July 15, 1969 N. J. FRANZ 3,455,496

SEAL END CARTON

Original Filed March 27, 1964 4 Sheets-Sheet 1

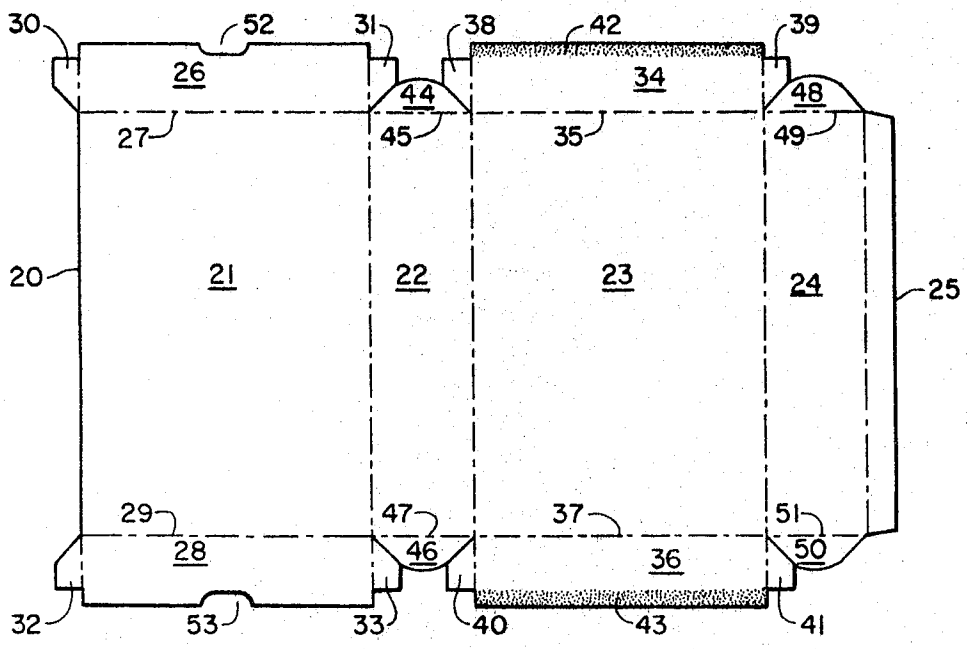


Fig. 1

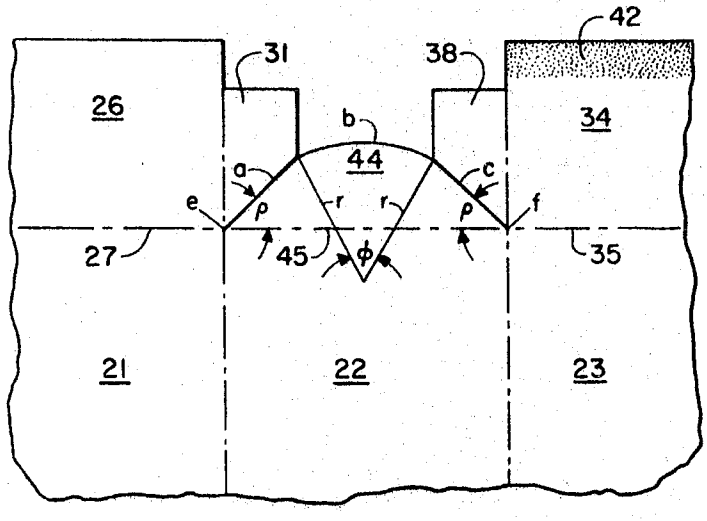


Fig. 2

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SEAL END CARTON

Original Filed March 27, 1964 4 Sheets-Sheet 2

