June 27, 1961 R. F. REIFERS 2,990,094

MOLDED PULP EGG CARTON

Original Filed Dec. 16, 1953 2 Sheets-Sheet 1

Fig. 1

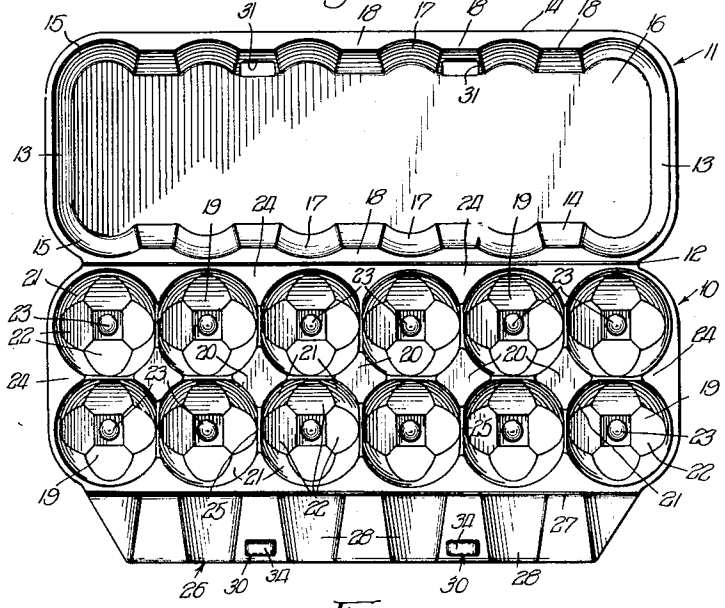


Fig. 2

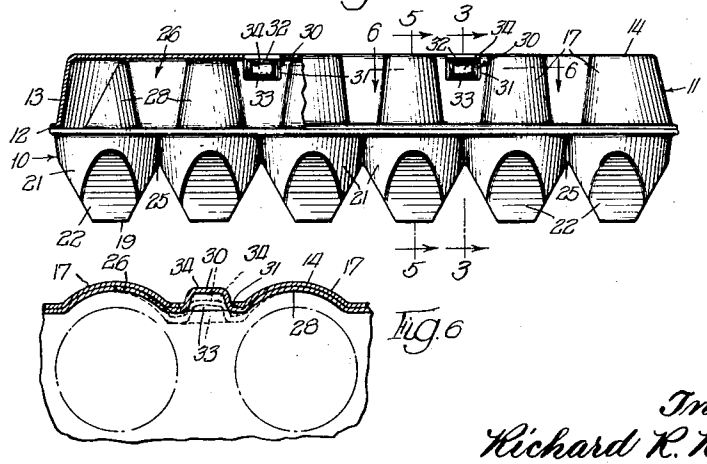


Fig. 6

Inventor
Richard R. Reifers

By Karl W. Flocks
attorney

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Fig. 3

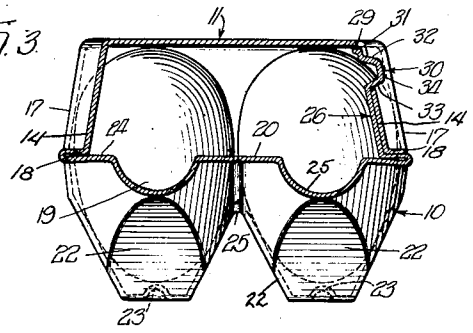


Fig. 4

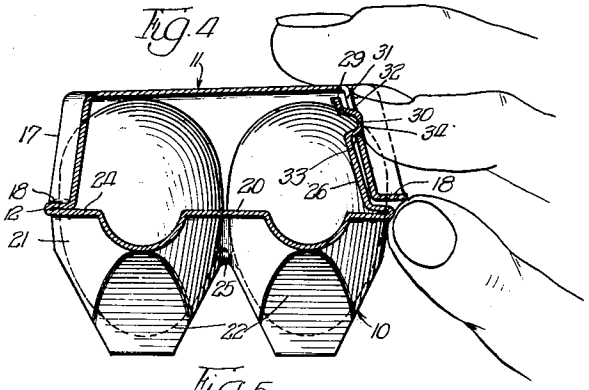
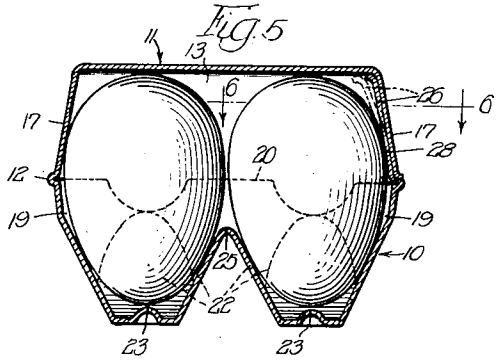


