June 18, 1957 F. D. BERGSTEIN 2,796,007

METHOD OF MAKING TIGHT CARTONS

Filed June 5, 1952 3 Sheets-Sheet 1

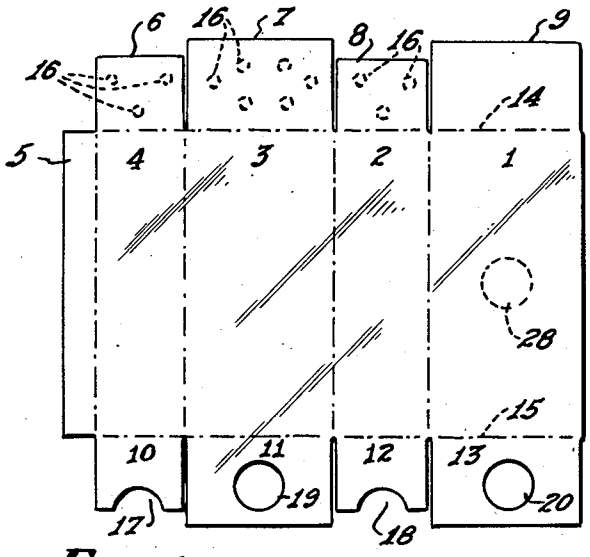


FIG. 1.

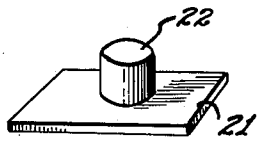


FIG. 2.

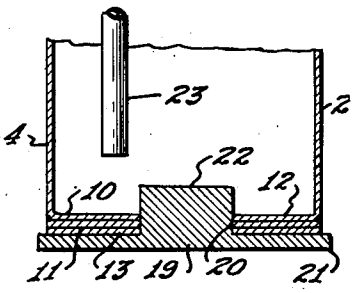


FIG. 3.

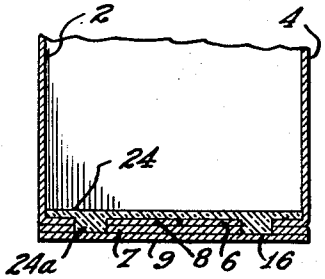


FIG. 4.

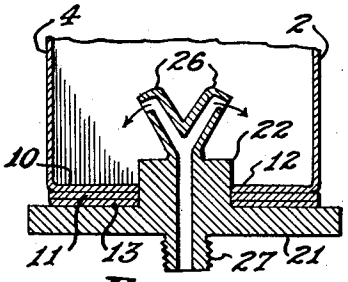


FIG. 5.

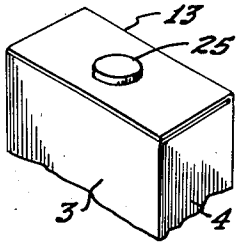


FIG. 6.

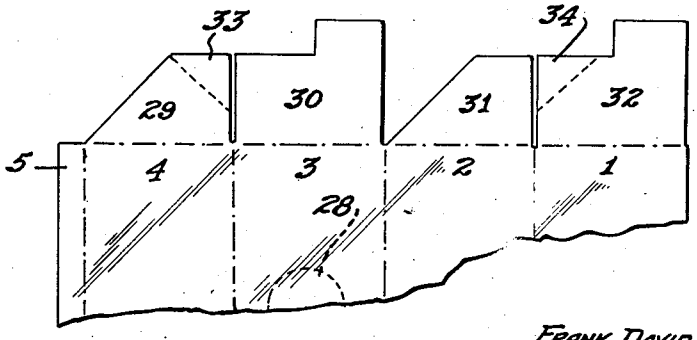


FIG. 7.

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June 18, 1957 F. D. BERGSTEIN 2,796,007

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Filed June 5, 1952 3 Sheets-Sheet 2

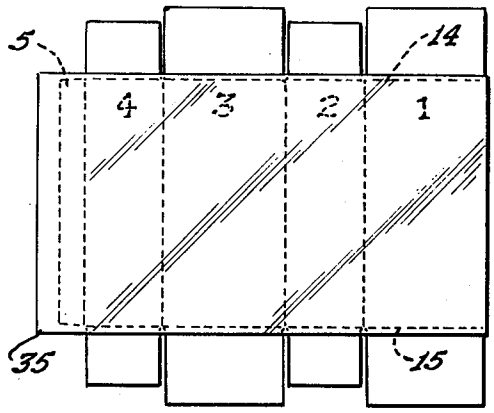


FIG. 8.

