Feb. 21, 1967 J. F. LEHMAN 3,305,160

EXPANDABLE BAG LINER

Filed April 16, 1965

FIG. 1

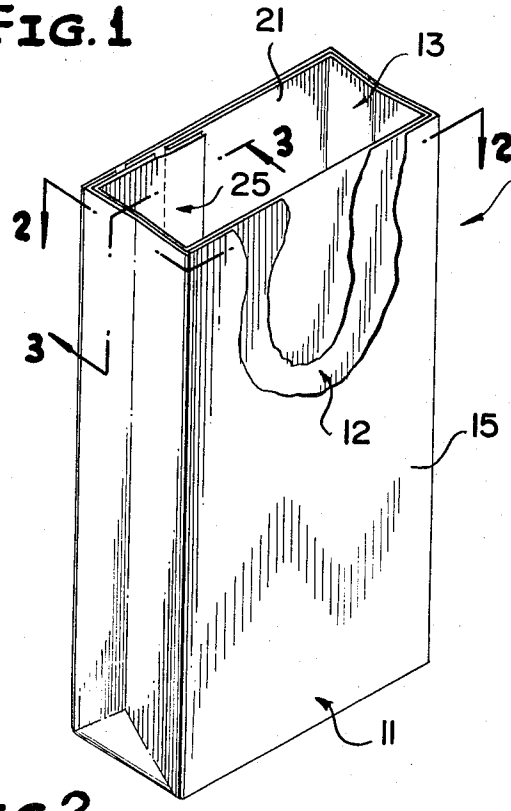


FIG. 3

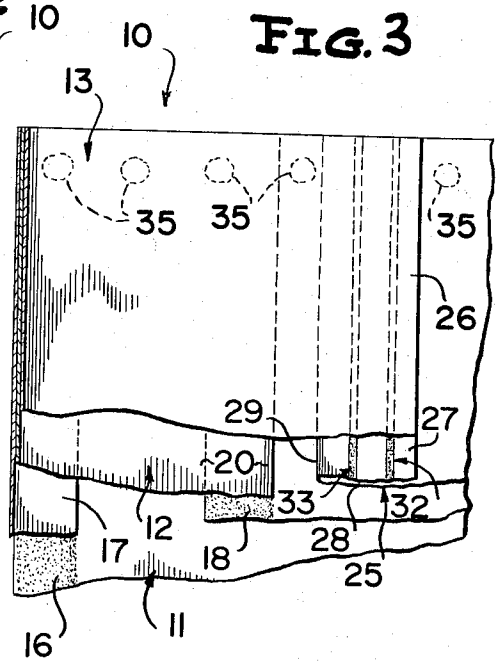
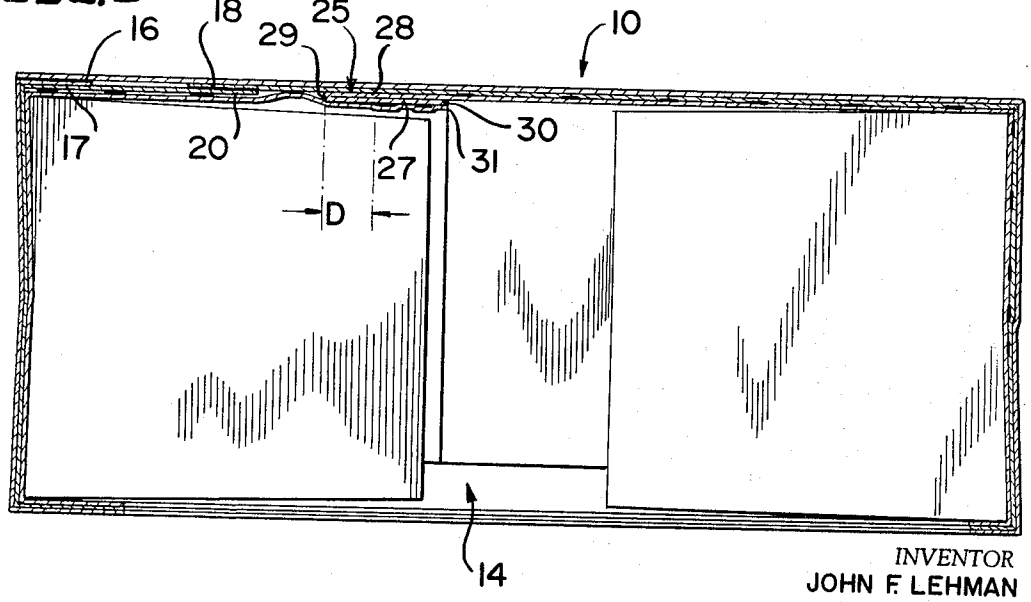