Fig. 5



Inventor
Richard R. Reifers

By Karl W. Flocks
Attorney

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2,990,094

MOLDED PULP EGG CARTON

Richard F. Reifers, Lincolnwood, Ill., assignor to Diamond National Corporation, a corporation of Delaware

Continuation of abandoned application Ser. No. 398,475, Dec. 16, 1953. This application Apr. 19, 1957, Ser. No. 654,016

2 Claims. (Cl. 229—2.5)

The present invention pertains to improvements in a molded pulp egg carton and particularly to its integral means to releasably lock together the cover and bottom sections of the carton. This application is a continuation of my copending application Serial No. 398,475, filed December 16, 1953, now abandoned, which, in turn, is a continuation-in-part of my application Serial No. 289,727, filed May 24, 1952, now abandoned.

Locking provisions which are integrally built into the improved carton securely but releasably hold its cellular, egg receiving bottom section and its non-cellular, flat-topped, tray-like cover section in closed condition; and one of the main advantages of the improvement is that a very reliable locking action is had while still holding the longitudinal and transverse dimensions of the sections sufficiently small that 30 of the filled and closed cartons of the 2x6 style can be packed in a standard 30 dozen egg case. The locking provisions occasion no increase in the over-all dimensions of the carton.

A filled carton can be closed and locked without damaging its complement of eggs by simple automatic machinery operating at high speed; the strength of its integral lock far exceeds that afforded by any egg carton locking device now or previously on the market; and the carton is internally braced and rigidified by an integral, cell defining partition structure, whose rigidifying effect contributes materially to the efficacy and strength of the lock. Yet the locking provisions are conveniently accessible from the top and exterior of the carton for quick and easy unlocking, again without imposing crushing stress on the eggs. The locking elements have been devised with as much attention to their release as to their initial engagement.

Specifically, the invention provides a molded pulp egg carton featuring an internal cover bracing and locking flange which is integrally carried on a side margin of its cellular bottom section. The flange telescopes slidingly upwardly in the cover section of the carton as the cover is brought down toward the bottom section, finally assuming face to face engagement with a front wall of the cover. Externally projecting locking lugs are integrally molded in the flange, and the cover wall faced thereby has locking apertures molded therein to receive the locking elements under an inherent outward spring of the flange about its integral connection to the bottom.

A very rigid quality is imparted to the bottom section, notwithstanding the egg cushioning ability of its individual cells, by its integrally molded internal partitioning structure, which ties the section together as a rigid box-like unit. This structure stabilizes and stiffens an integral longitudinal hinge which connects the flange to the bottom section, with the result that a spring action of the flange about that hinge is made very pronounced. There is a stressing of the pulp fibers at the hinge as the flange is swung inwardly to upright condition which insures snap engagement of the flange locking lugs in the cover apertures when the flange is fully telescoped.

The locking apertures are so located in relation to a top panel of the cover, being closely adjacent the same, and the shapes of the locking flange and its lugs are such, as

to secure optimum efficiency in engaging and also in disengaging the lock.

The eggs are shielded by the upstanding bracing and locking flange as the carton sections engage and disengage, with the carton cover sliding over the outer face of the flange. The eggs have no function whatsoever in respect to the making or maintenance of the interlock between the flange lugs and cover apertures; hence, the lock is equally effective whether the carton is wholly or partially filled, or even when it is empty. It follows that the eggs are not subject to any wedging or crushing as the cover is closed over the flange and bottom, which would of course be extremely objectionable in a carton intended to be closed and locked by machinery.