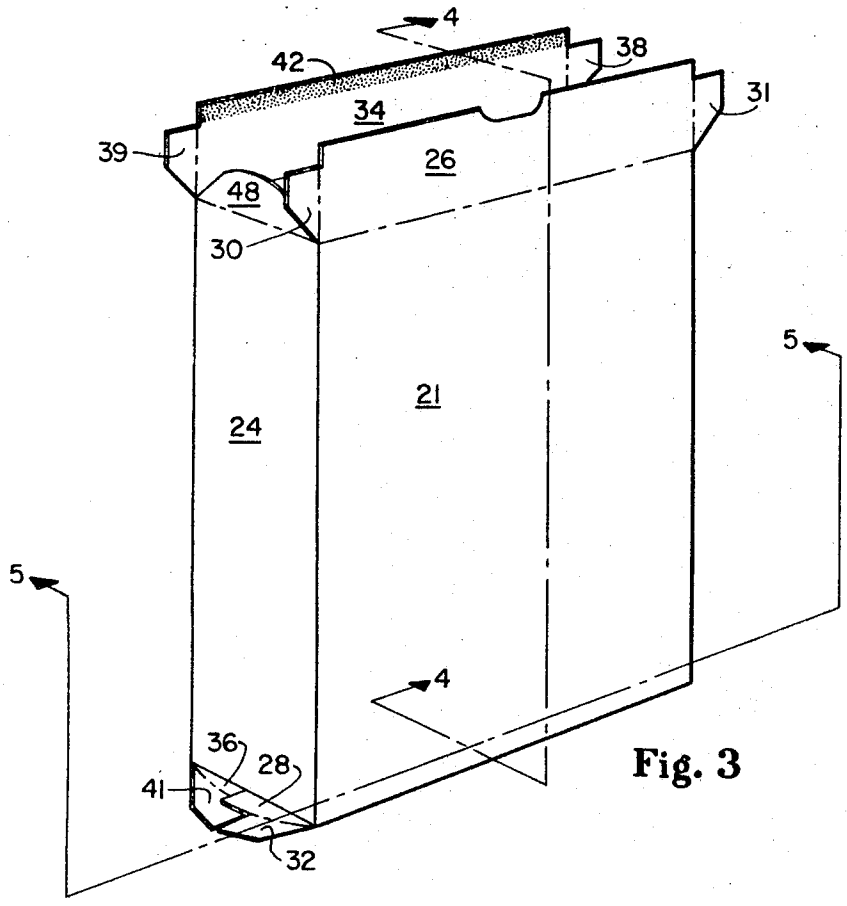


Fig. 3

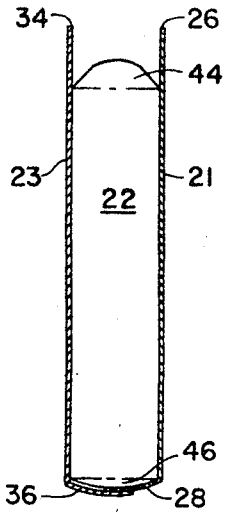


Fig. 4

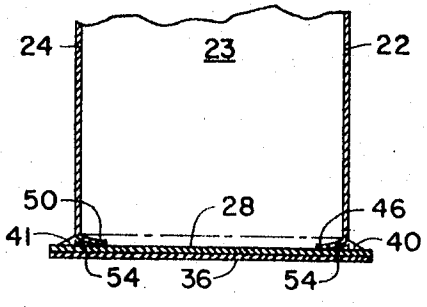


Fig. 5

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SEAL END CARTON

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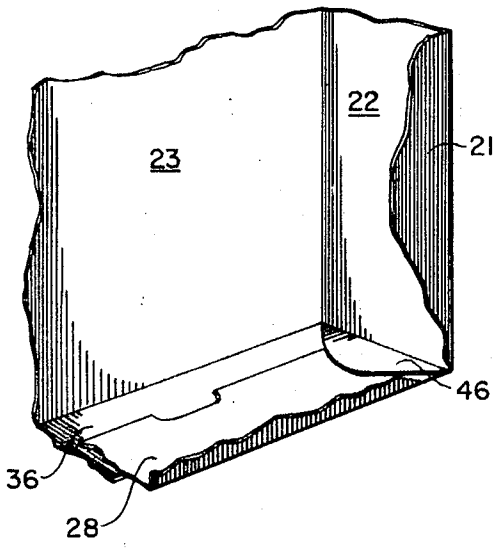


