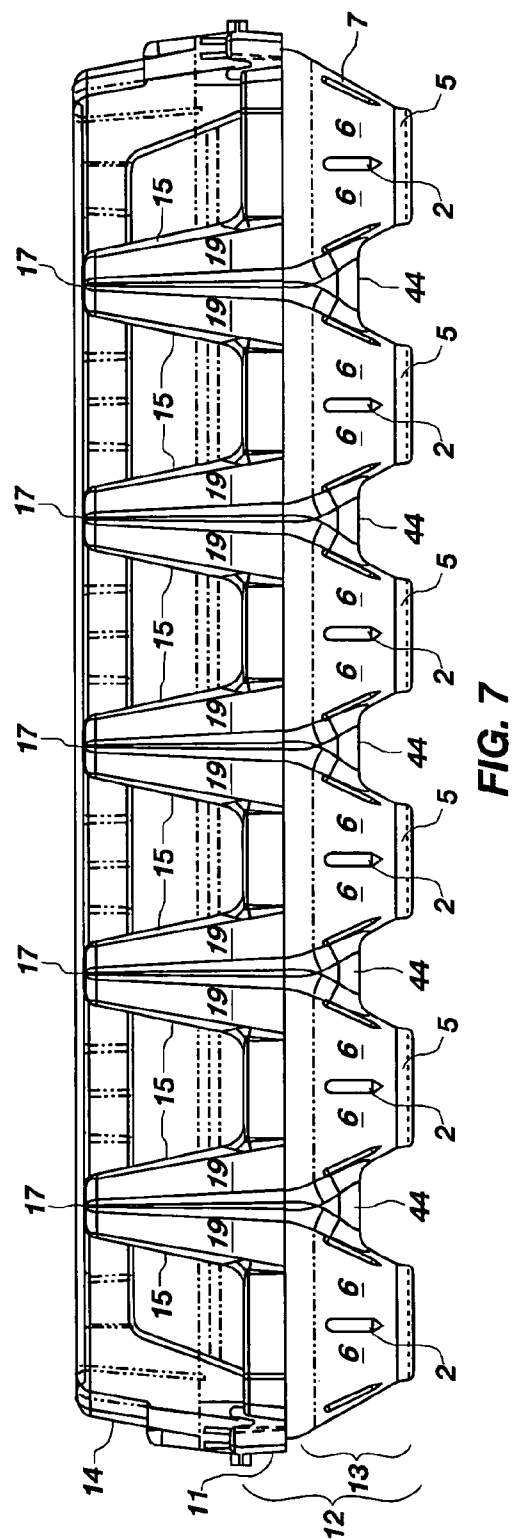


FIG. 7

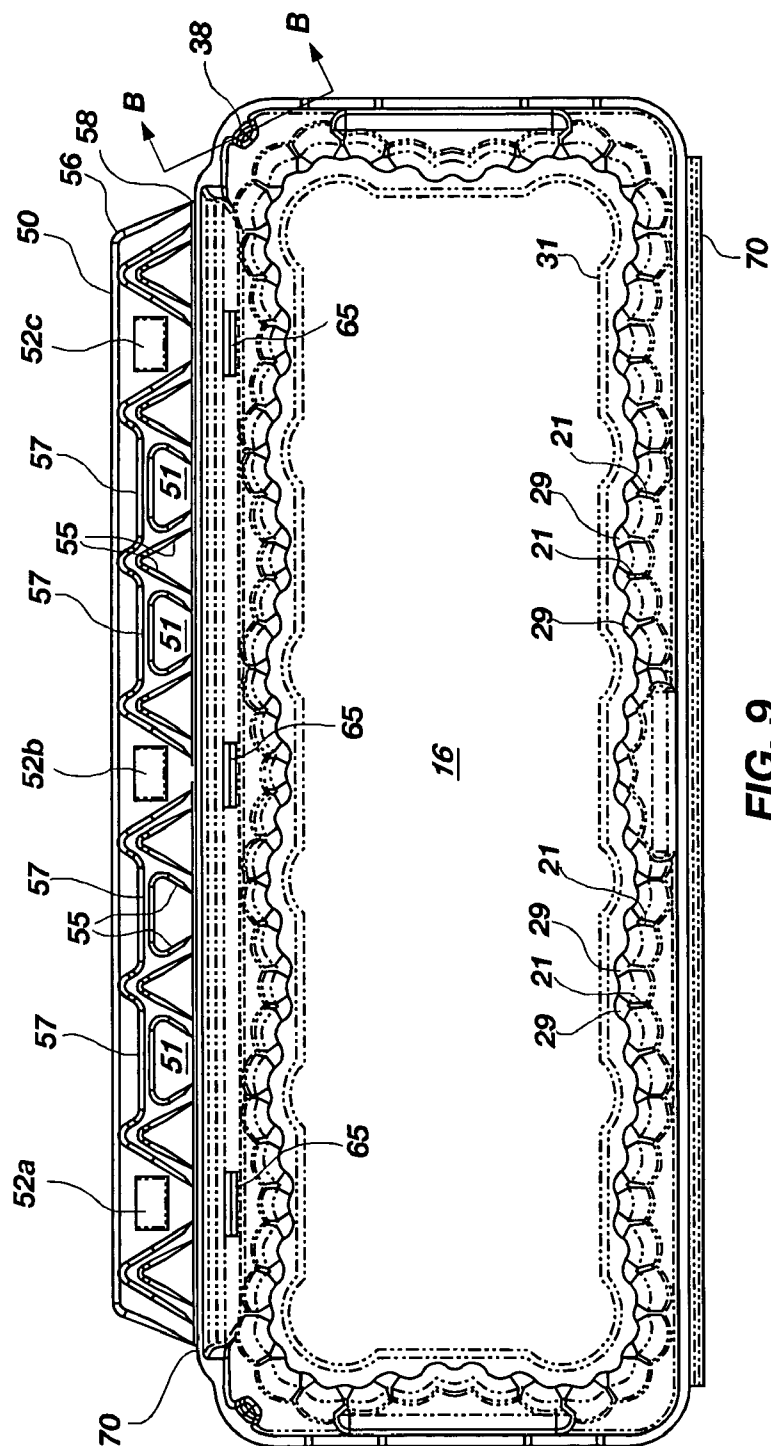


FIG. 9

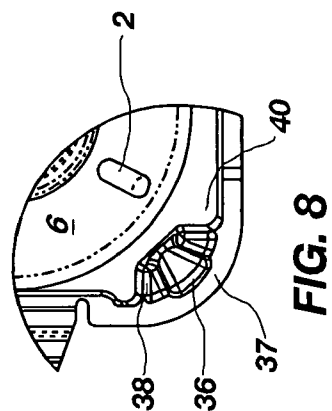


FIG. 8

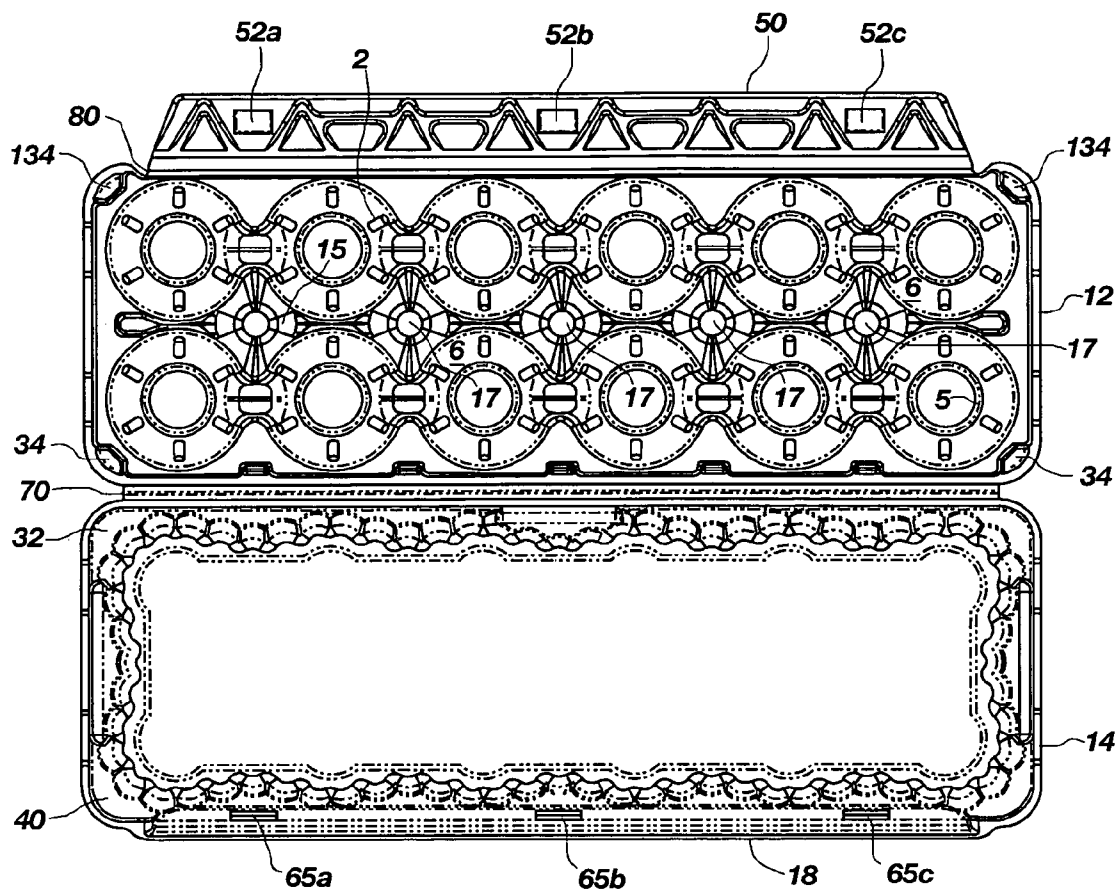


FIG. 13

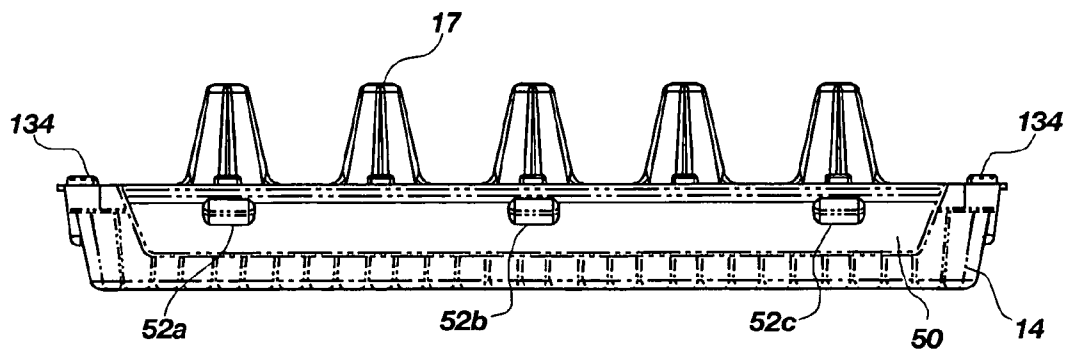


FIG. 12

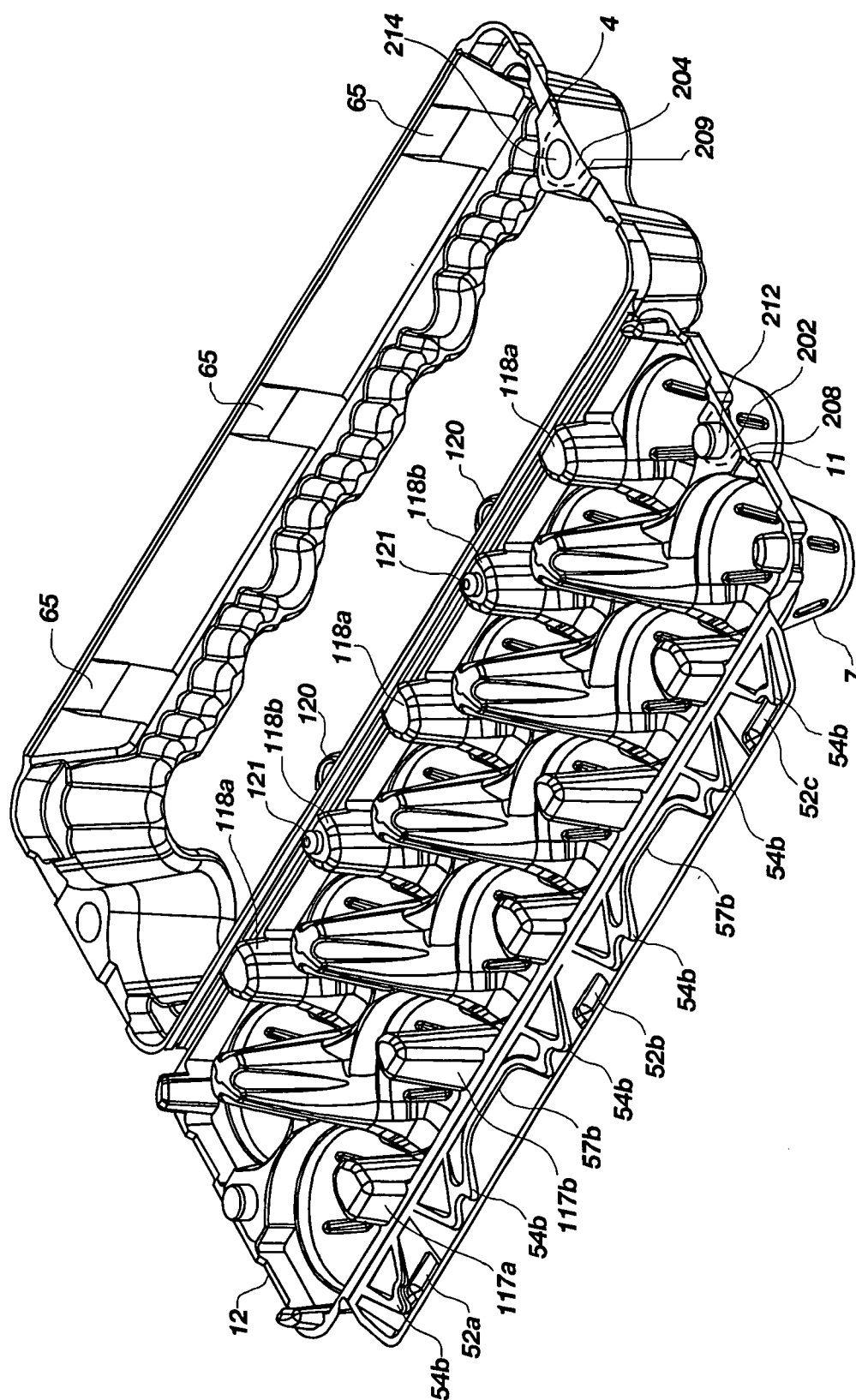


FIG. 14

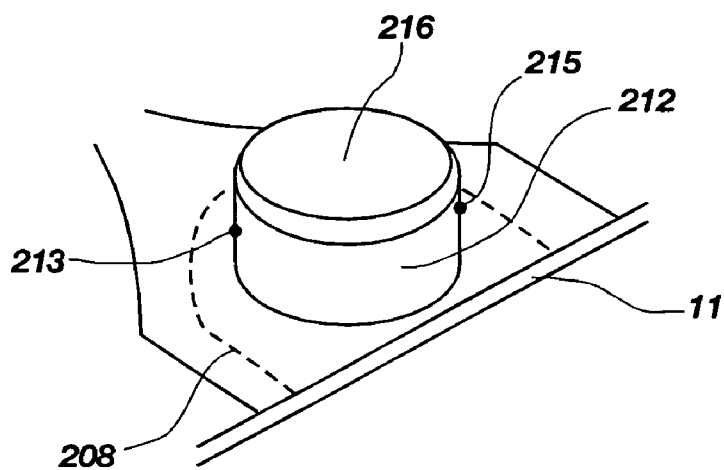


FIG. 16

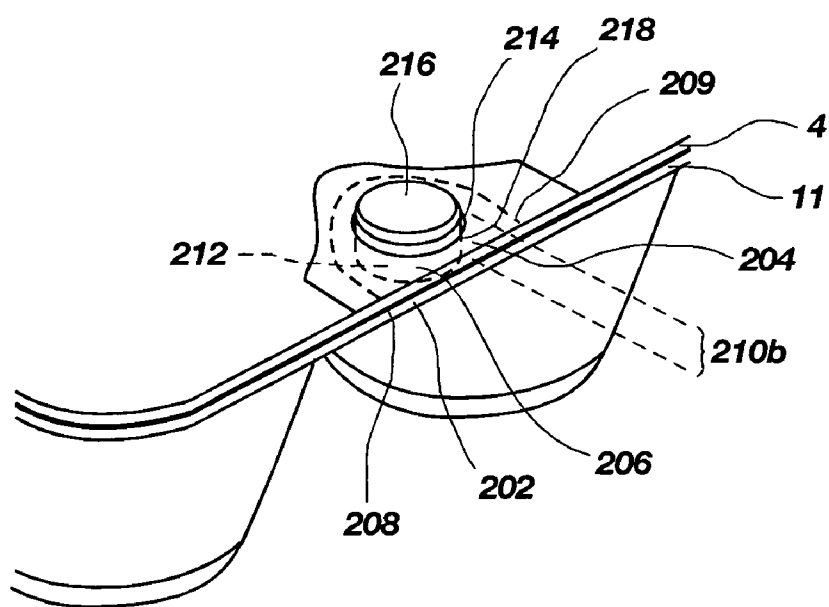


FIG. 15

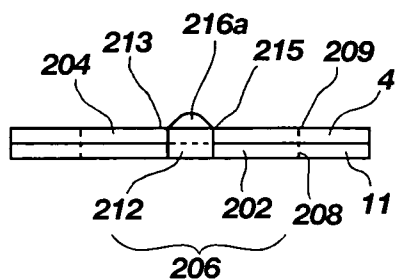


FIG. 17

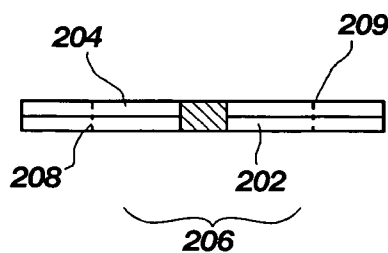


FIG. 24

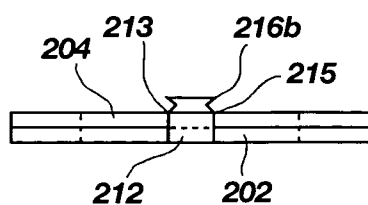


FIG. 18

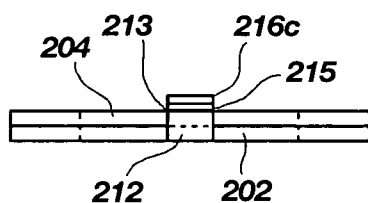


FIG. 19

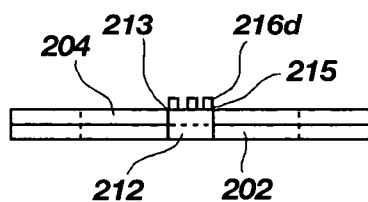


FIG. 20

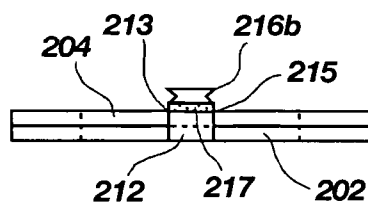


FIG. 22

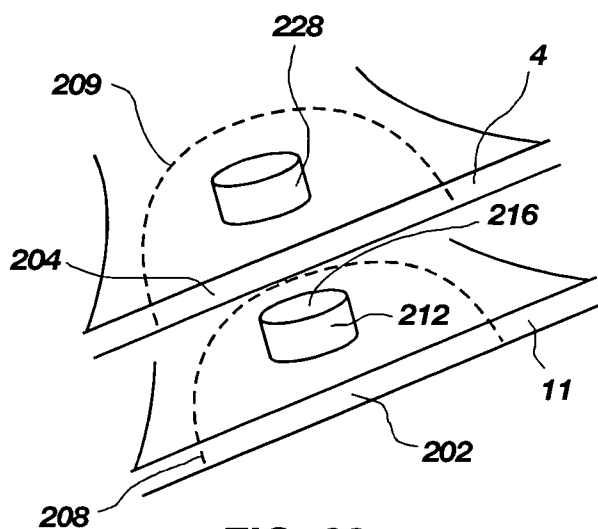


FIG. 23

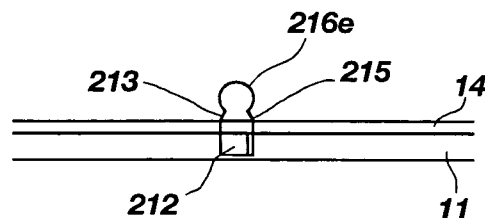


FIG. 21

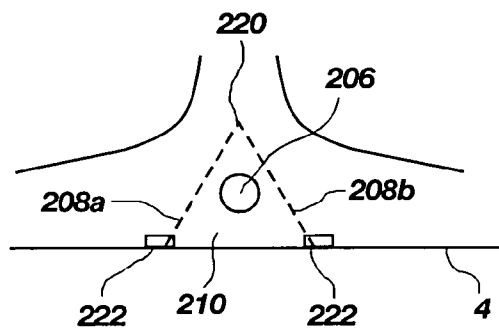


FIG. 25

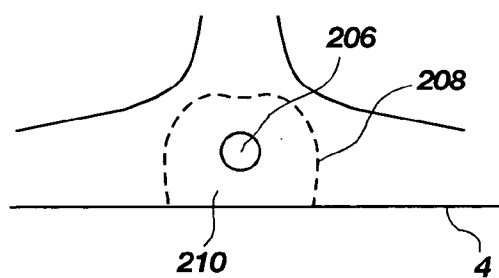


FIG. 26

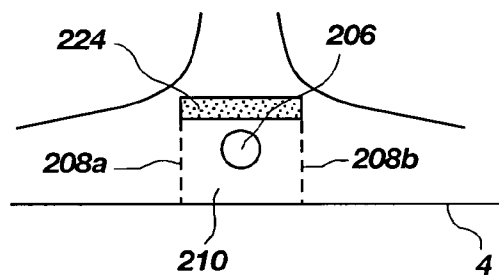


FIG. 27

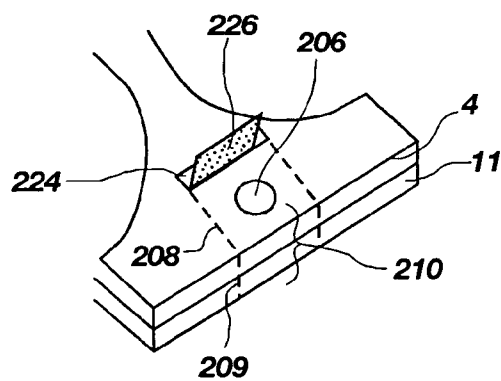


FIG. 28

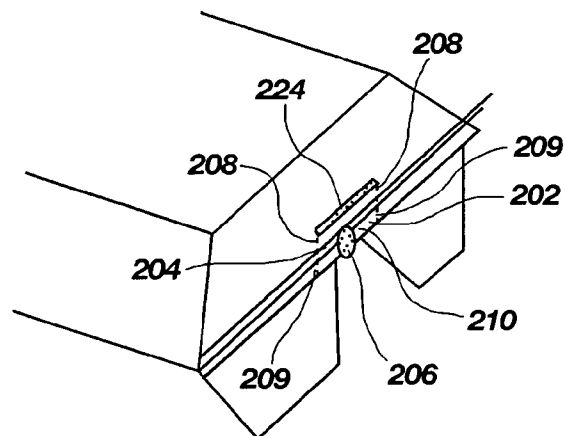


FIG. 30

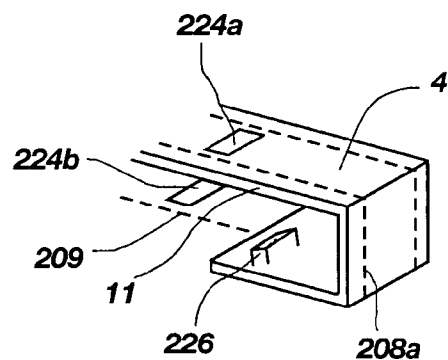


FIG. 29

TAMPER RESISTANT SEALS FOR TRANSPARENT OR OTHER EGG CARTONS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. Ser. No. 10/778,669 filed Feb. 11, 2004.

TECHNICAL FIELD

[0002] This invention relates to egg cartons, and more particularly a removable tamper resistant seal that can used with the egg cartons.

BACKGROUND OF THE INVENTION

[0003] Conventional egg cartons in wide use today are typically made either of a fibrous material, such as cardboard, or a foamed polymeric material, such as foamed polystyrene (Styrofoam™). While these materials are inexpensive to prepare they share the same disadvantage of being opaque, requiring a consumer to open the lid of the egg carton to inspect the eggs for damage.

[0004] Egg cartons made of a transparent polymeric materials, such as poly ethylene terephthalate (PET) polymers have also come into use, although to a more limited extent than cardboard and foamed polystyrene cartons. Such transparent egg cartons exhibit various disadvantages that result from the properties of the materials used. For example, while these materials are recyclable, they are not biodegradable. In addition, most plastic materials, such as PET, have too much resiliency to easily operate as a crease type hinge between the lid of the carton and the tray that holds the eggs.