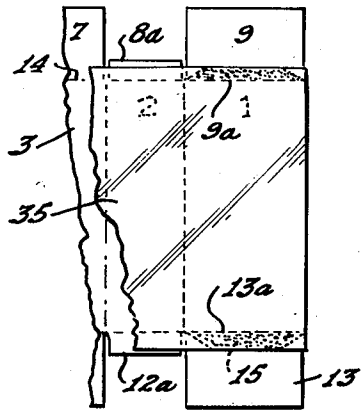


FIG. 8a.

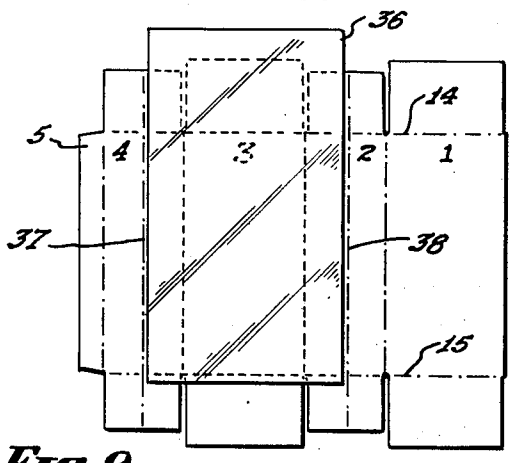


FIG. 9.

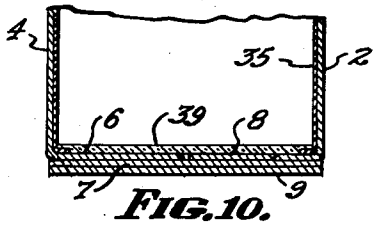


FIG. 10.

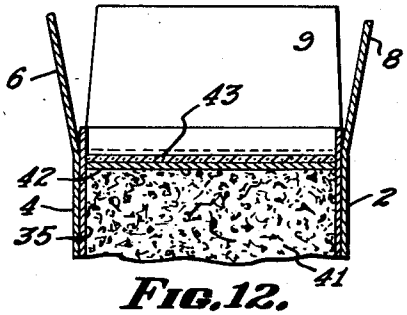


FIG. 12.

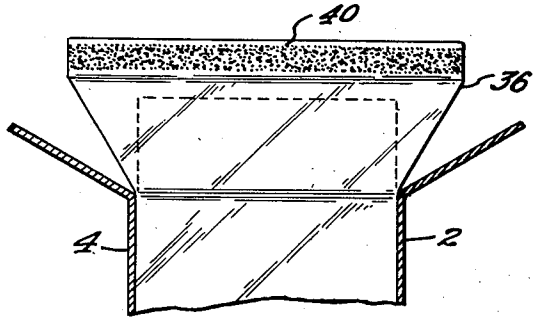


FIG. 11.

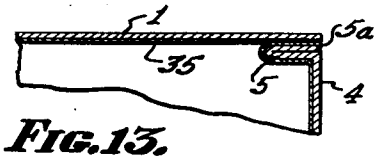


FIG. 13.

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METHOD OF MAKING TIGHT CARTONS