Fig. 6

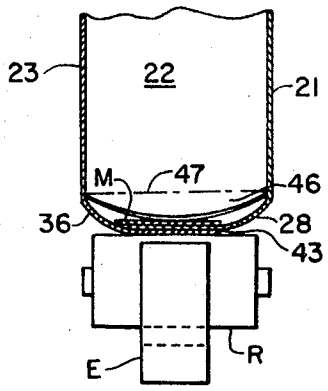


Fig. 9

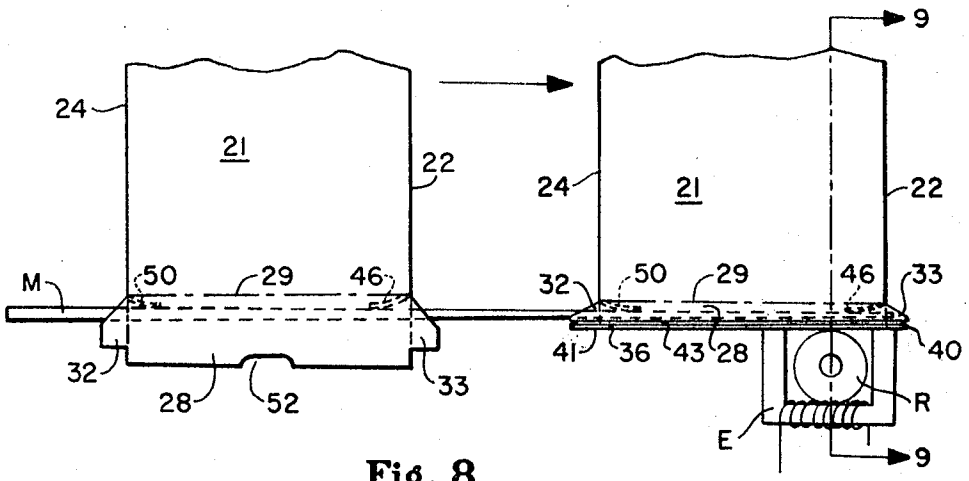


Fig. 8

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SEAL END CARTON

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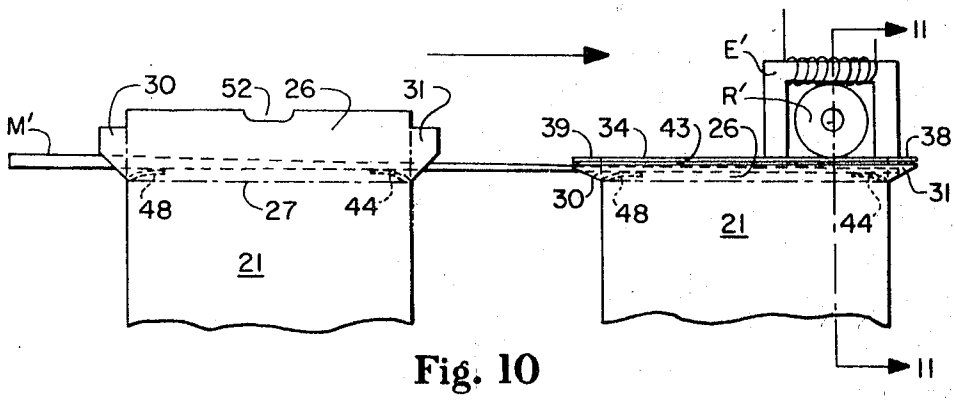