[0005] One method of solving the hinge problem with transparent egg cartons is illustrated in FIG. 1 where the edges between the lid and the carton that define the hinge are connected by a series of micro-battens that extend into slots formed along the edges of the lid and the tray. The series of battens are more bendable than a creased strip of PET. A disadvantage of this design is that it is more costly to produce than a standard type of hinge, such as used with foamed polystyrene and cardboard cartons, where the hinge is formed by continuous crease in the strip of material that defines the junction between the base and lid. Another method of solving this problem is to use a two hinge design, where two rounded hinge portions of the plastic are separated by an intermediate panel as illustrated in FIG. 2. One problem with this design is that the lid must be closed by rotating about two axes rather than one, making proper alignment of the lid over the tray more difficult.

[0006] Another problem with hinge junctions for egg cartons made of transparent plastics relates to difficulty in securely interlocking the lid onto the tray. In the typical cardboard or foamed polystyrene carton, a front flap is provided on the front of the tray and the flap also has a crease hinge along the junction between the flap and the tray. The flap contains two tabs positioned to fit into two holes formed in corresponding positions of the front surface of the lid, each positioned about $\frac{1}{3}$ rd the length of the flap from the edge. Because transparent polymeric materials tend to be relatively pliable, a full egg carton made with a flap and two tabs would tend to bend downwardly when grasped by the end, causing failure of the carton or premature release of the

tabs from the lid. Moreover, because the resiliency of transparent polymeric materials is relatively large, a creased hinge for the flap has the same problems as a creased hinge for the lid.

[0007] One method to overcome this problem illustrated in FIGS. 1 and 2 is to dispense with the flap altogether. In the trifold design of FIG. 1, instead of using a flap, two lids are used. The first lid is conformed to fit over the top of the eggs, and the second lid is conformed to fit over the first lid. In the design of FIG. 2, instead of using a flap, the lid and tray of the carton are configured with a series of snap locks 103 around the rim. One problem with this design is that it is difficult to precisely align each of the snap locks into