FIG. 2



INVENTOR
JOHN F. LEHMAN

BY Mason Porter, Dillon & Brown
ATTORNEYS

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EXPANDABLE BAG LINER

John F. Lehman, Glenside, Pa., assignor to Continental Can Company, Inc., New York, N.Y., a corporation of New York

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This invention relates to a novel improvement in so-called multi-ply bags, and in particular, is directed to a novel liner for multi-ply bags having means for permitting the liner to expand under the influence of pressure exerted by a product packaged in the liner to prevent the liner material from rupturing, thereby preventing the packaged product from escaping the liner or the entrance of atmosphere into the liner which might adversely affect the packaged product.

The normally constructed multi-ply bag generally includes an outer wrapper and an inner liner with the outer wrapper being constructed of relatively heavy paperstock material to give the bag requisite strength while the liner is generally constructed of thinner and weaker material of a highly impermeable nature. The impermeable material of conventional liners funtcions to prevent atmosphere from adversely affecting a product packaged in the liner, and in the case of a grease-containing product, prevents the grease from being absorbed by the wrapper. This absorption of the grease by the wrapper is undesirable because it weakens the strength of the wrapper, generally causes discoloration and weakens conventional adhesive seams in the body and bottom portions of the wrapper. Therefore, commercially acceptable multi-ply bags must include liners which, under all conditions, function to maintain the structural integrity of such bags and protect products packaged therein.

In such two ply bags the periphery of the exterior surface of the inner liner is generally at least equal to the periphery of the inner surface of the outer wrapper, and a spot coating of adhesive is applied between the surfaces to secure the liner to the wrapper. The liner, as well as a product packaged therein, is supported for the most part by the wrapper. It has been found, however, that under certain circumstances, such as aging or moisture loss of the liner material, the liner material shrinks sufficiently to lose supporting contact with the outer wrapper and ruptures under the forces (weight and/or pressure) of the packaged product.

Even under circumstances of slight liner shrinkage which might not otherwise rupture the liner, the additional strains to which the bag is subjected, such as impact forces under normal and rough handling conditions, can cause liner rupture.

Liners of conventional multi-ply bags also generally include a longitudinal seam formed by adhesively bonding terminal edges of the liner. Shrinkage of the liner and the attended reduction in the liner periphery can rupture this seam.

It is, therefore, a primary object of this invention to provide a liner which is expandable in size to compensate for liner shrinkage and thereby overcomes each of the noted disadvantages in conventional liner structures.

A further object of this invention is to provide a novel multi-ply bag including an outer wrapper and an inner liner, the liner including a generally tubular body closed at one end and constructed from foldable material, a longitudinal fold formed from the material of the body, and the longitudinal fold being defined by first, second and third opposing longitudinal portions of the body in generally parallel relationship in a first position adapted for unfolding movement toward a generally coplanar relationship in a second position whereby the liner can

expand and compensate for forces otherwise tending to rupture the liner.

Still another object of this invention is to provide a multi-ply bag including at least an outer wrapper and an inner liner having substantially identical peripheries, the liner being constructed from foldable material and including a longitudinal seam being defined by lapped edge portions having opposed surfaces bonded together by adhesive, the material of the liner being of a predetermined strength, and the bond strength of the adhesive of the seam being appreciably weaker than the strength of the liner material whereby any tendency of the liner to shrink under the influence of internal pressure applied to the liner by a packaged product causes partial separation of the seam thereby increasing the periphery of the liner and preventing rupture of the liner or the longitudinal seam thereof.

With the above, and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a top perspective view with parts broken away for clarity of a multi-ply bag constructed in accordance with this invention, and illustrates an expandable inner liner thereof.

FIGURE 2 is an enlarged sectional view taken generally along line 2—2 of FIGURE 1, and illustrates a longitudinal fold in the area of a longitudinal seam of the liner for compensating for shrinkage of the liner.

FIGURE 3 is an enlarged fragmentary view of the multi-ply bag of this invention taken generally along line 3—3 of FIGURE 1, and more clearly illustrates the longitudinal fold and longitudinal seam of the liner as well as an intermediate and outer ply of the bag.

A novel container constructed in accordance with this invention is generally referred to by the reference numeral **10** and is illustrated for purposes of describing this invention in the form of a multi-ply bag formed of an outer wrapper **11**, an intermediate ply or liner **12**, and an inner liner or inner ply **13**. The multi-ply bag **10** is of a three-ply construction, but more or less than this number of plies may be employed in the practice of this invention.