Fig. 10

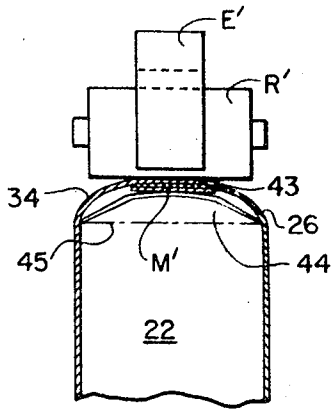


Fig. 11

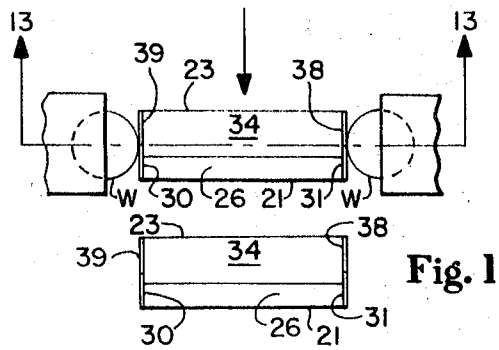


Fig. 12

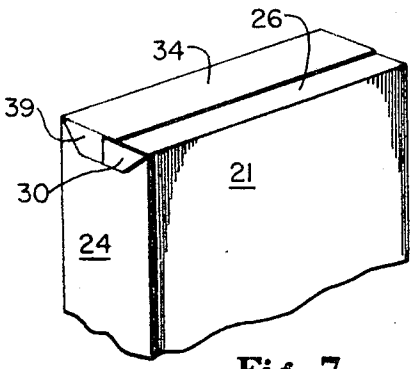


Fig. 7

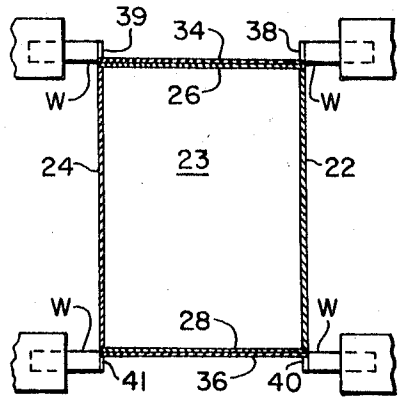


Fig. 13

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United States Patent Office 3,455,496 Patented July 15, 1969

3,455,496

SEAL END CARTON

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Original application Mar. 27, 1964, Ser. No. 355,156, now Patent No. 3,377,767. Divided and this application Jan. 29, 1968, Ser. No. 718,645

Int. Cl. B65d 5/00, 5/02

U.S. Cl. 229—37 2 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to an improved carton and more particularly, to a seal end carton which can be used to package granular or powdery products and the like and a method for sealing the carton.

Cross reference to related application

This application is a division of copending application Ser. No. 355,156, filed Mar. 27, 1964, now Patent No. 3,377,767, issued Apr. 16, 1968.

A commonly used carton for packing powdery products is composed of front, back and side wall panels, all of which have sealing flaps extending therefrom. The length of the sealing flaps extending from the side wall panels is usually less than half the front wall width dimension so that they only partially cover the open end of the carton when both are infolded. On the other hand, the sealing flaps extending from the front and back wall panels are usually full size, i.e., of a size to extend completely across and cover the end of the erected carton when folded into position. A reduction in the amount of paperboard needed for a carton having a given volume can be obtained by simply reducing the dimensions of these sealing flaps. However, when paperboard is saved in this way, it can cause problems in sealing the ends securely. It also may result in problems of sifting and leakage which occur frequently at the end structure of a carton having relatively small sealing flaps. The problem is particularly troublesome as the carton is being filled and handled on modern high speed packing equipment.

It is an object of this invention to provide an improved carton which will retain granular or powdery products without leakage during initial packing and under normal condtions of handling and storage.

It is another object of this invention to provide an improved carton in which a minimum of cartonboard material is used and which is especially adapted for use with granular or powdery products.

It is another object to provide a seal end carton in which the end flaps extending from the side walls function as baffles to serve as a means for preventing material leakage before the final end seal is completed.

Still another object is the provision of an improved carton which can be formed and filled with granular or powdery products on continuous motion, high speed packing equipment without materials leakage at the ends of the carton.

These and other objects of the invention which will be set forth hereinafter will become apparent to one skilled in the art upon reading these specifications when taken with the accompanying drawings of the exemplary embodiment.

Briefly summarized, the invention in one embodiment provides a carton having front, rear and side walls with each wall having flaps extending from both ends. The closure flaps attached to the front and rear walls are narrower than the full width of the side wall but yet are sufficiently wide to partially overlap when folded into sealing relation. Opposed baffle flaps extend from each end of each side wall. The baffle flaps have a special configuration as more fully described hereinafter. The baffle flaps are infolded under the front and rear closure flaps but are not sealed thereto. The baffle flaps in combination with the closure flaps provide a mechanical closure of the carton end prior to final end sealing.