In regard to the matter of disengaging or releasing the lock, the shape of the upstanding bracing and locking flange permits it to have side engagement with eggs in cells adjacent its hinge only at a zone slightly above their zone of maximum girth. This is true for even the largest size of eggs, or "jumbos," which can be housed in the carton. A substantial top space is left at the centers of the egg cells and between the flange and the upwardly receding curvatures of eggs in those cells, into which the flange can flex inwardly a substantial distance as its locking lugs are depressed to release the same. It is primarily the inherent hinged spring of the flange, not its abutment against the eggs in the cells, which resists release of the lugs; since there is no appreciable contact of the flange with the eggs at the vertical planes of the lugs themselves, which are between egg cells.

Inasmuch as the locking lugs are positioned adjacent the top of the flange, for reception in apertures adjacent the top of the cover, they are in a zone farthest spaced from the maximum curvatures of eggs in cells at either side thereof. It follows that there is a maximum free moment arm between each lug and adjacent egg, so that the lugs are disengaged with ease and convenience from the cover apertures in opening the carton.

The location of the locking apertures also bears on the procedure of molding the cartons. Being high in a front wall of a cover, i.e., adjacent its junction with the cover top panel, also assures that the molded carton will strip freely from a molding die. Since a plug in the molding screen is employed to form each aperture, the location of the latter at an intermediate point, heightwise of the flange, would cause the plug to interlock with the molded pulp fibers and prevent stripping. As constructed, the plug strips freely past the margin of the cover panel at the aperture.

Inasmuch as a strong snap action of the flange locking lugs, in springing into the apertures of the cover section wall, has been coupled in the improved carton with an adaptability of those lugs to be readily unlocked manually by the user, the invention furthers the attainment of this end by means of an improvement in the shaping of the lugs. They are contoured in the molding operation so that their lower surfaces merge downwardly at an appreciable angle to the horizontal into the remainder of the flange. This enables the lugs to cam themselves up over the lower surface of the cover wall aperture as they snap outwardly into the aperture. The effect, though slight, is that of urging the wall downwardly toward a closed position of the cover. Merging at a downward angle into the flange, the lugs will not be embedded by the bottom margin of the wall aperture, hence are freely depressed inwardly for unlocking.

The upper surface of each lug also angles, in this case upwardly, to a merger with the flange immediately adjacent its top, free edge. This assists the cover in sliding downwardly and over the lugs as the cover is plowed into closed position by the closing machine. In sliding

over the upper inclined surfaces of the lugs, the apertured free cover wall flexes outwardly, so that interference with the remainder of the free edge of the flange, as the cover continues its downward movement, is impossible.

The flexibility of the apertured and externally telescoped cover wall of course diminishes from a maximum at its free lower edge to a minimum adjacent its merger with the top. In offering maximum resistance to outward flexure at its topmost point, the wall resists to the greatest degree inadvertent displacement of a flange locking lug from its aperture as a result of accidental outward wall flexure. The stabilizing action of the braced bottom section on the flange hinge is also a contributing factor in this matter, since a laterally unrestrained hinge would compound the likelihood of an accidental unlocking of the lug upon flexure of the cover wall.

Another aspect of the bracing of the cellular bottom section by its integrally molded, upstanding longitudinal partition and cross partition structure is that this structure, as herein proposed, makes possible the over-all compactness of dimension of the improved carton. The bottom section is subdivided into rows of cells by continuous, longitudinally extending and integrally connected dividers, whose tops represent the approximate height of the cells. The dividers incline downwardly from the tops to intermediate zones at which successive cells are merged with one another by upwardly tapering lower wall portions. These portions are of substantially polygonal outline and joint upwardly into generally conical upper cell portions which are at a lesser angle to the vertical.

Successive cells are thus merged with one another at intermediate zones, in reference to the horizontal dimensions of the cells, and at an intermediate elevation which is approximately midway of the height of the cells. Each carton cell thus provides the necessary egg supporting cushion, at its upwardly tapered lower portion, for the smaller end of eggs disposed therein, and the eggs are laterally and longitudinally restrained and separated by the upper portions at the approximate maximum egg girth; yet the eggs are brought as close together as possible without actual contacts.