position. Another problem is that a relatively large amount of force is required to snap and unsnap the lid to the tray. Yet another method of solving this problem, exemplified by U.S. Pat. No. 4,240,575 is to form the locking flap and hinge at an obtuse angle so that the flap is situated in a partially closed position. However, this design does not eliminate the problem of bending of the egg carton when grasped from the end.

[0008] Another problem with resiliency in egg cartons made of transparent plastic materials is difficulty for a consumer to release the lid from the interlocking tabs and holes. In the cardboard or foamed polystyrene designs, the consumer typically pulls the front of the lid forward from the center to clear the holes from the tabs and rotates the lid upward to open the carton. However, if the flap and lid are made of typical transparent polymeric materials, which are more pliable than cardboard or foamed polystyrene, pulling the front surface of the lid forward from the middle creates a bow action that results in bowing of the middle of the flap outward and the lateral sides of the flap inward, making it difficult to release the lid from the button tabs on the flap. One method of overcoming this problem exemplified by U.S. Pat. No. 4,463,894 is to make the lateral portions of the flap thicker than the central portion to reduce the bowing effect. A problem with this design is that more material is required to form the flap.

[0009] One advantage of transparent egg cartons is that the consumer can inspect the eggs without opening the egg carton. Nonetheless, some consumers may be inclined to open the egg cartons merely out of habit. Repeated opening and closing of egg cartons, especially transparent egg cartons, inevitably leads to some percentage of cartons being improperly closed by some consumers. Some consumers may also be concerned that the eggs in the carton have not been tampered with post packaging. However, egg cartons of the prior art, unlike other food storage packages, are not sealed. Therefore, even upon opening the egg carton, the consumer cannot be guaranteed whether the egg carton had not been opened on a previous occasion.

[0010] Accordingly there is a need in the art to provide transparent egg cartons with a tamper resistant seal to provide assurances to the consumer that the egg carton has not been previously opened, and to thereby minimize the inclination to open the egg carton prior to purchase.