The multi-ply bag **10** includes a closed bottom **14** (FIGURE 2) formed by adhesively securing together a plurality of flaps and tabs (unnumbered) of each of the plies **11**, **12** and **13** in a manner well known in the prior art to form any desired bottom construction, such as a square or satchel-type bottom closure.

The outer ply or wrapper **11** includes a body **15** which is generally tubular in configuration. The body **15** includes a longitudinal seam (unnumbered) formed by adhesively securing together terminal longitudinal edge portions **16**, and **17** (FIGURE 2) in a customary manner. The wrapper **15** is preferably constructed from paperstock material and includes an inner surface (unnumbered) which has a periphery substantially identical in size to the periphery of the outer surface of the intermediate ply **12**.

The intermediate ply **12** is also preferably constructed from paperstock material and serves to additionally reinforce the bag **10**. The intermediate ply **12** also includes a longitudinal seam (unnumbered) defined by adhesively secured terminal edge portions **18** and **20** which are staggered in relation to the edge portion **16**, **17** of the wrapper **11**, as is best illustrated in FIGURE 2. The intermediate ply **12** is secured to the body **15** of the wrapper **11** by the selective application of adhesive (not shown) to the outer surface of the intermediate ply **12** or the inner surface of the outer ply **11**.

The liner **13** includes a generally tubular body **21** constructed of readily foldable flexible material which is preferably grease-proof, such as glassine. The material from which the liner **13** is constructed is generally, but not necessarily weaker, than the material of the intermediate ply **12** or the outer wrapper **11**.

The liner **13** is provided with means, generally referred to by the reference numeral **25**, for permitting the liner **13** to expand in peripheral and volumetric dimensions from the condition of the liner **13** illustrated in the drawings to a second condition at which the liner **13** has shrunk somewhat due to the aging or the loss of moisture from the material of the liner **21**. The expandable means **25** is in the form of a longitudinal fold formed from the material of the liner **13**. The longitudinal fold **25** comprises first, second and third longitudinal portions **26–28** respectively, disposed in generally opposing parallel relationship in the normal unexpanded position of the liner **13** illustrated in the drawings, but these longitudinal portions are capable of folding toward a generally planar relationship in a second expanded position (not shown) of the liner **13** as will be described more fully hereafter. The longitudinal portions **26** and **27** define edge portions of the blank which terminate in respective free edges **30** and **31** (FIGURE 2).

The longitudinal portion **27** of the longitudinal fold **25** is integrally joined along a longitudinal fold line or juncture **29** to the portion **28**. The longitudinal portion **27** is similarly joined to the longitudinal portion **26** at a similar juncture (unnumbered) adjacent the free edges **30**, **31** by adhesive means **32** (FIGURE 3) in the form of a line of water-base or hot-melt adhesive, depending on the particular material from which the liner **13** and intermediate ply **12** are constructed. The adhesive **32** extends the entire length of the bag **10**, including the tabs and flaps (unnumbered) defining the bottom closure **14**, and in conjunction with the longitudinal portions **26** and **27**, forms the longitudinal seam (unnumbered) of the liner **13**.

A second line of adhesive **33** is similarly applied between the opposed surfaces of the longitudinal portions **26**, **27** adjacent but spaced from both the fold line **29** and the line of adhesive **32**, as is best illustrated in FIGURE 3. The line of adhesive **33** also runs the entire length of the liner **13**.

The longitudinal fold **25** is completely free of the inner surface of the intermediate ply **12**. Remaining portions of the liner **13** to either side of the longitudinal fold **25**, as viewed in FIGURE 2 of the drawing, are provided with spots of adhesive **35** (FIGURE 3) which secure the liner **13** to the intermediate ply **12** completely about the upper periphery of the bag **10**. Except for the adhesive **35** at the upper periphery of the bag **10**, the remaining opposed surface portions of the liner **13** and the intermediate ply **12** are free of adhesive.

The multi-ply bag **10** is packaged with a suitable product, as for example, dog food, and the upper portion of the bag is closed. During subsequent storage of the packaged bag, the liner **13** may shrink for the reasons heretofore noted, and in the absence of the expandable means **25**, the material of the liner **13** would rupture. However, upon the shrinkage of the liner **13** of this invention the overfolded portions **27** and **28** of the longitudinal fold **25** begin to unfold toward a coplanar position, although this latter position is never fully reached. This unfolding of the longitudinal fold **25** continues until a peripheral length of material is unfolded equal to twice the distance D (FIGURE 2) between the fold line **29** and the line of adhesive **33**. The particular amount of overlap indicated by the distance D is determined by various factors, such as the particular product packaged in the bag **10**, the weight thereof, the co-efficient of shrinkage of the liner material etc., and under normal conditions of packaging, handling and storage complete unfolding ($2\times D$) of the longitudinal fold **25** will assure adequate compensation for liner shrinkage and will prevent the liner from rupturing.