The method of forming the carton comprises the steps of opening and squaring-up the collapsed carton blank, moving the open ended carton over the fixed end of a mandrel, infolding the baffle flaps against the mandrel and thereafter folding the closure flaps over the mandrel so that the mandrel lies between the baffle flaps and the closure flaps. Before the closure flaps are overlapped, a quick-setting adhesive is applied to the sealing surfaces of the closure flaps. At the free end of the mandrel, the overlapped surfaces of the closure flaps pass between the mandrel and a stationary roller to which an electromagnet is affixed. The force created by the electromagnetic field draws the mandrel and roller together thereby tightly squeezing together the overlapped surfaces of the closure flaps and the interposed adhesive. After the carton is filled with product, the other end is closed and sealed by a similar method as described above. The carton is completed by adhering the ear-like extensions projecting from the closure flaps to the side walls until the adhesive sets.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, it is believed the invention will be better understood from the following description when taken with the accompanying drawings in which:

FIGURE 1 is a plan view of a cut and scored carton blank from which the structure of this invention is made;

FIGURE 2 is a fragmentary view of the carton blank of FIGURE 1 showing a baffle flap in detail;

FIGURE 3 is an isometric view of the squared-up carton with baffle and closure flaps at one end in partially sealed condition;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary sectional view taken on line 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary isometric view showing the infolded baffle flap and closure flaps at an end of the carton; the front panel being removed to permit clear view of the interior;

FIGURE 7 is a fragmentary isometric view showing the carton sealed at one end;

FIGURE 8 is a fragmentary elevation showing the fixed mandrel, stationary roller and electromagnet which can be used to practice the method of the invention;

FIGURE 9 is an expanded fragmentary sectional view taken on lines 9—9 of FIGURE 8;

FIGURE 10 is a fragmentary elevation of another fixed mandrel, stationary roller and electromagnet used to close the carton tops in practicing the method;

FIGURE 11 is a sectional view taken on line 11—11 of FIGURE 10;

FIGURE 12 is a top view of the carton showing final sealing of the ears; and

FIGURE 13 is a sectional view taken on line 13—13 of FIGURE 12.

FIGURE 1 illustrates the carton blank **20** wherein the dash-dot lines represent conventional score lines and the solid lines represent either the carton outlline or cuts in the carton blank. The body of the carton comprises a front wall **21**, a side wall **22**, a back wall **23**, a side wall **24**, and a glue flap **25** separated by score lines as illustrated. Closure flaps **26** and **28** defined by the score lines **27** and **29**, respectively, extend from the ends of the front wall **21**. Closure flaps **26** and **28** have ear-like extensions **30**, **31** and **32**, **33**, respectively. In similar fashion, the closure flaps **34** and **36** separated by score lines **35** and **37**, respectively, extend from the ends of the back wall **23**. Closure flap **34** has ear-like extensions **38** and **39** and closure flap **36** has ear-like extensions **40** and **41**. Ears, **30**, **31**, **32**, **33**, **38**, **39**, **40** and **41** are articulated by score lines to the respective closure flaps. As shown, the closure flaps are of generally rectangular configuration. The width of each closure flap is greater than one-half the width of the side wall but less than the full width of the side walls. Closure flaps **34** and **36** have adhesive pattern areas **42** and **43**, respectively; these areas define the overlapped surface areas of the cooperating closure flaps at each end of the closed carton. The baffle flaps **44** and **46** extend from the sidewall **22**. Baffle flaps **44** and **46** are generally arcuate in form and are defined by the score lines **45** and **47**, respectively. Side wall **24** is similarly provided with projecting baffle flaps **48** and **50**, also of generally arcuate form, separated from the side wall **24** by the score lines **49** and **51**, respectively. The closure flaps **26** and **28** are notched as at **52** and **53**, respectively.