All of these factors compact the closed carton so that it can be packed in a standard 30 dozen egg case, and still the design of the locking flange in relation to the non-cellular carton cover permits the flange and its locking lugs to freely flex inwardly in locking and unlocking, without in either case imposing any crushing stress on even the largest sizes of eggs which can be placed in a row of cells adjacent the flange.

The foregoing statements are indicative in a general way of the nature of the invention. Other and more specific objects will be apparent to those skilled in the art upon a full understanding of the construction and operation of the improved carton and its locking features.

A single embodiment of the invention is presented herein for purpose of illustration. However, the invention may be incorporated in other modified forms coming equally within the scope of the appended claims.

In the drawings:

FIG. 1 is a top plan view of a finished molded pulp carton in the open, generally planar condition thereof as stripped from molding and drying dies, showing the highly compact nature of the carton;

FIG. 2 is a view in front elevation of the improved carton in closed and locked condition, being partially broken away to more clearly illustrate the character and action of the automatic internal locking flange and lugs thereof;

FIG. 3 is a view in transverse vertical section of the closed and locked carton along a line corresponding to line 3—3 of FIG. 2, which is in the vertical plane of a locked flange lug and cover aperture, showing the final relationship of the locking lug and aperture to one another and indicating the relationship of these features to a large size egg just behind them;

FIG. 4 is a view in transverse vertical section similar to FIG. 3, showing the simple manner of manipulating the carton to disengage the flange locking lugs;

FIG. 5 is a view in transverse vertical section along line 5—5 of FIG. 2, i.e., in a vertical plane through egg cell centers, illustrating the top clearance which the improved carton affords at this occupied zone for inward flexure of its bracing and locking flange; and

FIG. 6 is a fragmentary view in horizontal section along line 6—6 of FIGS. 2 and 5, showing in solid and dotted line how the carton permits inward flange flexure in disengaging its lock.

The illustrated carton, shown in FIG. 1 in its flat condition as stripped from a drying form, comprises a cellular, pronouncedly compartmented bottom section, generally designated **10**, to which a non-cellular or open faced, tray-like cover section **11** is integrally hinged by a longitudinal crease **12** at corresponding side margins of the sections. Cover section **11** has pairs of opposed end walls **13** and side walls **14** integrally joined by rounded corners **15**, and a flat top panel **16** is likewise integrally joined about its periphery with the walls. The exterior surface of this panel is smooth and continuous, well suited for the reception of printed matter or ornamentation.

Cover section side walls **14** are of scalloped shape, featuring longitudinally spaced, outwardly curved or recessed bays **17** formed by frusto-conical sectional surfaces molded in the front wall **14** of the cover section to increase the egg room in the cover section above the egg cells of the bottom section, which recesses are spaced by intervening, inwardly extending abutment portions **18**. These have stable vertical engagement with cellular bottom section **10** when the carton is closed.

The interior of bottom section **10** is partially subdivided into two rows of six egg receiving cells **19**, in the type of carton chosen for illustration, by a longitudinally extending series of upstanding center separator posts **20** which are of generally rectangular outline at their tops. Their sides merge downwardly in a concave shape, as at **21**, and at an angle to the vertical, into flat lower cell walls **22** which are arranged in rectangular outline. The floor of each cell **19** has a convexly rounded cushion button **23** molded therein which will afford a yieldable support for a relatively small egg. However, the primary cushioned vertical support is at the flat divergent wall surfaces **22**. Spaced, inwardly extending side and end abutment webs **24** along the respective side and end walls **13**, **14** of bottom section **10** complete the cellular partition structure of the latter. They have generally conical, upper and flat, lower cell defining surfaces which merge beneath the cell tops in like manner to the surfaces **21**, **22** of central posts **20**. The cells **19** are contiguous in their longitudinal and transverse arrangements. That is, the intended spacing of the bottoms of successive cells brings them so close to one another that adjacent, upwardly tapering flat surfaces **22** meet well below the top of the cells, in fact at an elevation a little more than midway of the cell height, as appears in FIG. 3. This is true of any pair of successive cells whether arranged transversely of the carton or in one of its longitudinal rows.