While the complete unfolding of the portions **27**, **28** of the longitudinal fold **25** between the line of adhesive **33** and the fold line **29** is normally sufficient to compensate for expected liner shrinkage, the line of adhesive **33** prevents the liner **13** from rupturing after the longitudinal fold **25** has unfolded the distance 2D. This function of the line of adhesive **33** is achieved by compounding the adhesive to have a bond strength which is less than the rupture strength of the liner material. That is, the adhesive line **33** is weaker than the strength of the material of the liner **13** and separates under continued shrinkage of the liner. The unfolding of the longitudinal fold **25** can then continue until resisted by the line of adhesive **32**. This construction is particularly effected when the liner **13** has been unfolded a peripheral distance equal to twice the distance D and subjected to an impact force during rough handling. The force of impact, is for the most part, "absorbed" by the adhesive as it separates thus preventing rupture of the liner and complete separation of the liner seam.

While the bag **10** has been illustrated as being provided with two lines of adhesive **32**, **33**, it is also within the scope of this invention to provide a single wider line of adhesive between the opposing surfaces of the longitudinal portions **26** and **27** of the longitudinal fold **25**. This single wide line of adhesive would, of course, be of a bond strength appreciably weaker than the strength of the material of the liner **13**. Such a construction would permit unfolding of the longitudinal fold **25** in a manner similar to that described above with the wider line of adhesive separating partially to increase the periphery of the liner in compensation for liner shrinkage.

From the foregoing, it will be seen that novel and advantageous provisions have been made for carrying out the desired end. However, attention is again directed to the fact that additional variations may be made in this invention without departing from the spirit and scope thereof as defined in the appended claims.

I claim:

1. A tubular member particularly adapted for being fabricated into a container which is capable of expanding under the influence of a packaged product comprising a tubular body, a longitudinal fold formed from the material of said body, said longitudinal fold being defined by first and second opposing generally parallel overlying freely unfoldable longitudinal portions movable relative to each other whereby internal pressure applied to a container fabricated from said tube causes unfolding of said overfolded portions from the generally parallel relationship toward a coplanar position to thus increase the body and prevent rupture thereof, and means for limiting the unfolding of said longitudinal fold and preventing complete unfolding of said first and second overlying freely unfoldable longitudinal portions toward a coplanar relationship.

2. A tubular member particularly adapted for being fabricated into a container component which is capable of expanding under the influence of a packaged product comprising a tubular body, first means for providing a first increase in the volume of said body and second means for providing a second increase in the volume of said body only after said first means has provided said first volume increase whereby internal pressure applied to a container fabricated from said tube is precluded from rupturing said tube.

3. A tubular member particularly adapted for being fabricated into a container body which is capable of expanding under the influence of a packaged product comprising a tubular body, said tubular body having longitudinal seam means, said longitudinal seam means including first means for providing a first predetermined increase in the volume of said body and second means for providing a second predetermined increased in the

volume of said body beyond said first increase only after said first increase in volume has occurred whereby internal pressure applied to a container fabricated from said tube is precluded from rupturing said tube.

4. The tubular member as defined in claim 3 where said first and second means additionally functions to prevent said seam means from rupturing under the influence of internal pressure.

5. An expandable joint construction comprising first and second lapped edge portions having respective first and second opposing surfaces and terminal edges, said second edge portion being joined at a juncture to an intergral overfolded portion thereof whereby said second and overfolded portions define a freely unfoldable fold, primary means joining said first and second edge portions between one of said edges and juncture, and secondary means also joining said first and second edge portions between one of said edges and said juncture.

6. A container comprising a body, said body being generally tubular in configuration and closed at one end portion thereof, said body being constructed from sheet material and having first and second lapped longitudinal edge portions, said first and second edge portions terminating in respective first and second edges, said second edge portion being joined at a juncture to an integral portion overfolded upon said second edge portion whereby said second and overfolded portions define a freely unfoldable longitudinal fold, and means both securing said first and second edge portions together and limiting the unfolding of said longitudinal fold to twice the distance between said means and said juncture whereby internal pressure applied to said container causes unfolding of said fold and thereby prevents the rupturing of the sheet material of said body.