In FIGURE 2, the form of the baffle flap **44** is shown in enlarged detail. It will be understood that the other baffle flaps **46**, **48** and **50** are of like configuration. As shown, the form of the baffle flap **44** is outlined by the configuration of the cuts *a* and *c*, the free edge *b* and the score line **45** separating the baffle flaps **44** from the side wall **22**. The outer edge of the flap **44** intercepts the score line **45** at the points *e* and *f*. The cuts *a* and *c* are substantially straight lines which sever the baffle flap **44** from the ears **31** and **38**, respectively. The arc-like edge *b* appears (see FIG. 2) to join cuts *a* and *c* tangentially. However, in the preferred embodiment, tangential intersection is not essential. The straight cuts *a* and *c* preferably subtend an angle with the score line **45** between about 40° and 50° (the angle ρ in FIGURE 2). In the preferred embodiment arc *b* is a portion of a circle on a chord subtended by a central angle ϕ of from about 55° to about 90°. The arc *b* has a radius *r* equal to about one-half of the width of the side wall panel **22**. The subtended central angle ϕ, the corresponding length of arc *b*, and the length of the straight cuts *a* and *c* will be varied according to the size and dimensions of the carton as well as the corresponding dimensions of the ears. The above described configuration of the leading edge of the baffle flap **44** is preferred over a full circular arc or other similar curve because of the need for tight line contact between the edge of the baffle flaps and the surfaces of the closure flaps when the carton is initially closed.

The carton blank of FIGURE 1 may be folded and tubed by ordinary carton making machinery well known to those skilled in the art so that glue flap **25** is securely adhered to the inside surface of front wall **21**. Glue flap **25** could extend, alternatively, from front wall **21** and thus be secured to the sidewall **24** when the carton blank is tubed.

In FIGURE 3, the squared up carton of the exemplary embodiment is shown with the top end open and the bottom end partially sealed. For purposes of this invention, however, the order in which the ends are sealed is immaterial. It will be especially noted in FIGURES 3 and 4 that closure flaps **28** and **36** have been folded over baffle flap **46** to overlap one another. The baffle flap **50** is in a position similar to the baffle flap **46**. The closure flaps are adhesively secured at the overlapped portion. At this stage, folding, gluing and sealing of the ears **32**, **41** and **33**, **40** to the side walls **24** and **22**, respectively, remains to be done in order to complete the end seal. At this stage, the bottom end, as shown in FIGURES 3 and 4 are called "partially sealed" as distinguished from the "final seal" when the ears have been folded and glued to the side walls.

A "quick-setting" thermoplastic or hot-melt adhesive is used in the preferred embodiment of the invention. The adhesive has the ability to sufficiently seal together the closure flaps before the natural spring-back of the cartonboard causes separation at the adhered surfaces. Various quick-setting adhesives will be familiar to those skilled in the art. However, the preferred adhesive for use with this carton is solid at room temperatures but sufficiently fluid at temperatures of about 250° to 400° F. to permit rapid application to the surfaces by conventional means. Thermoplastic or hot-melt adhesives cool rapidly and solidify upon application thereby hardening in less than 0.50 second. Since the hot-melt adhesive solidifies on cooling, if desired, artificial cooling may be practiced. The adhesive is applied by conventional means to areas **42** and **43** of closure flaps **34** and **36**, respectively. The size of the adhesively coated area will vary according to various carton sizes but generally the adhesive is applied to substantially the area of overlap when the closure flaps are infolded. Where the overlap area is greater than the amount of adhesive surface requirements for effective sealing, a strip or adhesive pattern may be desirable. In an alternative embodiment, it may also be desirable to use a strip of hot-melt adhesive with conventional slow-setting glue to complete the fastening.

In FIGURES 4, 5 and 6 the partially sealed end has been shown out of proportion to illustrate the void **54** (see FIG. 5) at the corners of the carton and the sealing function of the baffle flaps **46** and **50** after the closure flaps **28** and **36** have been folded and adhesively secured. The void **54** can be the principal point of product leakage at this stage of the carton structure. The leakage would occur at the juncture of the baffle flap extending from the carton side wall and the adhered closure flaps. As previously described, the problem of product leakage results because the carton is filled and moved on the packing line with the bottom end partially sealed to a point as heretofore described.

In most paperboard materials used for commercial cartons, there is a natural tendency for scored and folded flaps to spring back to the original flap condition of the carton blank. Because of this inherent property of paperboard, the closure flaps **28** and **36** (FIG. 6), even though folded and adhesively secured, do not lie in a flat plane but tend to bow-out thus exposing the void **54** when the end of the carton is partially sealed. This bow-out in a cross-section resembles a catenary shape. As shown in FIG. 6, the arcuate and straight line portions of the leading edge of the baffle flap **46** fit in substantially tight line contact with the inside surfaces of the closure flaps **28** and **36** at the partially sealed end of the carton.