Filed June 5, 1952 3 Sheets-Sheet 3

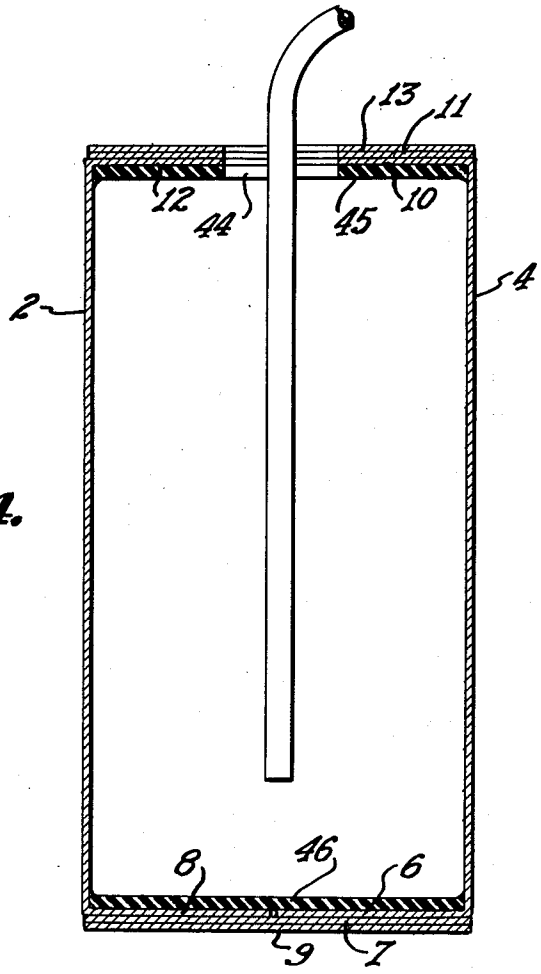


FIG. 14.

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United States Patent Office 2,796,007 Patented June 18, 1957

2,796,007

METHOD OF MAKING TIGHT CARTONS

Frank David Bergstein, Hamilton, Ohio, assignor to The Bergstein Packaging Trust

Application June 5, 1952, Serial No. 291,963

4 Claims. (Cl. 93—36)

This is a continuation in part of my copending application, Serial No. 740,313, filed April 9, 1947 and entitled Tight Cartons, now Patent 2,604,252, dated July 22, 1952.

My invention relates to methods of making paperboard packages which are moisture tight, liquid tight, or gas tight as desired, which comprise a knock-down paperboard carton as the principal body element, and which may be shipped and stored in the flat condition.

Hitherto in the provision of cartons to hold liquids it has been the practice to provide a tubular paper carton which, after erection and closure on one end, is dipped bodily into a bath of liquid-proofing substance. This requires elaborate mechanism in the hands of the carton user, and it also results in an all-over coating of the proofing substance within and without the structure.

In the provision of gas tight structures in which the contents may be packaged in a protective gaseous atmosphere, it has been suggested to provide over the whole exterior surface of the filled and closed package a gas tight skin, covering, or membrane. This may be provided by an all over coating of skin forming substance, or by a wrapping, or by a sleeve covering the body of the package together with treatments for the ends involving the application of softened sealing substances.

Collapsible paperboard cartons have also been provided with interior tubular liners or bags which could be hermetically sealed at both ends. In such structures, the bag or liner is the proofed container, while the carton is an external protective element.

It is an object of my invention to attain proofness in collapsible cartons in a new way, having many advantages, and being applicable to a wide variety of package structures.

It is an object of my invention to attain proofness in collapsible structures in simpler ways whereby the cost of such structures can be lowered, and whereby the required equipment in the hands of the carton user can be simplified and cheapened.

It is an object of my invention to attain filled and proofed packages by less complicated procedures and equipment and with fewer operations.

It is also an object of my invention to provide proofed packages in which the proofing elements are confined to the inside of the package and do not in any way interfere with or change its external appearance.

These and other objects of my invention which will become apparent as the description proceeds, I accomplish in those structures and arrangements of parts and in those procedures of which I shall now describe certain exemplary embodiments. Reference is made to the accompanying drawings wherein:

Figure 1 is a plan view of a blank for a carton to be used in accordance with my invention.

Figure 2 is a perspective view of an end sealing fixture.

Figure 3 is a sectional view showing the fixture in use.

Figure 4 is a sectional view through one type of end seal formed in accordance with my invention.

Figure 5 is a sectional view showing another type of end sealing fixture in use.

Figure 6 is a partial perspective view showing the closed end of one form of my package.

Figure 7 is a partial plan view of another form of blank.

Figure 8 is a plan view of a blank with which a sheet of proofing material has been associated.

Figure 8*a* is a partial plan view showing a more definite projection of the liner sheet into the flap area.

Figure 9 is a plan view of a blank with which a preformed tubular liner has been associated.

Figure 10 is a partial sectional view showing an end seal in a lined carton.

Figure 11 is a partial sectional view showing a projecting, sealed liner end.

Figure 12 is a partial sectional view illustrative of another mode of effecting an end seal.

Figure 13 is a partial sectional view showing one mode of securing a gas-tight condition at the longitudinal glue seam.

Figure 14 is a vertical sectional view illustrating the end-flooding of the bottom end of a carton the top end of which has already been end-flooded.