SUMMARY OF THE INVENTION

[0011] Provided herein are transparent egg cartons of improved design. In one aspect there is provided an egg carton that includes a tray with a plurality of egg compart-

ments, a lid hingedly connected to the tray, and a closure flap hingedly connected to a front surface of the tray. In various embodiments, the tray, lid and flap are all made of a transparent polymeric material and at least one of the lid and flap are connected to the lid by either a "W" shaped hinge or a box hinge.

[0012] In another aspect there is provided an egg carton formed of a transparent polymeric material selected from the group consisting of a polylactic acid polymer, a poly glycolic acid polymer, and a polylactic-glycolic acid co-polymer. Polylactic acid is one of the preferred transparent materials. Use of these biodegradable materials is made possible by the various design features provided herein including any one, or preferably a combination of features that include: use of the "W" shaped hinge or box hinge, the provision of lattice struts in the flap, the provision of three button tabs in the flap with the lateral buttons being located about $\frac{1}{8}$ th the length of the flap from the edge, or the provision of vertical ribbing in the lid to provide additional mechanical strength to egg cartons made of these otherwise fragile materials.

[0013] In one exemplary embodiment, there is provided an egg carton made of polylactic acid and that includes: a tray having a lower portion defined by a plurality of egg compartments configured for receiving eggs, the tray having a tray front surface, a tray rear surface and tray end surfaces and an upper portion that defines a tray rim with a tray edge extending above the lower portion. Also included is a reversibly closeable lid configured to cover the tray when closed, the lid having a top surface, a lid front surface, a lid back surface and lid end surfaces, each of the front, back and end surfaces of the lid having a lower portion defining a lid rim with a lid edge. The lid is formed with vertical ribbing along its downwardly extending surfaces and has an undulated perimeter that provides additional strength to the lid by increasing the lineal footprint thereof. Also included is a flap rotatable along an axis parallel to the front surface of the tray, the flap having a rear edge connected to the tray, and a front edge opposite the rear edge and a width defined by a distance between the front and rear edges of the flap. The flap includes three tab buttons for interlocking with the lid, with the lateral tabs being located about $\frac{1}{8}$ th the length of the flap from the end. The flap also includes lattice struts to increase the lateral strength of the flap. A "W" shaped hinge or box hinge is used to connect the flap to the front surface of the tray and the lid to the back surface of the tray.

[0014] In a different aspect, there are provided tamper resistant seals for sealing an egg carton in a closed position. This aspect of the invention is suitable for egg cartons made of any material and is particularly suitable for egg cartons made of transparent material, which do not need to be opened to inspect the eggs.

[0015] In a general embodiment, this aspect provides egg cartons having a tray with a plurality of egg compartments and an upper portion defining a tray rim. A lid is hingedly connected to the tray to permit opening and closing of the lid over the tray, the lid having a lower portion defining a tray rim. The tray rim and the lid rim have corresponding first and second areas for contacting one another when the lid is closed. In a first condition, the first and second contact areas are engaged to form a sealed area between the lid and the tray that prevents the lid from being opened from the tray.

The cartons also include a tear-away section on the tray rim and lid rim. The tear-away section is configured to disengage the sealed area from the lid and tray rims when the tear-away section is removed in a second condition that permits the lid to be opened from the tray.

[0016] In typical embodiments, the first and second contact areas are located on an end of the tray and lid rims, respectively. In particular embodiments, one of the first and second contact portions comprises a protrusion, the other of the first and second contact portions comprises a hole dimensioned to receive the protrusion. In these embodiments the seal includes a region where a top portion of the protrusion is expanded over a perimeter of the hole. Several embodiments of the protrusion are provided, including embodiments with various configurations of an upper portion of the protrusion to facilitate collapsing the protrusion over the perimeter of the hole.

[0017] In alternative embodiments, the first and second contact portions are sealably engaged by being bonded together. The bonding together of the first and second contact areas may be done by one or more of several techniques including having melted, glued, or co-solubilized the corresponding portions of the first and second contact areas.

[0018] With respect to the tear-away section, in typical embodiments the tear-away section on the tray rim and lid rim is defined by perforations through top and bottom surfaces of the tray and lid rims. The perforations at least partially surround the sealed area. Various exemplary embodiments of the tear-away section with perforations are provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is an isometric view of one transparent egg carton of the prior art.

[0020] FIG. 2 is a plan view looking on the end of another transparent egg carton of the prior art.

[0021] FIG. 3 is a plan view looking on an end of one embodiment of an open egg carton as provided herein.

[0022] FIG. 4 is a plan view looking on an end of another embodiment of an open egg carton as provided herein.

[0023] FIG. 5 is a plan view looking on the end of a closed, unlocked egg carton according to FIG. 3.

[0024] FIG. 6 is a cut-away plan view looking from the front of an egg carton as provided herein.

[0025] FIG. 7 is a rear plan view of an egg carton as provided herein.

[0026] FIG. 8 is top view of a detail of a front corner of an egg carton as provided herein.

[0027] FIG. 9 is a top view of a lid of an egg carton as provided herein.

[0028] FIG. 10 depicts a "W" shaped hinge and a box hinge as used in the egg cartons provided herein.

[0029] FIG. 11 is a side view of a detail of a closed and locked egg carton as provided herein.

[0030] FIG. 12 is a front view of an egg carton of FIG. 4.

[0031] FIG. 13 is a top view of an open egg carton of FIG. 4.

[0032] FIG. 14 is an isometric view of another embodiment of a transparent egg carton provided herein.

[0033] FIG. 15 is an isometric detail of a tamper proof seal provided herein.

[0034] FIG. 16 is an isometric view of a tray rim with a protrusion as a component of the tamper proof seal.

[0035] FIG. 17 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal.

[0036] FIG. 18 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal.

[0037] FIG. 19 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal.

[0038] FIG. 20 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal.

[0039] FIG. 21 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal.

[0040] FIG. 22 is as side elevation view of another embodiment of the protrusion component of the tamper proof seal used with a hole having a raised collar.

[0041] FIG. 23 is an isometric view of a protrusion and pit embodiment of contact areas for a tamper proof sea.

[0042] FIG. 24 is a side elevation view of a bonded-together embodiment of a tamper proof seal.

[0043] FIG. 25 is a top view of a tear-away section for the tamper proof seal provided herein.

[0044] FIG. 26 is a top view of another embodiment of a tear-away section for the tamper proof seal provided herein.

[0045] FIG. 27 is a top view of another embodiment of a tear-away section for the tamper proof seal provided herein.

[0046] FIG. 28 is a top view of another embodiment of a tear-away section for the tamper proof seal provided herein.

[0047] FIG. 29 is an isometric view of another embodiment of a tear-away section for the tamper proof seal provided herein.

[0048] FIG. 30 is an isometric view of yet another embodiment of a tear-away section for the tamper proof seal provided herein.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0049] In the following detailed description of exemplary embodiments of the invention, reference is made to the accompanying drawings, which form a part hereof, and in which are shown, by way of illustration, specific exemplary embodiments in which the invention may be practiced. In the drawings, like numerals describe substantially similar components throughout the several views. These embodiments are described in sufficient detail to enable those

skilled in the art to practice the invention. Other embodiments may be utilized and structural, logical and other changes may be made without departing from the spirit or scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

[0050] Described herein are various features for a transparent egg carton 10, which is suitable for embodiments using a variety of transparent polymeric materials, including, but not limited to relatively pliable recyclable polymeric materials such as polyethylene terephthalate (PET), which is an amorphous polyester; clarified polypropylene (CPP), which is polypropylene containing nucleating agents to increase clarity; styrene butadiene copolymers (SBC) without impact modifiers; copolymer blends of SBC with crystal polystyrene (cPS), which is commercially known as "K-Resin/Crystal™", oriented polystyrene (OPS); polyvinyl chloride (PVC); styrene acrylonitrile polymer (SAN); polymethyl methacrylate (PMM) and copolymers thereof, commercially known as plexiglass; and polycarbonate (PC). In advantageous embodiments, the features of the egg carton 10 are also suitable for a newer class of transparent polymeric materials that are recyclable and biodegradable. Examples of such polymeric materials include polylactic acid (PLA), polyglycolic acid (PGA) and polylactic acid-glycolic acid copolymers (PLGA). Until the present invention, such materials were not suitable for egg cartons because of their relatively low tensile strength and brittle properties. Surprisingly, however, in advantageous embodiments, the egg carton 10 is preferably made of PLA, PGA, or PLGA.

[0051] FIGS. 3-30 illustrate various views and features of transparent egg cartons 10 made of a transparent polymeric material as provided herein. FIG. 3 is an end view of one embodiment of the egg carton 10 in an open position. FIG. 4 is an end view of another embodiment of the egg carton 10 in an open position. FIG. 5 is an end view of the egg carton 10 of FIG. 3 in a closed and unlocked position. The egg carton 10 has a tray 12 that includes a lower portion 13 configured in a shape to receive a plurality of eggs, such as exemplified by the conical shaped egg compartments 7. The egg compartments 7 may be made in a variety of other shapes and sizes configured for receiving the generally ovoid shape of an egg, including for example, cup shapes, cylindrical shapes, polygonal shapes and the like. The tray also 12 includes an upper rim portion 11, which defines an outer perimeter of the tray 12 and that extends above the egg compartments 7.

[0052] The egg compartments 7 have interiorly directed side ridges 2 that contact the eggs keeping them away from the interior side walls 6 of the egg compartment 7. The egg compartments 7 also have a lower platform ridge 5 that prevents the bottom of the eggs from contacting the interior surface of the bottom of the egg compartment 7. The side ridges 2 and bottom ridges 5 are typically shaped so that the exterior side of the ridges 2, 5 form a generally concave contour and the interior side of the ridges 2, 5 that contacts the egg have a generally convex contour. As illustrated in the cut-away front view of FIG. 7 and the rear view of FIG. 6, an upper portion of adjacent egg compartments 7 that are arranged along the longitudinal axis of the tray 12 are interconnected by bracing elements 44 disposed between

adjacent egg compartments 7. The bracing element 44 provides additional tensile strength along the longitudinal axis of the tray 12 to help prevent the egg carton from bending or breaking when loaded with eggs.