Looking again at FIGURE 6, it will be seen that the configuration of the outer edge of the baffle flap **46** (bent inwardly) fits tightly against the infolded closure flaps **28** and **36** to seal the void **54** thereby preventing material leakage at the corner of the carton. In other words, the outer edge of the baffle flap is configured to substantially conform to the inside contour of the closure flaps as they tend to bow-out. In this position the baffle flap acts as a short stiff mechanical baffle which serves as a dependable sift-proofing device between the leading edge of the baffle and the inside surfaces of the closure flaps. Having been partially sealed in this manner, it is now possible to fill the carton with a powdery product without leakage even though the final sealing of the carton end has not been completed.

The method of forming and sealing the ends of the carton will now be discussed. In the practice of the method

it is possible to use a mandrel M together with the roller R and an electromagnet E as shown in FIGURE 8. The mandrel M comprises a magnetizable structure in the form of a rod, bar or the like, cantilevered from a fixed support. The mandrel tapers smoothly from the larger end at the fixed support to a thin flexible "spring-like" blade at the distal end. Iron, steel or any material having magnetic propensities under the influence of an electrical field are usable in the illustrated embodiment. Preferably the mandrel M when used on a conventional high speed packing line is located between the carton blank storage magazine and the product filling machine. Alternative locations are equally adaptable so long as one carton end is partially sealed before the carton is filled with product.

Collapsed cartons are magazine stored, opened and squared by conventional equipment and methods well known in the art. The squared-up carton is moved over the fixed end of the mandrel M and by use of known flap folding instrumentalities the baffle flaps **46** and **50** (FIG. 8) are infolded against the mandrel. As the carton advances, one closure flap **28** is folded over the mandrel, i.e., with the mandrel interposed between the baffle flaps and the closure flap **28**. Next, the hot-melt adhesive is applied to the adhesive area **43** of the closure flap **36** by conventional means (not shown) and then the closure flap **36** folded over against the closure flap **28**. The closure flaps **28** and **36** are superposed at the adhesive area **43**. As the carton continues its advance, the overlapped closure flaps pass over the stationary roller R and electromagnet E. When the electromagnet E is energized, a substantial nip pressure is exerted to hold the overlapped adhered surfaces of the flaps **28** and **36** tightly together as the carton closure flaps **28** and **36** pass between the roller R and the mandrel M. The baffle flaps **46** and **50**, which have been previously infolded, bear against the upper side of the mandrel M due to the natural spring of the paperboard carton material. In other words, as the carton is moved along the mandrel M toward its free end, the overlapped closure flaps are pinched or squeezed between the roller R and the mandrel M.

The mandrel M is thin and flexible at the free end and would be deflected away from the roller R as the closure flaps are moved between them. If this happened, the necessary pressure for sealing the quick-set adhesive at the overlap of the closure flaps would be insufficient for effective sealing. However, the electromagnet E located near the roller creates a magnetic field which draws the thin flexible end of the mandrel toward the roller thereby adding substantially to the compressive force applied to the adhesive area of the closure flaps. In this manner sufficient compressive force can be applied at the overlap area to firmly secure the hot-melt adhesive to the closure flaps for an effective partial seal of the carton end. Once the carton has moved beyond the roller, the closure flaps spring outward into the bow-out shape and the baffle flaps spring into line contact against the inner surfaces of the closure flaps thereby providing the previously described mechanical seal. All of these steps are performed continuously as the carton moves along the line at high linear speed.

FIGURE 9 shows, in expanded detail, the mandrel M in its position between the baffle flap **46** and the closure flaps **28** and **36** just before the carton moves beyond the mandrel M. This is the position wherein closure flaps **28** and **36** are under the maximum nip pressure exerted by mandrel M and roller R because of the force created by the field of the electromagnet E.