In the practice of my invention, I provide a knock-down carton having the desired proofed characteristics as to its body portion. I then effect an end closure and a seal, the latter by operations effective on the inside of the package structure. In view of the various fields of use for which different cartons made in accordance with my invention may be put, the closure and seal just referred to may be made on one end of the carton only, and the other end closed in some other fashion, as by the provision of a sealable liner. Or both ends of the carton may be closed and sealed by operations such as those set forth, before or after filling. In one form of my invention, the effecting of a seal serves at the same time to bring about adhesive union of the folded end closure flaps.

Referring to Figure 1, I have illustrated a carton blank having body walls **1**, **2**, **3**, and **4**, and a glue flap **5**, in articulation along the usual longitudinal score lines. Ends of the body walls are provided with closure flaps **6** to **13** inclusive, articulated to the walls along the transverse score lines **14** and **15**.

At one end of the carton, I may provide the short flaps **6** and **8** and the intermediate flap **7** with mating, small perforations **16** shown in dotted lines. At the other end of the carton, the short flaps **10** and **12** may be provided with cut-outs **17** and **18**, while the flaps **11** and **13** each have a mating perforation **19** or **20**.

The carton will be made of paperboard, and will be so formed or processed as to have a body portion at least with the required proofness. Where the proofness desired is resistance against liquids or moisture, the proofness may be attained by treating the blank, or the board from which it is made, with a suitable proofing substance, of which there are many. The nature of the proofing substance is not a limitation upon this invention. Where a gas tight package is desired, I prefer to proceed in other ways, some of which will be set forth hereinafter, and involving the use of liner structures. Where the liner structures are substantially confined to the body walls of the carton, the mode of closure and sealing next described may be carried out in the same way.

The blank of Figure 1 will be tubed in the usual fashion by folding it on two intermediate longitudinal score lines with the adhesive union of the glue flap **5** to the free edge of the body wall **1**. An adhesive having the required proofness will, of course, be used. In the col-

lapsed tubular form the carton may be shipped to the user.

The user will erect or square up the carton body and will proceed to effect an end closure and seal. One way of doing this is to fold the flaps **10** and **12** at one end of the carton, next the intermediate flap **11**, and finally the flap **13**. These flaps can be adhesively secured together, and the adhesive may be applied during the operation of folding. The mating cut-outs **17** and **18** and the perforations **19** and **20** will come together to form a filling opening through the end of the carton.

A proofed condition of the end closure may be attained in accordance with one aspect of my invention with the use of a sealing fixture shown in Figure 2. This comprises a base **21** and an upstanding columnar member **22** of a size to enter the hole in the carton closure and project somewhat within the carton as illustrated in section in Figure 3.

The operation involves the formation of an imperforate seal across the closed ends of the carton, since it is in these areas that the greatest likelihood of leakage occurs, due to the presence of the closure flaps and to the abuse the ends of the carton receive during handling, transportation and use. In accordance with my invention, the bulk of the sealing substance is confined to these critical areas where it will do the most good and where the amount of sealing substance employed can be so controlled as to provide a seal of a thickness sufficient to withstand the abuses to which the container will be subjected.

The seal is effected by introducing into the carton a pipe or nozzle **23** and depositing upon the inner surface of the end closure a metered quantity of liquid proofing substance which is permitted to harden in situ to form an internal end casting. The proofing substance as introduced must be flowable to the extent that it will flow to all corners of the carton, and its quantity must be sufficient to form an imperforate covering extending continuously across the end of the carton to cover and seal all interstices therein and to bond to end portions of the body walls of the carton. If it is so desired the coating or casting may be made thick enough to contribute to the physical strength of the carton end; and it may be applied in such quantity as to flow around the columnar member **22**, but not sufficient to cover it.

The nature of the sealing substance does not form a limitation on my invention, and may be varied according to the particular qualities of proofness desired and the necessary degree of hardness and durability required. Since, in accordance with my procedures, the sealing material does not have to flow in and then flow out of the carton, as is necessary in the ordinary dipping and draining of cartons as heretofore practiced, the viscosity and other characteristics of the sealing substance may be varied widely and tailored exactly to the particular needs of a given carton. Thus a coating material can be selected which provides the exact degree of proofness, hardness and durability required to prevent leakage of the carton even under extremely rough handling conditions. The necessary fluidity may be attained by making a solvent solution of the proofing substance. But this will entail subsequent evaporation of the solvent, and I prefer to employ thermoplastic sealing substances which may be rendered liquid by heat, and which will set rapidly. Also, since the viscosity of the proofing substance need not be as carefully controlled as in a dipping operation, various resins and other toughening agents may be added to the sealing substance without impairing its sealing function. After the sealing substance has hardened, the fixture of Figure 2 may be withdrawn from the closed carton end, leaving a closure which has an opening in it as will be clear, but is otherwise in proofed or sealed condition.