[0053] Within the interior of the tray 12 a plurality of tower elements 17 are formed between the egg compartments 7 in such a way that an interior facing surface 19 of the towers 17 are continuous with the interior surfaces 6 of a plurality of the egg compartments 7 to support the upper portions of the eggs in adjacent compartments 7. The interior facing surfaces 19 of the towers 17 are separated by tower support ridges 15. The lower portion of the tower ridges 15 are interconnected or integral with the bracing elements 44 between the egg compartments 7. The towers 17 are made of a sufficient height so that an upper surface of the towers 17 contacts an interior side of the top surface 16 of the lid 14 when the lid 14 is closed, thereby providing additional mechanical support to prevent the egg carton 10 from being crushed from above, for example, when multiple cartons are stacked on one other after being filled with eggs.

[0054] Referring again to FIG. 3, the tray rim 11 terminates in a tray edge 3, which in typical embodiments, is outwardly turned so that the tray rim 11 forms a lip with a horizontally disposed upwardly facing surface. At or near a rear comer 35 of the tray rim 11, there is provided a rear guide element 34, which is formed at or near the tray edge 3, for example, on the upper surface of the lip 11, and which extends upwardly therefrom to a point above the highest point of the tray rim 11. The outer surface of the rear guide element 34 is positioned interiorly from the outer perimeter of the tray rim 3 so that when the lid 14 reaches beyond a 90° angle with respect to the tray 12 when being closed, an inner comer surface 32 of the lid 14 is guided into position over the tray 12 by sliding over the outer surface of the rear guide element 34. The rear guide element 34 is advantageously configured with a curvilinear outer surface that is shaped to correspondingly conform with the inner comer surface 32 of the lid 14.

[0055] In certain embodiments, such as depicted in FIGS. 3, 8 and 9, a closure guide slot 38 is provided at a front comer 37 of the tray rim 11. The closure guide slot 38 is formed with a “female” recess 39 configured to slidably receive a “male” closure guide tab 36 positioned at a front comer 40 of the lid 14. Importantly, the closure guide slot 38 and the closure guide tab 36 do not form interlocking surfaces, such as in snap lock closure 103 of the prior art (see FIG. 2). Instead, the interior surfaces of the closure guide slot 38 and the outer surfaces of the closure guide tab 36 slidably contact one another, thereby facilitating accurate positioning of the lid 14 over the tray 12, without creating an interlocking connection that must be disconnected when opening the lid 14. The closure guide slot 38 and guide tab 36 may be formed in a variety of configurations with different geometries. FIG. 8 is a top view detailing the front tray comer 37 and the front lid comer 40 of the egg carton 10 in a closed position that illustrate one example configuration of the guide slot 38 and the guide tab 36. In this embodiment, the guide slot 38 is configured as a trapezoidal indentation formed on the tray rim 11 and the guide tab 36 is configured as correspondingly shaped protrusion formed on the lid rim 4.

[0056] In certain other embodiments, such as depicted in FIGS. 4, 12 and 13, instead of using a closure guide slot 38

and guide tab 36, a front guide element 134 analogous to the rear guide element 34 is provided in the front comers 37 of the tray 12. The front guide element 134 is formed on the upper surface of the tray rim 11. The outer surface of the front guide element 134 is positioned interiorly from the outer perimeter of the tray rim 3 so that when the lid 14 reaches beyond about a 160° angle with respect to the tray 12 when being closed, an inner corner surface 40 of the lid 14 is guided into position over the front of the tray 12 by sliding over the outer surface of the front guide element 34. The front guide element 134 is configured with a curvilinear outer surface that is shaped to correspondingly conform with the front comer surface 40 of the lid 14.

[0057] The lid 14 has a top surface 16, a front surface 18, a rear surface 20 opposing the front surface and opposing side surfaces 22, each of which extend downwardly from the front top surface 16. Three features of the lid 14 provide additional strength to the carton 10 to resist crushing when multiple cartons are stacked on one another, which is particularly advantageous for cartons made of pliable transparent materials. First, the front 18, rear 20 and side 22 surfaces of the lid 14 are heavily corrugated forming a plurality of parallel support ribs 21 separated by outwardly bulging areas 27 each extending vertically along the front 18, rear 20, and side 22 surfaces of the lid 14 between the top surface 16 and the lid rim 4. As illustrated in the top view of FIG. 9, the support ribs 21 are formed by folding the transparent polymeric material into a convoluted surface which surround voids 29 between adjacent rib folds 21. Preferably there are at least two, at least three or preferably at least four support ribs 21 per linear inch of the lid perimeter. This corrugation provide a substantial increase in the lineal footprint of the closed lid 14, thereby providing increased mechanical strength to the lid 14 to resist crushing. Second, as further illustrated in FIG. 9, the outer perimeter of the front 18, rear 20, and side 22 surfaces of the lid 14 are undulated, for example in a sinusoidal pattern, to further increase the lineal footprint area of the lid 14. Third, a perimeter portion 31 of the top surface 16 of the lid 14 is indented, which transmits load placed on the top surface 16 of the lid 14 to the load bearing ribs 21 along the front 18, rear 20, and end 22 surfaces.

[0058] Referring to FIGS. 5 and 6, the rear surface 20 of the lid 14 has a first flat portion 60 located beneath a shorter length of ribbing 21 that extends from the top surface 16 to the flat portion 60. As best illustrated in FIG. 6, the flat portion 60 is provided so that a label or code, such as a bar code, may be conveniently stamped on the lid 14. Similarly, referring to FIG. 5, at least one of the end surfaces 22 of the lid 14 has a second flat surface 61 located beneath a shorter portion of ribbing 21. The second flat surface 61 is provided so that an expiration date or other form of information regarding the packaged eggs may be stamped on the end 22 of the egg carton 10.

[0059] The lid 14 and the tray 12 may also constructed to form vents 25 when the egg carton 10 is closed. Eggs are typically packed into the egg carton 10 in a warm condition, then quickly moved to a refrigerated chamber to cool the eggs. This causes condensation to occur on the eggs if the egg carton 10 is not vented. Accordingly, the vents 25 are provided in the egg carton 10 to allow moisture to exhaust from the interior thereof. The vents 25 are formed by tray recesses 23 formed in the tray rim 3, which are correspond-

ingly opposed to lid recesses 27 formed in the lid rim 4 so that the vent is formed when the lid 14 is closed.

[0060] Referring now to FIGS. 3-5, and 9 the egg carton 10 also includes a locking flap 50 hingedly connected to the front surface of the tray rim 11. While a locking flap 50 is conventional in fiber based and foamed polystyrene egg cartons, prior to the instant design, the dual problems of excessive pliability and resilience of transparent polymeric materials have not permitted use of flaps in egg cartons made of such materials. As mentioned in the Background section above, flaps made of plastic polymeric materials tend to bow when being unlocked. Moreover, even where the problem of bowing might be solved by increasing the thickness of the flap along the exterior lateral portions, another problem discovered by the inventors, is that the vertical (edge to edge) pliability of flaps made of clear polymeric materials is so great that a full egg carton 10, even containing the bracing elements 44 between the egg compartments 7, would still bend laterally downward when lifted from one end, causing the egg carton 10 to fail and/or the flap 50 to be released resulting in spilling of the eggs.

[0061] These problems are addressed herein by providing at least three additional features to the flap 50. First, the flap 50 is formed with a plurality of lattice struts 54 that extend across the flap 50 from a point at, or adjacent to, a front edge 56 of the flap to a point at or near a rear edge 58 of the flap 50. The lattice struts 54 are comprised of a vertical portion 55 and a horizontal portion 57 transversely oriented to the vertical portion 55. The vertical portion 55 extends across at least about 75% or at least about 80% or at least about 90% the width of the flap 50 between the front edge 56 and the rear edge 58. In the advantageous design depicted in FIGS. 8 and 13, the vertical portion 55 is arranged in a plurality of inversely oriented "V" shaped sections, that define a lattice of alternating triangular cross sectional areas 51 between the lattice struts 54. The lattice struts 54 may be formed by using a thicker dimension of the plastic material in the region forming the lattice struts 54, or by ribbing the plastic material by bending it into a raised surface above and/or below the adjacent cross sectional regions 51 between the lattice struts 54. Thus, the cross sectional areas 51 between the lattice struts 54 are thinner than, and/or indented with respect to, the outer surface of the lattice struts 54.

[0062] A second feature of the flap 50 provided herein, which is contrary in principle to the design of egg cartons generally, is the provision of at least three button tabs 52a, 52b, and 52c rather than two as in conventional egg carton designs. The button tabs 52 are adapted to fit into corresponding button holes 65 formed in the front surface 18 of the lid 14 to lock the lid 14 into place over the tray 12. In certain embodiments not illustrated herein, the button holes 65 may be replaced by closed pockets configured with a shape that corresponds to the shape of the button tabs 52. As a general principle in egg carton design according to the prior art, it was desirable to use only two button tabs 52a and 52c disposed on lateral sides of the flap 50, because egg cartons with additional button tabs 52 such as centrally located button tab 52b would generally be more cumbersome to open. However, it has been discovered that when the egg carton is made of a pliable transparent polymeric material such as PET or PLA, a third, centrally located button tab 52b prevents the egg carton 10 from bending downward when held at the end. In addition and surpris-

ingly, the third button 52b actually makes the lid 14 easier to open, especially when used in combination with the other features of the transparent egg carton 10 described herein.