The merger of successive contiguous cells occurs approximately at, and not below, the elevation at which the respective sets of lower flat surfaces **22** merge upwardly into the conical surfaces **21**. The result is that downwardly curved intermediate ridges or saddle-shaped portions **25** integrally connect successive posts **20** with one another, in the longitudinal direction, and integrally connect each post with abutment ledges **24** on either side thereof, in the transverse direction. These depressed connections are of slight width, their cross section representing a somewhat thickened apex of the upwardly convergent surfaces **22**, and they are concavely curved in their transverse contour. Thus eggs in successive cells are brought as close together as possible, for the larger

sizes, yet they are safely protected against contact by the upwardly tapered cell dividers **25** and posts **20**. The conical upper surfaces **21** of the posts **20** and side and end abutments **24** cradle the maximum girth of the eggs, restraining them from contact and holding them from rolling when the carton is open.

In practice it has been found best to taper the lowermost flat cell surfaces **22** at an angle of about 28° to the vertical, with the upper conical surfaces at a substantially lesser angle, as shown in FIG. 5. This gives best cushioned egg support at surfaces **22** and best horizontal egg restraint at its zone of approximately maximum girth.

Thus, the improved carton presents a cellular bottom section **10** made up of cells which are contiguous well beneath the tops and above the bottoms thereof. This means the maximum compacting of the over-all longitudinal and transverse dimensions of the carton as a whole, which will enable the cells to accommodate large size eggs without their destructive contact with one another and to hold the eggs against excessive tilt or shift. The partitioning means extend integrally from end to end and side to side of the carton, substantially rigidifying the same as a result.

An elongated internal cover bracing and locking flap or flange **26** is integrally hinged by a longitudinally extending crease **27** to the side margin of bottom section **10** opposite its cover hinge **12**. Flange **26**, like the side walls of cover section **11**, is of generally scalloped outline. It has egg accommodating bays or recesses **28** formed by frusto-conical sectional surfaces molded therein which are in transverse alignment with the bottom section egg cells **19** and intervening, inwardly projecting abutments **29** which are transversely aligned with the side abutments **24** of the bottom. Flange **26** and the front or free unhinged wall of the cover **11** carry the locking provisions of the carton.

The locking means comprises a pair of locking elements or lugs **30** which are integrally molded in the flange **26** to project outwardly adjacent the free outer edge thereof, and detent apertures **31** molded in the front wall **14** immediately adjacent its junction with cover top panel **16**. The lugs and apertures are of substantial width in order to take strong and tear resistant engagement when the carton is locked. The lugs are characterized by upper and lower surfaces **32**, **33**, respectively which angle divergently and merge with the remainder of flange **26** above and below the lugs. A rounded nose **34** connects lug surfaces **32**, **33**.

The locking apertures **31** extend upwardly from an intermediate point in the height of cover front wall **14** to its junction with the top panel **16** of the cover section, as illustrated in FIGS. 2, 3 and 4. Locking and bracing flange **26** is of a height to also extend to this panel, being in edge abutting and vertically bracing engagement with the latter, as well as in internal, side by side contact with the inner surface of the apertured cover front wall when the carton is closed and locked, as in FIG. 3. However, it should be noted that in this condition the flange is readily flexible inwardly to disengage the lock as an inspection of FIGS. 5 and 6 will reveal and as will be hereinafter explained in detail. FIG. 6, which depicts in dot-dash line the shape or outline of eggs at the elevation at which the section is taken, shows the substantial space between the eggs and the flange which permits freedom of inward flange flexure.

In using the carton eggs are deposited, large end up, in bottom section cells **19**, whereupon flange **26** is swung to upstanding position adjacent the front row of eggs and the cover section **11** is swung downwardly into externally telescoped relation over the flange. These operations are ideally performed on high speed closing apparatus adapted to plow the flange and cover inwardly about their hinges and swing the cover down. As this happens, the free front cover wall **14** slides downwardly over the upper inclined camming surface **32** of the flange locking lugs **30**, flexing the wall outwardly so that it is unnecessary to exert special precautions to cause the cover to clear the flange. When the lower edge of each wall aperture **31** passes the nose **34** of its locking lug the latter snaps outwardly under the inherent spring of flange **26** to a positively interlocked relationship in the aperture. The lower inclined surface **33** of the lug facilitates its entry into the aperture without snagging, and the inclination even exerts some cam action on the cover wall to urge it further down as the wall returns inwardly.