Next the carton may be closed upon its opposite end by the folding of flaps **6** and **8**, followed by the folding of the intermediate flap **7** and the final flap **9**, together with the adhesive securement of these flaps. This operation is followed by the effecting of a seal. The carton is positioned with the last closed end downwardly, as seen in Figure 14, and the nozzle or pipe **23** is introduced into it through the opening **44** in the first made closure **45**. Again a complete covering is made over the end closure, provided an internal end casting **46** which is joined at its edges to the body walls of the carton.

Where the flaps **6**, **7**, and **8** are provided with perforations as shown in dotted lines in Figure 1, or are cut away at their edges or elsewhere to permit penetration of the sealing substance, the sealing substance may itself be used as the flap securing adhesive. In Figure 4, I have shown at **24** a sealing coating which at **24***a* passes through the perforations **16**, and, penetrating between the flaps, secures them together. Where this expedient is employed, it is necessary only to fold the flaps and effect the seal while holding them in folded condition. This expedient may also be adapted to the securing and sealing of the opposite end, i. e., the end formed of flaps **10** to **13** inclusive.

In the manner described above, I have now produced a carton which is closed at both ends, possesses the desired proofness for the use to which it is to be put, and has an opening through one of its end closures. It may be filled through this opening, and then may be closed in any suitable way. One way, is through the use of a shaped metal, plastic, or paperboard plug **25**, which may be sealed in the opening in any suitable way (Figure 6). I prefer to dip the plug into molten proofing substance such as used in the seal, and then insert the plug. The molten coating on the plug will bond with the seal coating inside the container end, providing a tight and secure closure.

In the effecting of seals by my method, I may also preheat the end of the carton before injecting the sealing material. This improves the quality of the seal and effects a saving which for comparable results, may reach fifty percent. The reason for this saving is that if the end of the container is at room temperature or cooler, the sealing substance does not flow as freely to all the corners and crevices of the end closure. When this condition exists, it is likely to be found that more flooding material is needed to accomplish the same liquid-tight or gas-tight result. Further, I find that it is very desirable to rock the carton once or twice in both directions, to assist in the distribution of the flooding or sealing material and to insure its entry into the corners of the end closure. The rocking is, of course, accomplished at a time when the flooding material is still in a liquid and flowable condition. The rocking may be accomplished by hand, or the containers may be engaged in cages with mechanism to provide a rocking action, that is to say a lowering of each of the four corners of the end closure of the carton successively.

The exact sequence of steps described above may be varied. For example, I may first fold and glue the flaps **6** to **9**, inclusive and effect a seal at their end of the carton. Then I may fold and glue the flaps **10** to **13** inclusive and up-end the carton over a fixture such as is shown in Figure 5. Like the fixture of Figure 2, it has a base **21** and a column **22**; but the column is perforated and is provided with interior members **26** for the delivery of the liquid proofing substance, and an external means **27** by which the device may be connected to a source of supply of the proofing substance. In this way I may seal both ends of the carton with sealing material introduced through only one end.

Alternatively, the flaps at both ends of the carton may be first folded and glued, whereupon the end of the carton opposite the filling opening, is flooded through the opening, the carton inverted and placed over the fixture shown in Figure 5 to flood the remaining end.

While I have described a form of carton having an

opening through one end closure, the location of the opening may be changed. Thus I may provide an opening **28** in a body wall of the carton in which event, the flaps **10** to **13** may be made like the flaps **6** to **9**. The flaps at both ends of such a carton may be folded and held in closed position, whereupon I may effect seals successively at the two ends of the carton by resting the carton first on one end and then the other and introducing the sealing material by means of a curved spout or pipe projected into the carton through the hole **28**.