[0063] A third feature of the flap 50 is the location of the most lateral buttons 52a and 52c. In conventional egg cartons using only two buttons, these are each placed about $\frac{1}{3}$ rd the length of the flap 50 from the edge. In the designs provided herein, the lateral buttons 52a and 52c are located at about $\frac{1}{10}$ th to $\frac{1}{6}$ th, and most advantageously, about $\frac{1}{8}$ th the length of the flap 50 from edge. This location of the lateral buttons increases the overall strength of the closed egg carton 10, helping to prevent the closed egg carton 10 from buckling when grasped from the end.

[0064] Another advantageous feature of the egg carton 10 is the use of a "W" shaped hinges 70 and/or box hinges 80 to connect the flap 50 and/or the lid 14 to the tray 12. Referring to Figures 10a and 10b, a "W" shaped hinge is characterized by having adjacent and symmetrical inner 72 and outer 74 depressions joined at an apex 75 defined by an apical junction where an outer wall 76 of the inner depression 72 meets an inner wall 78 of the outer depression 74 at an acute angle. When viewed from the end as depicted in FIGS. 3, 5 and 10, the adjacent depressions 72, 74 have a generally "W" shaped cross section when the hinge is an open position and the depressions 72, 74 are disposed at 0° from one another. When the hinge 70 is rotated inward 180° about an axis defined by a longitudinal length of the apex 75 the outer depression 74 folds over the inner depression 72 so that the outer wall 76 of the inner depression 72 meets the inner wall 78 of the outer depression 74 at an obtuse angle. The walls 72, 78 of the closed hinge 70 surround a void with a cross section having a mirror symmetry defined by the walls of the depressions 72, 74. As depicted in the Figures, the "W" shaped hinge 70 is formed with adjacent "U" shaped depressions 72, 74, however, it is understood that the "W" shaped hinge may be formed with adjacent depressions 72, 74 of a variety of shapes, such as "V" shapes, square shapes, polygonal shapes and the like.

[0065] As illustrated in FIG. 10c and 10d, the box hinge 80 is characterized by having single depression 82 defined by opposing side walls 81 and 83 interconnected by a bottom wall 85. The single depression 82 aids in rotating the flap 50 (or lid 14) about the axis defined by a longitudinal length down the center of the depression 82. In certain embodiments, as illustrated in FIG. 4, the egg carton 10 uses the box hinge 80 to interconnect the flap 50 to the tray 12 and uses the "W" shaped hinge 70 to interconnect the lid 14 to the tray 12. In other embodiments, the positions for the box hinge 80 and the "W" shaped hinge 70 may be reversed. In yet other embodiments, as depicted in FIGS. 3 and 5, both the lid 14 and the flap 50 are connected to the tray 12 using "W" hinges 70, while in still other embodiments (not illustrated), both the lid 14 and the flap 50 are connected to the tray 12 using the box hinges 80.

[0066] The "W" shaped hinge 70 and box hinge 80 of the egg carton 10 provides a variety of advantages to egg cartons made from pliable and/or resilient transparent polymeric materials. First, when the "W" shaped hinge is closed so that the walls of the depressions 72, 74 meet at the obtuse angle, the walls of the inner depression 72 bear a portion of the weight of the attached lid 14 or flap 50. Second, the "W" shaped hinge and box hinge 80 are relatively easy to mold

from a variety of transparent polymeric materials. Third, the “W” shaped hinge and box hinge **80** each extend outwardly from the front and rear surfaces of the rims **4**, **11** of the lid **14** and the tray **12**, respectively, which increases longitudinal rigidity of the egg carton **10**. Fourth, these hinge types are suitable with transparent polymeric materials of different levels of pliability, such as PLA which is relatively more brittle and PET, which is relatively more pliable, because with these types of materials, the “W” shaped hinge **70** and box hinge **80** provide less resilience than a typical creased hinge of the prior art, making the carton **10** easier to open and close.

[0067] Another feature of the egg carton **10** is that the front surface **18** of the lid **14** along the lid rim **4** is formed with an awning portion **30** that extends outwardly from the front surface **18** of the lid rim **4**. As illustrated in the detail of FIG. **11**, which is a cut-away side view of the egg carton **10** in a closed and locked position, the awning portion **30** is configured to fit over the “W” shaped hinge **70** (or box hinge **80**) when the lid **14** is closed over the tray **12**. This provides several advantages. One advantage is that absent the awning portion **30** the lid **14** would not fit properly over the tray **12** in a closed position because the “W” shaped hinge **70** or box hinge **80** would block the lower rim **4** of the lid **14** from rotating to a full 180° position when closed. In addition, the buttons **52** in the flap **50** would not fully engage the holes **65** (or pockets) formed in the front surface **18** of the lid **14** if the awning portion **30** were not present because the flap **50** and the front surface **18** of the lid **14** would not be properly aligned. Moreover, and unexpectedly, a space **86** formed between the rim of the awning portion **30** and the “W” shaped hinge **70** or box hinge **80** provides a convenient opening for a consumer to insert a finger tip under the rim **4** of the lid **14** to pull the lid **14** outward and upward to disengage the flap **50** from the lid **14** when opening the egg carton **10**.

[0068] Referring to FIG. **14**, in certain other embodiments of the egg carton **10**, the tray **12** may also be configured with front tower elements **117** and rear tower elements **118**. The front tower elements **117** include a short tower element **117a** and a tall tower **117b** element. The short tower element **117a** is positioned along the front side of the tray **12**, typically located within less than about 0.5 inches or less than about 0.25 inches of the position that button tabs **52** on a flap **50** and corresponding holes **65** in the lid **14** will be when the flap **50** is interlocked with the lid **14** when the carton **10** is closed. The short tower elements **117a** provide a back stop and back support for the flap **50** when the buttons **52** are inserted into corresponding holes **65** to close the carton **10**. The tall tower elements **117b** are dimensioned to be of sufficient height to contact the underside of the top of the lid **14** when the lid is closed. These tall tower elements **117b** provide additional mechanical support for stacked egg cartons. The back tower elements **118** may be configured in at least one of several types of support forms. One form is a lid support tower element **118a**. The rear support tower element **118a** is made of sufficient height to contact a lower planar portion of the lid rim **4** when the lid **14** is closed over the tray **12**, thereby providing mechanical support for the front section of the lid **14** to prevent collapsing when cartons **10** are stacked. The guide tower **118b** provides similar mechanical support for the rear section of the lid. In addition, the guide tower **118b** contains a raised tab **121** located at the pinnacle of the tower element **118b**. The raised tab **121** is dimen-

sioned to be received into a corresponding receptacle **120** formed on the back side of the lid rim **4**. When the lid **14** is closed, the tab **121** is inserted into the receptacle **120**, thereby not only providing additional mechanical strength for the lid **14**, but also facilitating correct alignment of the lid **14** over the tray **12** for closure.

[0069] FIG. **14** also illustrates that in another embodiment, the lattice struts **54** may be configured with “W” shaped or part “W” shaped sections **54b** extending across the flap **50** between the front edge **56** and rear edge **58**. At least two of the “W” shaped or half “W” shaped sections **54b** are interlinked by a horizontal portion **57b** formed by raising, ribbing or bending the plastic in the flap **50** to the same degree as the “W” shaped sections. In a typical embodiment, the “W” shaped or half “W” shaped sections **54b** are oriented vertically across the flap between the front and rear edges **56**, **58** and at least two of the “W” shaped or half “W” shaped sections **54b** are positioned on adjacent sides of button tabs **52a**, **52b** and **52c**, typically within less than 0.5 inches or less than 0.25 inches of the button tabs **52**. This positioning and configuration of the lattice struts provides localized strength to the flap **50** in the vicinity of the button tabs **52**, which are subject to greater mechanical stress than other portions of the flap **50** due to repeated opening and closing of the egg carton **10**.

[0070] Also notable with respect to FIG. **14** is that the hinge connecting the flap may be formed of thinner material, obviating the use of either a “W” shaped hinge or box hinge described hereafter for the flap **50** due to the strengthening provided by the lattice struts **54** and **54b**. Thus, the flat hinge **81** on the flap **50** depicted in FIG. **14** may be formed by merely thinning the plastic material at the junction between the rear edge **58** of the flap **50** and the top front of the tray rim **11**. Thinning of the material for the hinge may be accomplished by applying an edge of a heat source to the junction for a time sufficient to partially melt the plastic and applying a sufficient outward force to draw the flap **50** away from the tray rim **11** for a time sufficient to thin the melted junction area thereby forming the flat hinge **81**. As an alternative, the flat hinge **81** may be formed by engaging the rear edge **58** of the flap **50** with the top front edge of the tray rim using a plurality of slots separated from one another by solid transparent material. The width of the slots should be between about 0.1 to 1.0 inch, typically about 0.5 inches, and the width of the material separating the slots is about 1/32 to 1/4 inches, typically about 1/16 of an inch.

[0071] Turning now to a different aspect of egg cartons depicted in FIGS. **14-31**, there is also provided herein, egg cartons having a tamper proof seal that includes a sealed area **206** that prevents the lid from being opened with respect to the tray. As used herein, “a sealed area” “that prevents the lid from being opened with respect to the tray,” means an area where upper and lower portions of the carton are physically linked together so that an ordinary human hand exerting the ordinary force and ordinary motions typically used to open the lid of an egg carton would not be able to open the lid without encountering difficulty. It is understood of course, that given the range of human abilities and ingenuity, some persons may be able to use non-typical means to open the lid, including for example, exerting extraordinary force, using atypical attitudes of motion, or using various tools such as cutting implements to break the seal or otherwise open the lid from the tray by unusual methods. The ability

to use such atypical means or methods is an accepted principle, so the meaning of the term includes designs where such atypical methods would be required to open the lid without difficulty.