Flange **26** is in edge abutting, load sustaining relation to cover top panel **16** when the cover is fully closed, and its inherent outward spring urges it outwardly to maintain this strut relationship to the cover and to resist accidental inward displacement of lugs **30** from apertures **31**. The lock has been completed without the necessity of jamming flange **26** inwardly under substantial force which would be apt to crush the eggs.

In order to unlock the cover, lugs **30** are pressed inwardly in the fashion illustrated in FIG. 4, preferably placing the thumbs beneath locked cover section wall **14** and the index fingers in engagement with the lugs, with the other fingers of the hands resting on top panel **16** as a fulcrum for an outward stretching of wall **14** and upward lift of wall **14** as the lugs **30** are depressed inwardly. Inward springing of flange **26** which necessarily attends the depression of the lugs is facilitated due to the arrangement of the latter in a top portion of the flange, immediately adjacent its free upper edge. See FIGS. 5 and 6.

By reference to FIGS. 5 and 6, it is seen that there is a substantial space between the upper part of the flange and the receding upper curvature of an egg to permit ready inward flexure of the flange. The most restricted space is at the longitudinal center of an egg cell, a zone depicted in FIG. 5, and it is there indicated in dotted line how the flange **26** can flex inwardly at its top to accommodate inward shift of its lug in a zone to one side of the egg. The egg will not ordinarily be engaged by the flange at an elevation even as much as midway of the height of the cover section **11**. There is a maximum moment arm between the lug **30** and this point of egg-flange engagement for inward yielding of the flange and unlocking of the carton.

There is no possibility of damaging an egg in unlocking. The lugs are conveniently accessible to the fingers with the carton in upright position, and when the cover is opened the eggs are held in place against roll or shift by their individual, relatively high walled cells.

The non-cellular cover section **11** will of course permit some degree of rearward tilt of large sized eggs, if necessary, in flexing flange **26** between egg cells to close or open the carton, so that in no case do the eggs themselves act as an abutment primarily holding lugs **30** in apertures **31**. This will inevitably cause egg breakage. It is the spring of the flange at its stiffly stabilized hinge, coupled with its top flexibility, which are the key to the maintenance of the lock and to its ready disengagement when desired. The partitions which compartmentize bottom section **10** tie its two longitudinal hinge-bearing walls together in a rigid relationship.

In short, as regards flexibility, the bottom section **10** progresses upwardly from a practically inflexible perimeter, rendered so by its elevated, internally molded partitioning in integral merger with its walls, past the flange hinge and into the locking flange **26**. The latter decreases in its resistance to local flexure from maximum at a lower portion adjoining the hinge, which determines the flexibility or snap of the flange as a whole, to an upper free edge which is of maximum local flexibility, as about any upright fulcrum.

The reverse is true in reference to the outer free wall **14** of cover section **11**. Its yieldability to outward flexure increases from a zero or minimum at its junction with top panel **16** to a maximum at its lower free edge. This

means that since locking apertures **31** are located at a zone of minimum flexibility they will have best locking stability in holding lugs **30**; the lower part of the wall can still flex outwardly for ease of camming engagement of the lock lugs, and for disengaging them manually, when desired.

Locking lugs **30** can be made wide and rugged, for example of a width substantially exceeding that of the intermediate transverse space in the cover **11** to permit their rearward flexure.

The carton is capable of repeated re-use without noticeable diminution of the effectiveness of its locking provisions, which are so devised that minimum stress is placed on lugs **30**, but even so the reinforced shaping of the lugs makes them well able to take any shearing stress they may encounter. The carton obviously consumes a minimum of molded pulp paper for a self-locked type. The improved lock requires no special operation to engage it beyond a normal manipulation of the carton parts into closed position. Special lock interengaging procedures are avoided. Hence, there is no need, in a large scale egg room operation, for complicated or special closing machinery. From another equipment aspect, the locking lugs **30** and detent apertures **31** are all formed incident to a normal pulp molding procedure, not increasing in any degree the time or technical difficulties involved in making the carton.