The size and shape of cartons made in accordance with my invention do not form a limitation on it. Likewise, the nature of the end closures can be widely varied. The type of imperforate end closures hereinabove described may be at only one end of the carton and the other end may be closed after filling in some other fashion. For example, a carton may be made and used with my sealed closure at the bottom and, where employed for liquids, it may be closed with the familiar gable top closure in use on paper milk bottles. Again, in forming my sealed closures, the nature of the flaps and the manner of their securement may be widely varied. Interlocking flaps may be employed as well as flaps so configured that when folded, depressed inwardly, and released, they automatically spring into interlocked position.

I may also employ an automatically self-erecting end closure. Referring to Figure 7, I have shown flaps **29** to **32** on the ends of the body walls. Two of these flaps have triangular corner portions **33** and **34** demarked by diagonal score lines. Prior to the tubing of the carton, the end flaps will be folded inwardly with the triangular portions **33**, and **34**, reversely folded and treated with adhesive. The result of the tubing operation will be to cause these triangular portions to adhere to adjacent flaps. In the tubed carton, the end closure will be in infolded condition; but when the carton is erected, the closure will automatically come into position across the end of the carton.

Such a closure may be formed at one end only of the carton, or similar closures may be formed at both ends. In this event, the formation of the end seals will be effected as described above through the opening **28** in one of the body walls.

Where a gas tight structure is desired, I prefer to line the body walls with a suitable gas-tight element. In Figure 8, I have shown one method of accomplishing this, wherein a sheet of suitable material such as parchment, foil, or one of the cellulose films, coated with a preferably thermoplastic, gas-tight adhesive, has been adhered to the inside surfaces of the body walls and glue flap, with a projection beyond the latter. This projection will be folded over and adhered to the outer surface of the glue flap. When such a treated carton is tubed with a suitable gas-tight adhesive and with the glue flap inside, a gas-tight longitudinal seal will be produced. If the carton is to be tubed with the glue flap outside, the projection of the sheet **35** may be caused to extend beyond the free edge of the wall **1**, and may be folded over and adhered against its outside surface.

The sheet or membrane **35** may be so dimensioned that its edges coincide with or lie slightly inwardly of the transverse score lines **14** and **15**; but I prefer to extend the sheet beyond these score lines as shown in Figure 8*a*. It is essential that the end seal make good contact with the edges of the membrane at the ends of the carton and a projection of the sheet facilitates this. The projecting portions of the liner sheet **35** may either be left unadhered to the flaps, or the nature of the adhesive may be such that during the folding of the flaps the liner will strip away from them sufficiently to permit such folding. Again, the projecting ends of the liner may be adhered to the wider flaps **7**, **9**, **11** and **13** in areas such as those shaded and marked **9***a* and **13***a* in Figure 8*a*. The shorter flaps, such as those indicated at **8***a* and **12***a* in the figure need not extend substantially if at all beyond the projecting ends of the liner sheet. During the folding of the flaps, the projecting portions of the liner will form bellows-folds at the corners of the carton.

The formation of a gas-tight longitudinal carton seam may be accomplished in various ways. As shown in Figure 13, the glue flap **5** may be provided with an articulated extension **5***a* of the full length of the glue flap. The liner sheet **35** may be caused to cover both the glue flap and its extension as well as the body walls of the carton. Then, in tubing the carton the glue flap extension **5***a* is first folded back and adhered against the glue flap. Next, the tubing of the carton is accomplished in the usual way, the result being a longitudinal glue seam in which the edges of the liner sheet are directly adhered together as will be clear from the drawing. A direct reversal of these parts would be to form the covered extension on the free edge of wall **1**, bend it back against this wall on the outside, adhesively securing it, and then tubing with the glue flap outside.

Again I may provide a lining by deposition upon the blank a preformed tube or bag of suitable gas-tight or liquid-tight substance. This may be done by using procedures and apparatus set forth in the Robert M. Bergstein Patents Nos. 2,250,249 and Re. 20,789. In Figure 9, I have shown a carton blank on which there has been deposited a tube **36** of suitable gas-tight membranous material with a preformed, proof, longitudinal seam. The carton in this instance has been shown as having medial score lines **37** and **38** in the body walls **4** and **2**. In tubing, the blank is bent along these score lines. This expedient is useful where one end of the tube is preclosed to form a bag, but is not necessary where open ended tubes are used.

The tube **36** may terminate at both ends adjacent the lateral score lines **14** and **15** of the blank as shown at the bottom of Figure 8. However, for some uses I may wish to cause one end of the liner to project into and even beyond the flap area as shown at the top of Figure 9.