[0072] The various embodiments of the tamper proof seal include the tear-away section 210 that permits the sealed area 206 to be removed so that the lid 14 can be easily opened from the tray. The term “tear-away section,” as used herein means that an ordinary human hand using ordinary forces and typical motions can more easily break, tear, dislodge, disengage, disintegrate, detach, or otherwise remove one section of the carton (the tear-away section) than sections of the carton not configured with a tear-away section. It is understood of course, that given the range of human abilities and ingenuity, some persons may be able to break any section of the carton using ordinary forces and may be able to find a non-typical approach for using the same or a less amount of force to break other sections of the carton. The ability to use such atypical means or methods is an accepted principle, so the meaning of term includes designs where such atypical means or methods could be used. To better understand the meaning by way of analogy, it is known that some food bags have a seal that closes the bag, and the bag contains specific regions designed to be more easily torn or more easily disengaged when pulled in a certain direction than other parts of the bag. The regions specifically designed to be more easily torn are analogous to the “tear-away regions” of the egg carton, despite the fact that a person could also open the bag from other places using more force or using a different technique.

[0073] FIG. 14 shows an isometric view of an open egg carton 10 configured with components of a tamper proof seal. The egg carton includes the tray 12 with the plurality of egg compartments 7 and the an upper portion of the tray 12 defining the tray rim 11. The egg carton also include the hingedly attached lid 14 with the lower portion thereof defining the lid rim 4. The tray rim 11 further includes a first contact area 202 while the lid rim 4 includes a corresponding second contact area 204. As illustrated in FIG. 15, the first contact area 202 and the second contact area 204 are configured to be in contact with one another when the lid 14 is closed over the tray 12. In the closed position (a first condition) the first and second contact areas 202, 204 are interlocked, bonded together, or otherwise non-detachably engaged to form a sealed area 206 between the lid 14 and the tray 12 that prevents the lid from being opened from the tray. For convenience of illustration, the sealed area 206 depicted in the Figures are herein shown as a circular region within contact areas 202, 204. This depiction is for purposes of illustration only. The sealed area 206 can be made of any shape or size and may include all or part of the contact areas 202, 204.

[0074] In the exemplary embodiments depicted in FIGS. 14-22, one of the first and second contact areas 202, 204 includes a protrusion 212 and the other of the first and second contact areas 202, 204 includes a hole 214 dimensioned to receive the protrusion 212. As depicted, the protrusion 212 is formed on the tray rim 11, and the hole 214 is formed on the lid rim 4, however, the relative positions of the protrusion 212 and hole 214 can be reversed to accomplish the same function. In these embodiments, the sealed area 206 is formed by a region where a top portion 216 of the protrusion 212 is collapsed over a perimeter 218 that

defines the edges of the hole 214. The respective contact areas 202, 204 thus include the collapsed portion 216 of the protrusion 212 and the perimeter 218 of the hole 214, respectively. Because the diameter of the collapsed top portion 216 is greater than the diameter of the perimeter 218 of the hole 214, the lid 14 cannot be lifted from the tray 12 because the collapsed portion 216 prevents the protrusion 212 from being withdrawn from the hole 214.

[0075] When initially formed, the outer most diameter of the protrusion 212 needs to be equal to or smaller than, the perimeter 218 of the hole so that the protrusion 212 can be inserted through the hole 214. To facilitate collapsing of the top portion 216 over the perimeter 218 to produce a diameter of the top portion 216 greater than the perimeter 218, it is useful to initially form the protrusion 212 with a top portion 216 having a greater lineal perimeter than the diameter of the hole 214. Turning to FIG. 16, the lineal perimeter of the top portion 216 is calculated from a first point 213 where the protrusion 212 would extend above the hole 214, over the top 216 and down to a second point 215, opposite the first point 213 where the protrusion would extend above the hole 214. In the embodiment depicted in FIG. 16, the top portion 216 of the protrusion 212 is flat. Other embodiments for the top portion 216 of the protrusion 212 are depicted in plan view in FIGS. 17-22, which illustrate the protrusion 212 in the tray rim 11 inserted through the hole 214 in the lid rim 4.

[0076] In the embodiment pictured in FIG. 17, the top portion 216a of the protrusion is domed shaped. In the embodiment depicted in FIG. 18 the top portion 216b is flanged. In the embodiment pictured in FIG. 19 the top portion 216c is horizontally fluted around a cylindrical cross section of the protrusion 212. In the embodiment depicted in FIG. 20 the top portion 216d is formed by of a set of outwardly bendable flaps separated by voids. In the embodiment pictured in FIG. 21, the top portion 216e is a bulbous sphere. With each of these embodiments, when the top portion 216 of the protrusion is subject to a downward collapsing force and the lower portion of the protrusion 212 is temporarily reinforced to prevent collapse, the top portion 216 will be flattened and the diameter of the flattened portion will be greater than the diameter of the perimeter 218 of the hole 214 sealably engaging the contact portions 202, 204.

[0077] To temporarily reinforce the lower portion of the protrusion 212 and provide a surface for flattening the top portion 216, the egg packaging equipment may be configured to insert a suitably sized post having a flat surface through the bottom of the protrusion 212 to the points 213 and 215. The top surface of the post serves as an anvil surface while a hammer or other flat surface tool is used to apply a downward force over the top portion 216 of the protrusion, flattening it against the top surface of the post, thereby extending the upper portion 216 over the perimeter 218 of the hole 214.

[0078] Any of the foregoing embodiments may optionally be used with a hole 214 having a raised collar 217. In the embodiment depicted in FIG. 22, a flanged top portion 216b is depicted in conjunction with a hole 214 that has a collar 217 that extends upward from the perimeter 218 of the hole 214. To flatten the top portion 216 over the collar 217, a reinforcing post may again be inserted into the protrusion as described above, however, instead of using a flat hammer to

flatten the top portion **216** over the perimeter **218** of the hole, a suitably sized cylinder having an interior diameter just greater than the exterior diameter of the collar **217** is used to apply the collapsing force, thereby flattening the edges of the upper portion **216** outward and downward over the collar **217**.

[0079] In alternative embodiments, the first and second contact portions **202**, **204** of the sealed area **206** may be sealably engaged by being bonded together. The bonding together of the contact areas **202**, **204** can be accomplished by several techniques, including, for example being melted, glued, or co-solubilized together. In one such embodiment depicted in FIG. 23, instead of having a complete hole **214** passing through the lid rim **4**, the hole **224** can be designed as a pit **228** sized to receive the protrusion **212**. The top most portion of the protrusion **216** and the bottom of the pit **228** within the contact areas **202**, **204** are bonded together to form the sealed area **206**.

[0080] In other embodiments, neither the protrusion **212** nor the hole **214** nor the pit **228** need be used. Rather, as depicted in FIG. 24, the contact portions **202**, **204** are merely flat surfaces to which a glue, a solvent, or heat is applied to bond the surfaces together. This can be accomplished by configuring the egg packaging equipment with a suitably placed heat iron, heat gun, or applicator for the glue or solvent. If heat is used, the lid **14** is first closed over the tray **12** bringing the first and second contact areas **202**, **204** into contact with one another and then heat is applied from the top and bottom of the rim tray and lid rims **11**, **4** at a suitable temperature and for a suitable time to melt the contact areas **202**, **204** together. If glue or a solvent is used, the glue or solvent is applied to at least one, but preferably both of the contact areas **202**, **204** just prior to closing the lid **14** over the tray. Optionally, pressure may be applied to the tops and bottoms of the rim edges **11** and **4** in the vicinity of the contact areas **202**, **204** for a sufficient time to ensure the bonding.

[0081] The first and second contact areas **202**, **204** are each surrounded by corresponding perforations **208**, **209** or other easily broken border in the tray rim **11** and lid rim **4** extending horizontally across the surface of the rims and vertically down the edges thereof. These are depicted in plan view in FIGS. 17-22 and 25, in isometric view in FIGS. 14-16, 23, 29 and 31, and in top view in FIGS. 6-28. The perforations **208**, **209** define the edges of the tear-away section **210** on the tray rim **11** and lid rim **4**. The tear-away section **210** includes the sealed area **206**, which is depicted in the Figures as being circular in shape, as in the case where the sealed area **206** is sealed by flattening the upper portion **216** of the protrusion **212** over the hole **224**. In other embodiments, the sealed area **206** may be of other shapes and may include all or any subpart of the contact areas **202**, **204** on the tray and lid rims **11**, **4**. When the tear-away section **210** is torn away or otherwise detached from the rims **11**, **4**, the sealed area **206** is removed from the lid and tray rims **11**, **4** permitting the lid **14** to be opened from the tray **12**. In a typical embodiment, the tear-away section **210** is irreversibly removed, meaning that the tear-away section **210** cannot be reassembled on the tray and lid rims **11**, **4** without aid of an adhesive, tape or other additional means of attachment. As illustrated, the first and second contact areas **202**, **204** are located on the side ends of the tray and lid rims **11**, **4** respectively, however other embodiments may include

other places for locating the tear away section **206**, such as for example, between the flap **50** and the front side of the lid **14**, or between the front side of the lid **14** and the front side of the tray **12**.

[0082] The perforations **208**, **209** may be configured in a variety of geometries to make the tear-away section **210** easy to remove. FIGS. 26-28 are top view details that illustrate various exemplary embodiments of the tear way section **210**. Because of the top view, each illustration shows only the details on the lid rim **4** configured with perforations **208**, however, it is understood that the same details are in corresponding locations on the tray rim **11** configured with perforations **209**. In the configuration illustrated in FIG. 25, the perforations **208a**, **208b** define a triangular tear-away section **210**, where two rows of perforations **208a**, **208b** extend from the outer edge of the lid rim **4** interiorly to meet at an apex **220**. Optionally, the rim **4** may be formed with notches **222** and the outer most portion of the perforations **208**, **209** terminate at the notches **222**. In this embodiment, the tear-away section **210** is removed by twisting the tear-away section **210** toward the front or back of the egg carton or toward the top or bottom, by rotation about the apex **220**. The notches **222** facilitate the twisting action by providing less resistance at the very edge of the rim **4**.