When the carton (one end only partially sealed) is filled with detergent granules or any similar product, a certain amount of jostling, bouncing or vibrating of the carton is desirable to settle the product. Rough handling of the partially filled carton in this fashion increases the tendency to bow-out and thus increase the size of the void at the bottom of the carton which has, as yet, not been finally sealed. It has been found that the mechanical sealing effect of the baffle flaps is sufficient to prevent leakage and sifting past the partially sealed end during this filling process.

After the carton is filled, the open end is sealed in a similar manner as the bottom. This is illustrated in FIGURES 10 and 11 wherein the baffle flaps **44** and **48** pass under the mandrel M'. The roller R' together with the electromagnet E' is positioned above the carton. This means, of course, that the baffle flaps **44** and **48** in the illustrated embodiment are first folded down so that they bear up against the mandrel M'. Thereafter, the closure flap **26** is folded over the top of the mandrel M'. The hot-melt adhesive is applied by conventional means (not shown) at the area **42** of the closure flap **34**, and the flap **34** is folded into superposed relation with closure flap **26**. The overlapped closure flaps **26** and **34** are then passed under the roller R' and electromagnet E' thereby squeezing the superposed portions of the closure flaps tightly against the mandrel M'. The squeezing force is exerted for less than about 0.50 second while the carton moves under the roller R'.

FIGURE 11 resembles FIGURE 9 except that the former shows the upper carton end being partially sealed. Mandrel M' is shown between the overlapped closure flaps **26** and **34** and the baffle flap **44** just before the carton moves beyond the mandrel M'. It will be understood from FIGURE 11 that additional nip pressure on the closure flaps **26** and **34** can be achieved by the use of the mandrel M', roller R' and electromagnet E' in the identical manner as previously discussed for partially sealing the lower end of the carton prior to filling. In other words, the mandrel M' and the roller R' are drawn together by the force created by the field of the electromagnet E' so that the overlapped portion of closure flaps **26** and **34** are squeezed tightly together.

In FIGURES 12 and 13, the ears **30–33** and **38–41** have been bent 90° so that they lie in the plane of the side walls. A conventional roll-type applicator W is used to apply an adhesive to the ears as the carton is moved past. Generally, a slow setting glue is used. Next, the ears **30–33** and **38–41** are folded 180° and adhered against the side walls **22** and **24**. The carton is then passed between conventional compression belts (not shown) arranged to hold the ears firmly against the sidewalls until the glue hardens thus completing the carton.

A fragmentary view of one completed end of the carton is shown in FIGURE 7. The ears **30** and **39** have been sealed to the side wall **24** as shown. All of the other ears would be similarly sealed to their respective side walls.

While particular embodiments of the invention have been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention.

What is claimed as new is:

1. A seal end carton having oppositely disposed front and back walls and two oppositely disposed side walls, closure flaps extending from both ends of the front and rear walls, baffle flaps extending from both ends of said side walls, said closure flaps being narrower than said side walls and having a sealing ear extending from each end thereof, each of said baffle flaps having an arcuate edge configuration, said baffle flaps being folded inwardly, said closure flaps being thereafter folded and adhered in overlapping relationship, said free edge of said baffle flaps fitting in tight line contact with the inside surfaces of the corresponding infolded closure flaps thereby providing a short, stiff mechanical baffle at the carton end during the formation of said carton, said sealing ears being folded and glued to the end portions of said side walls thereby completing the carton structure.

2. A carton as claimed in claim **1** wherein the configuration of the edge of said baffle flaps comprises straight edges of equal length at the ends thereof with an arc-like curved central portion therebetween, said straight edges extending from the line of articulation of said baffle

flap to the curved central portion, the said straight edges subtending an angle of from about 40° to about 50° with the said line of articulation, said curved edge portion having a radius equal to about one-half the side wall width, said circular arc subtending a central angle of from about 55° to about 90°.

References Cited

UNITED STATES PATENTS

1,199,535	9/1916	Feeley	229—38
2,523,246	9/1950	Elliott et al.	229—38
2,524,032	10/1950	Back	53—47
3,007,376	11/1961	Hickin et al.	229—37
3,094,265	6/1963	Hovland	229—37
3,197,110	7/1965	Neuman et al.	229—38
3,377,767	4/1968	Franz	229—37

DAVIS T. MOORHEAD, Primary Examiner

U.S. Cl. X.R.

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