Figure 10 shows an end seal formed in accordance with my invention in a lined carton such as that of Figure 8. It will be noted that the interior end coating of sealing substance **39** unites with the edge portions of the liner sheet **35**. In connection with packages such as are illustrated in Figures 8 to 11, where my object is to obtain dependable gas-tightness, I have found that an extreme fluidity of the sealing substance as it is injected into the carton end is highly desirable. The viscosity or fluidity of the sealing substance does not appear so important where liquid-tightness alone is the quality desired; but in gas-tight cartons I have obtained uniformly superior results when I heat my sealing substances to temperatures materially higher—say 100° F. higher—than the lowest temperatures giving a good pouring consistency. I believe that the more thinly fluid the sealing substance is made the more perfectly it will penetrate into minor crevices in the structure to give dependable gas-tightness.

Where the liner has been caused to project at the top end of the carton, as in Figure 9, a bottom closure end seal may be effected as illustrated in Figure 10 after which the carton may be filled and the top end of the liner **36** closed with a seam **40** as shown in Figure 11. While this entails the closure and sealing of a liner end in ways hitherto current in the art for inner-lined containers, my procedure presents the singular advantage of enabling me to carry on all operations in the carton while the carton is in a single position. Thus the formation of the bottom seal, the filling of the carton, and the formation of the top seal are all accomplished while the carton is held in an upright position. I am not required to send a carton in reversed positions twice through sealing and closing equipment, or to provide a duplication of closing and sealing equipment for the purpose.

It will be understood that when the top seal **40** has been effected, the projecting end of the liner may be folded,

and the end flaps of the carton folded and secured over it in ways known in the art.

Where my cartons are made gas-tight, and are to be gassed, I prefer to fill them with their contents and then close them in a gas-tight fashion, prior to effecting change of atmosphere. Gassing may afterward be accomplished by perforating the containers and either enclosing them in a vessel and successively vacuumizing and gassing them, or by introducing nozzle means into the containers and expelling the enclosed atmosphere by means of the desired protective gas. After either of these operations, the holes or perforations in the containers may be sealed by covering them with a gas-tight web adhesively secured in place or by merely depositing over the perforations a quantity of softened thermoplastic sealing substance.

It may be pointed out, however, that where my cartons are provided with a filling opening they may be gassed through this opening before application of the plug 25.

Figure 12 shows another way of forming an end seal in a lined or unlined, filled carton. After the carton has been erected and closed and sealed at one end, it is then filled with the contents **41**. A platform **42** is placed across the end of the carton and within the liner **35** if one is used. The coating **43** is formed above the platform so as to bond with the walls of the carton or with the liner as the case may be. Afterward, if the carton has been provided with end closure flaps, these may be folded and secured in the usual fashion.

Modifications may be made in my invention without departing from the spirit of it.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of producing a proofed package which comprises the steps of providing a tubular paperboard carton with enclosing body walls and closure flaps, erecting said carton, folding the flaps at an end, said flaps being configured to provide a filling opening when folded, placing the carton with the folded end down over a fixture having a plug-like member entering said opening, coating the said end of the carton interiorly with a sealing substance, and withdrawing said fixture.

2. A process of producing a proofed package which comprises the steps of providing a tubular paperboard carton with enclosing body walls and closure flaps, erecting said carton, folding the flaps at an end, said flaps being configured to provide a filling opening when folded, placing the carton with the folded end down over a fixture having a plug-like member entering said opening, coating the said end of the carton interiorly with a sealing substance, and withdrawing said fixture, folding the flaps at the other end of said carton, positioning the carton with the last folded end down, and coating said last named end interiorly with sealing substance introduced therein through said filling opening.

3. The process claimed in claim 2, in which the several increments of sealing substance are introduced into the carton through the same end, the said fixture having a passageway therethrough for the introduction of one of said increments.

4. A process of producing a proofed package which comprises the steps of providing a tubular paperboard carton with enclosing body walls and closure flaps, erecting said carton, folding and adhesively securing together the flaps at one end of said carton, said flaps being configured to provide a sealing opening when folded, placing the carton with the folded end down over a fixture having a member entering said opening, coating the said end of the carton interiorly with a sealing substance, withdrawing said fixture, folding and adhesively securing together the flaps at the other end of said carton, positioning said carton with the last folded and glued end down, and coating said last-mentioned end interiorly with sealing substance introduced therein through said sealing opening.

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