The advantages of egg cartons embodying the invention have been described with particular reference to large scale egg packaging operations involving automatic machinery for closing and sealing the cartons. The simplicity of construction and the outstanding ease of operation of the locking mechanism also makes these cartons attractive and highly convenient for ordinary housewives. Unlike the egg cartons available heretofore, it is unnecessary for the housewife to place the carton on a support and then use both hands in order to unlock and open it. Instead, it is possible for her to hold the carton in one hand while quickly and easily unlocking and opening the carton with her other hand, in the manner described hereinbefore relative to FIG. 4 of the drawings. Furthermore, the readily and smoothly operable positive locking mechanism enables the housewife to perform these operations without jerking or straining the carton in any way, thereby greatly minimizing the danger of dropping and breaking the eggs.

In the single embodiment of the invention illustrated and described in detail, the egg carton is provided with two rows of six egg cells each, which is known as a two by six type carton. However, it is evident that the invention may be embodied advantageously in other types of cartons, such as the widely used three by four type egg carton. Furthermore, although it is highly desirable for the cover front wall **14** and the flange **26** to have mating scalloped configurations, it is also contemplated that these portions of the carton may be made perfectly flat. Likewise, although a preferred type of egg cell structure has been illustrated and described, it should be understood that other suitable types of cell structure may be employed in cartons embodying the invention, if desired, and that the cells may be adapted to contain fruit or other generally spherical objects instead of eggs.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. In an integral and nestable egg carton made of relatively flexible molded pulp, a cellular tray portion having a front side, a rear side, and two ends, an inverted dished cover hinged to said tray portion, means for latching said tray portion to said cover with a latch located above said tray portion and extending completely through said cover from the inside to the outside, said tray portion having its front side strongly tied to its rear side by a plurality of spaced cell-forming partitions extending generally parallel to said tray portion ends, said partitions acting as means for preventing spreading of said front side from said rear side, said tray portion including egg cells adjacent but below the latching means, said inverted dished cover having a planar top, a front side, a rear side, and two ends, said front side being connected to said rear side only by said two ends and said planar top so that the front side is relatively flexible and is not rigidly tied to said rear side intermediate the ends of said front side, said front side of said cover having an opening formed therein through which the latch is adapted to extend completely from the inside to the outside, said dished cover being hinged to said tray portion along its rear side, a latch holding flap hinged to the front side of said tray portion, the hinge line connection of said cover with said tray portion and the hinge line connection of said latching flap with said tray portion being maintained parallel by said tying partitions even when the tray portion is loaded with eggs, said latch on said latching flap being located on one side of said tray portion which is opposite to the side where the cover is connected to the tray portion so that both the cover and the latching flap are each connected to the tray portion when the carton is open, said molded pulp egg carton being integrally formed with the latching flap, the upper edges of the two sides and the two ends of the tray portion, the upper edges of the two sides and two ends of the cover generally in the same plane and with the latch extending downwardly from the underside of the latching flap which is hinged to the front side of the tray portion and said latch being relatively close to the tray portion as compared with the opening in the front side of the cover which is relatively remote from the tray portion; when the tray portion is loaded with eggs and the latching flap is turned upwardly and the cover portion is rotated in a direction to telescope over the latching flap, the two hinge lines are relatively immovable but the front side of the cover may flex, whereby the loaded egg carton may be latched by simply rotating the latching flap upwardly and inwardly and rotating the cover upwardly and around the latching flap while the structural features maintain the geometric relation of the latch on the latching flap to the opening in the cover until the front side of the cover engages the latch on the latching flap and is cammed thereover until the latch on the latching flap registers with the opening in the front side of the cover whereupon the latch passes through the opening in the cover from the inside to the outside to effectively latch the carton.

2. A nestable molded pulp egg carton in accordance with claim 1, wherein the opening in the front side wall of said cover extends to the planar portion thereof and the latch on said latching flap is near the edge thereof which is remote from the hinge connection of the latching flap with the tray portion.

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