[0083] In the configuration illustrated in FIG. 26, the perforation **208** is formed in a semicircular shape and the tear-away section **210** is removed by pulling upward or downward on the rim **3**. In the configuration illustrated in FIG. 27, two rows of perforations **208a**, **208b** extend interiorly with respect to the rim **4** and end at a slot **224** formed in the lid and tray rims **11**, **4**. The slot **224** is a void, large enough for a consumer to insert a finger tip so that the tear-away section **210** can be removed by placing the finger tip in the slot **224** and pulling outward from the egg carton with an upward or downward force along the perforations **208**, **209**. In a modification of this arrangement, in the configuration illustrated in FIG. 27 the slot **224** is formed in the lid rim **4** and a tab **226** is formed in the tray rim **11** at a corresponding location so that the tab **226** extends upward through the slot **224**. The tear-away portion **210** is removed by grasping the tab **224** and pulling upward and outward through the slot **224**, which provides a mechanical advantage in applying the upward and outward force to break the perforations **208**, **209**. In a variation depicted in FIG. 29, the tab **226** and a slot first slot **224a** are formed on the lid rim **4**, while the tray rim **11** has a corresponding second slot **224b** configured to receive the tab **226** after the tab is folded around the edge of the tray rim **11** and upward through the slots **224b**, **224a** in the tray and lid rims **14**, **4**, respectively.

[0084] The embodiments depicted in FIGS. 14-30 all illustrate the first and second contact areas **202**, **204** being formed on an upper surface of the tray rim **11** and the lower surface of the lid rim **4**. It should be noted that while the protrusion **212** and hole **214**, the protrusion **212** and pit **228**, or flat surfaces bonded together have been described for forming the sealed area **206** between the contact areas **202**, **204**, any other method of forming the sealed area may be used. Examples of such methods include use of a strong bonding adhesive tape or mechanical fasteners made of a suitable material. In addition, the perforations **208-209** of the embodiments described above are horizontally oriented on the rims **11**, **4** and vertically oriented on the edges thereof. Other orientations of the contact areas **206** and perforations

208, 209 forming a tear-away section **210** to accomplish the same function are also contemplated. For example, the embodiment depicted in **FIG. 30** illustrates forming the contact areas **202, 204** on the outer most edges of the lid and tray rims **11, 4** with a vertical orientations of the perforations **208, 209**. The sealed area **206** in this case may be formed bonding, melting, solubilizing or mechanical attachment between the contact areas **202, 204** using an adhesive tape or some other attachment means. The perforations **208, 209** end in a slot **224** formed on the side of the lid **14**. The tear-away portion **210** is removed by inserting a thumb into the slot **224** and pulling down along the perforations. **208, 209**.

[0085] It is further noted that while the tamper proof seal provided herein is particularly suitable for use with egg cartons made of transparent materials, and has been described in combination with such egg cartons **10**, the tamper proof seal may also be adapted for use with opaque egg cartons where desired. All that is required is formation of the sealed area **206** within the contact areas **202, 204** between the lid **14** and tray **12** to prevent the lid from being easily opened, along with the formation of a tear-away section **210** to permit the sealed area **206** to be easily removed from the egg carton.

[0086] Although the foregoing describes particular combinations of features in particular embodiments, the features provided herein are useful in any of a variety of combinations that may include any of the disclosed features alone or in combination with any other of the disclosed features. Accordingly, what is provided herein can be practiced in many alternative embodiments. Therefore, from the foregoing it will be appreciated that, although specific embodiments of the invention have been described herein for purposes of illustration, various modifications may be made without deviating from the spirit and scope of the invention.

What is claimed is:

1. An egg carton comprising,
 - a tray with a plurality of egg compartments and an upper portion defining a tray rim,
 - a lid hingedly connected to the tray to permit opening and closing of the lid over the tray; the lid having a lower portion defining a lid rim,
 - a first contact area on the tray rim and a corresponding second contact area on the lid rim, the first contact area and the second contact area being configured to be in contact with one another when the lid is closed over the tray, and where in a first condition the first and second contact areas include a sealed area between the lid and the tray that prevents the lid from being opened from the tray; and
 - a tear-away section on the tray rim and lid rim, the tear-away section being configured to remove the sealed area from the lid and tray rims when the tear-away section is removed in a second condition that permits the lid to be opened from the tray.
2. The egg carton of claim 1 wherein the egg carton is made of transparent polymeric material.
3. The egg carton of claim 2 wherein the transparent polymeric material is selected from the group consisting of a polylactic acid polymer, a poly glycolic acid polymer, and a polylactic-glycolic acid co-polymer.

4. The egg carton of claim 25 wherein the material is polylactic acid.

5. The egg carton of claim 1 wherein the first and second contact areas are located on an end of the tray and lid rims, respectively.

6. The egg carton of claim 1 wherein one of the first and second contact portions comprises a protrusion, the other of the first and second contact portions comprises a hole dimensioned to receive the protrusion, and the seal comprises a region where a top portion of the protrusion is expanded over a perimeter of the hole.

7. The egg carton of claim 6 wherein the protrusion includes upper portion that fits into a perimeter of the hole, the upper portion configured to be collapsible over the hole to form a greater perimeter over the hole than when the upper portion is not collapsed over the hole.

8. The egg carton of claim 6 wherein the upper portion of the protrusion is domed shaped.

9. The egg carton of claim 6 wherein the upper portion of the protrusion is flanged relative to a lower portion of the protrusion.

10. The egg carton of claim 6 wherein a perimeter of the upper portion of the protrusion is fluted around a cylindrical cross section of the protrusion.

11. The egg carton of claim 6 wherein the upper portion of the protrusion includes flaps that are outwardly bendable over the perimeter of the hole.

12. The egg carton of claim 6 wherein the perimeter of the hole is raised to form a collar around the hole.

13. The egg carton of claim 1 wherein the first and second contact portions are sealably engaged by being bonded together.

14. The egg carton of claim 13 wherein the bonded together portions of the first and second contact areas includes at least one of a melted, glued, and a co-solubilized portion of the first and second contact areas.

15. The egg carton of claim 13 wherein the first and second contact portions have flat surfaces bonded in contact with one another in the first condition.

16. The egg carton of claim 1 wherein the tear-away section on the tray rim and the lid rim comprises perforations through the tray and lid rims and the perforations at least partially surround the sealed area.

17. The egg carton of claim 16 wherein the perforations are configured in lines that meet at a vertex positioned interior to an edge of the tray and lid rims and behind the sealed area.

18. The egg carton of claim 16 wherein the perforations are configured in lines positioned interior to an edge of the tray and lid rims, wherein a slot is formed through at least one of the tray and lid rims, and the lines of the perforations end at the slot.

19. The egg carton of claim 16 wherein the perforations are configured in at least a partially circular arrangement with a portion of the perforations being positioned interior to an edge of the tray and lid rims behind the sealed area.

20. The egg carton of claim 16, wherein at least one of the tray rim and the lid rim include a slot positioned interior to an edge of the tray and lid rims and behind the sealed area, and the other of the lid and tray rims includes a tab configured to fit through the slot, and wherein the perforations end at the slot.

21. The egg carton of claim 1 wherein the tear-away section is formed on the side ends of the tray and lid rims.

22. The egg carton of claim 1 further including a flap attached to the tray, the flap including at least three buttons configured to engage corresponding holes in the lid to reversibly interlock the tray and the lid.

23. The egg carton of claim 22 wherein the flap includes lattice struts that include a vertical portion and a horizontal portion transversely oriented to the vertical portion within a plane of the flap.

24. The egg carton of claim 23 wherein the lattice struts form a triangular cross sectional area.

25. The egg carton of claim 23 wherein the lattice struts form at least one of a “W” shaped and a half “W” shaped planar cross section in the flap.

26. The egg carton of claim 25 wherein at least two of the “W” shaped and/or half “W” shaped cross section is positioned less than 0.5 inches from a button on the flap.

27. The egg carton of claim 1 further including a rear tower element located interiorly at a rear section of the tray, the tower element including a tab positioned at an apex of the tower element configured to fit into a corresponding hole positioned on the lid when the lid is closed over the tray.

28. The egg carton of claim 1 further including a plurality of towers located in the tray between a plurality of adjacent egg compartments, each of the plurality of towers having an interior surface contiguous with an interior surface of the adjacent egg compartments.

29. The egg carton of claim 28 further including a rear tower element located interiorly at a rear section of the tray, the tower element including a tab positioned at an apex of the tower element configured to fit into a corresponding hole positioned on the lid when the lid is closed over the tray.

30. The egg carton of claim 28 wherein the towers extend upward from a tray rim for a height sufficient to contact an interior surface of a top of the lid when the lid is closed over the tray.

31. The egg carton of claim 28 wherein the tray has a tray rim and a guide element located at a rear corner of the tray

rim, interior to, and extending above the tray rim, and configured to guide an interior surface of a rear corner of the lid over an exterior surface of the guide element.

32. The egg carton of claim 1 wherein the lid is hingedly attached to the tray with “W” shaped hinge.

33. The egg carton of claim 28 wherein the lid is hingedly attached to the tray with “W” shaped hinge.

34. An egg carton comprising,

a tray with a plurality of egg compartments,

a lid hingedly connected to the tray with a “W” shaped hinge;

a closure flap hingedly connected to a front surface of the tray; the tray, lid and flap being made of a transparent polymeric material, and the flap having at least three button tabs configured to fit into at least one of corresponding holes and corresponding pockets in a front surface of the lid when the lid is closed and interlocked with the flap;

a first contact area on the tray rim and a corresponding second contact area on the lid rim, the first contact area and the second contact area being configured to be in contact with one another when the lid is closed over the tray, and where in a first condition the first and second contact areas include a sealed area between the lid and the tray that prevents the lid from being opened from the tray; and

a tear-away section on the tray rim and lid rim, the tear-away section being configured to remove the sealed area from the lid and tray rims when the tear-away section is removed in a second condition that permits the lid to be opened from the tray.

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