7. A container comprising a body, said body being generally tubular in configuration and closed at one end portion thereof, said body being constructed from foldable material, a longitudinal fold formed from the material of said body, said longitudinal fold being defined by first, second and third opposing longitudinal portions of said body in generally parallel relationship in a first position but adapted for unfolding movement toward a generally coplanar relationship in a second position, said first and second portions being joined at a first juncture internally of said body and said second and third portions being joined at a second juncture externally of said body, one of said junctures being defined by adhesive means adhesively securing together terminal edges of at least two of said first, second and third opposing longitudinal portions, the distance between said junctures in the first position being generally one-half the distance between the junctures in the second position whereby unfolding of said longitudinal fold under the influence of a product in said body can take place.

8. A container comprising a body, said body being generally tubular in configuration and closed at one end portion thereof, said body being constructed of foldable material, a longitudinal fold formed from the material of said body, said longitudinal fold being defined by first, second and third opposing longitudinal portions of said body in generally parallel relationship in a first position but adapted for unfolding movement toward a generally coplanar relationship in a second position, said first and second portions being joined at a first juncture and said second and third portions being joined at a second juncture, said first juncture including first adhesive means adjacent edges of said first and second edge portions, second adhesive means between said second juncture and said first adhesive means, and the distance between said second adhesive means and said second juncture in the first position of said longitudinal fold being generally one-half the distance between said second juncture and the second adhesive means in the second position whereby unfolding of said longitudinal fold under the influence of a product in said body can take place.

9. A container comprising a body, said body being generally tubular in configuration and closed at one end portion thereof, said body being constructed of foldable material, a longitudinal fold formed from the material of said body, said longitudinal fold being defined by first, second and third opposing longitudinal portions of said body in generally parallel relationship in a first position but adapted for unfolding movement toward a generally coplanar relationship in a second position, said first and second portions being joined at a first juncture and said second and third portions being joined at a second juncture, said first juncture including first adhesive means adjacent edges of said first and second edge portions, second adhesive means between said second juncture and said first adhesive means, and the distance between said second adhesive means and said second juncture in the first position of said longitudinal fold being generally one-half the distance between said second juncture and the second adhesive means in the second position whereby unfolding of said longitudinal fold under the influence of a product in said body can take place, and the bond strength of said first adhesive means is weaker than the tear strength of said material.

10. A container comprising a body, said body being generally tubular in configuration and closed at one end portion thereof, said body being constructed of foldable material, a longitudinal fold formed from the material of said body, said longitudinal fold being defined by first, second and third opposing longitudinal portions of said body in generally parallel relationship in a first position but adapted for unfolding movement toward a generally coplanar relationship in a second position, said first and second portions being joined at a first juncture and said second and third portions being joined at a second juncture, said first juncture including a longitudinal line of adhesive between said first and second edge portions forming a longitudinal seam of said container, and the bond strength of said adhesive being appreciably weaker than the strength of said material whereby said adhesive partially separates after the longitudinal fold has fully unfolded to preclude rupture of the body material.

11. An expandable liner comprising a body formed of sheet material, said body including means whereby said body can expand under the influence of internal forces created by a product packaged in the body, said last mentioned means including a longitudinal fold formed by first, second and third opposing generally parallel overfolded freely unfoldable longitudinal portions movable relative to each other from a generally parallel relationship toward a coplanar relationship, said second and third portions being joined to each other by an integral longitudinal fold line, said first and second portions being joined to each other by adhesive means, and said adhesive means having a bond strength appreciably less than the strength of said sheet material whereby said liner can expand under the combined effects of the second and third portions freely unfolding under the pressure of a packaged product in said liner and at least a partial breakdown of the adhesive bond between the first and second portions without rupture of the liner material.

12. The expandable liner as defined in claim 11 wherein said first and second portions include free edges and additional adhesive means are provided between said free edges and said first mentioned adhesive means.

13. A container comprising at least an outer wrapper and an inner liner, said inner liner being capable of expanding under the influence of a packaged product and comprising a tubular body, first means for providing a first increase in the volume of said liner body, and second means for providing a second increase in the volume of said liner body only after said first means has provided said first volume increase whereby internal pressure applied to the liner by a product packaged therein is precluded from rupturing said liner, and one of said first and second means is not a folded portion of said inner liner.

14. A container comprising at least an outer wrapper and an inner liner, said inner liner being capable of expanding under the influence of a packaged product and including a tubular body, said tubular body including first and second lapped edge portions having respective first and second opposing surfaces, said first and second opposing surfaces including terminal edges, said second edge portion being joined at a juncture to an integral overfolded portion thereof whereby said second and overfolded portions define a freely unfoldable fold, and adhesive means securing said first and second lapped edge portions to one another.

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JOSEPH R. LECLAIR, *Primary Examiner.*

DAVID M. BOCKENEK, *Examiner.*