

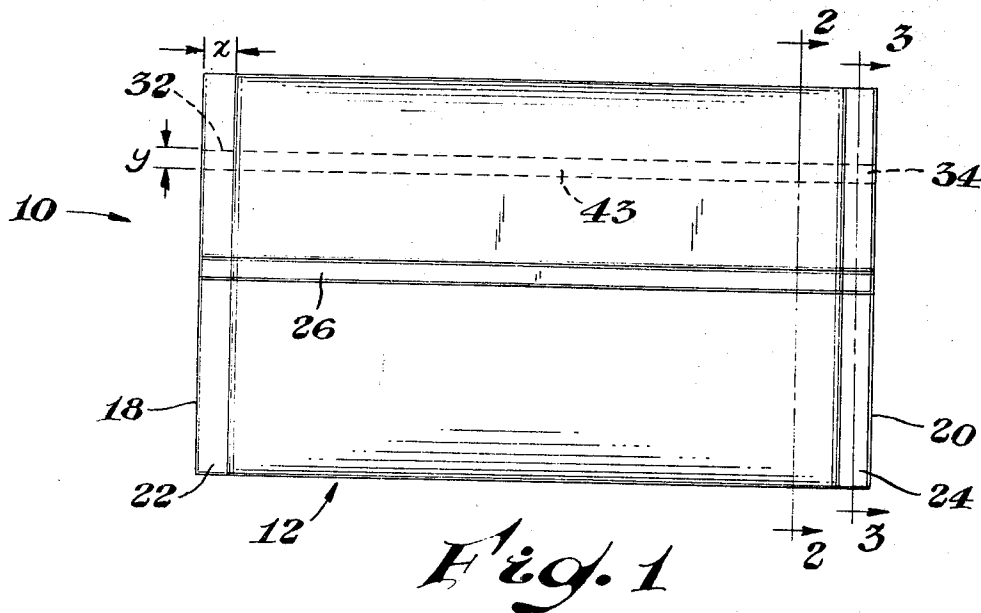
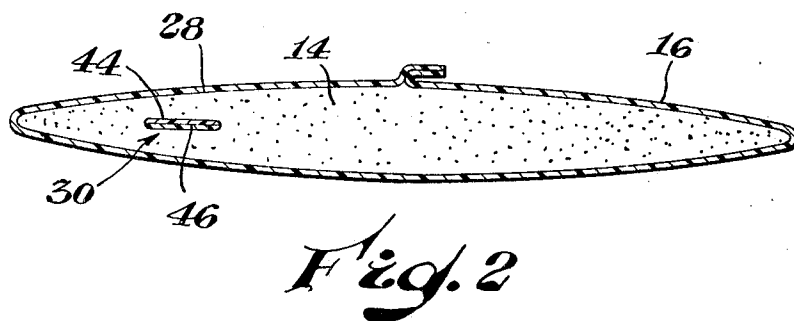
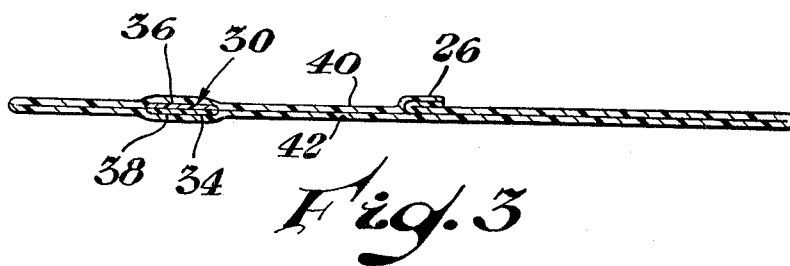
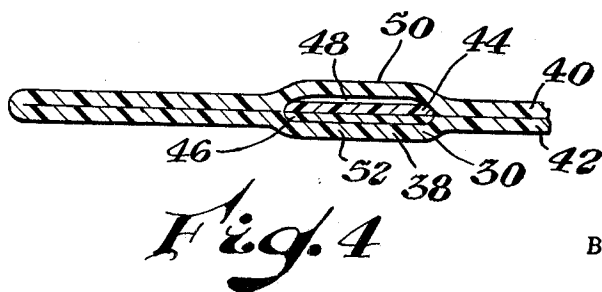
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3,512,632

PRESSURE RELEASE VALVE FOR FLEXIBLE POUCHES

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PRESSURE RELEASE VALVE FOR FLEXIBLE POUCHES

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13 Claims

ABSTRACT OF THE DISCLOSURE

In a package including a flexible pouch, the pouch normally comprising a tubular body and strip seals closing the opposite ends of the tubular body, a one-way pressure release valve comprising an interiorly disposed ribbon anchored at each end, respectively, by flatwise securement with the layers of the pouch at the strip seals. A valving or venting action occurs when a face of one of the ribbon ends releases from the adjacent layer in the seal.

DESCRIPTION OF THE INVENTION

The packaging of whole or ground coffee beans in flexible pouches is particularly troublesome because the product emits large quantities of carbon dioxide and small quantities of other gases. These gases can create internal pressures of a degree sufficient to burst even those pouches constructed of the strongest practical materials. The gases are produced during the processes employed to roast the beans and are trapped under pressure in small cells in the bean structure. With whole coffee beans, diffusion of the gases from the cells is relatively slow. Grinding opens up the cells allowing the gases to escape at a more rapid rate.

Purging methods can be employed whereby the gases are substantially driven off from the product prior to its being placed in the pouch. Venting the pouch, as for example, by perforating a wall of the same, is another somewhat more obvious solution to the problem. In the former, the expense of purging is a drawback, while in the latter, it is impossible to control the internal environment of the package due to the perforate nature of the pouch. Oxygen and moisture vapor entering through the perforations effects a more rapid deterioration of the product which is recognized by consumers as "staleness" in the brewed beverage.

Accordingly, it is an object of the present invention to provide a package suitable for containing ground or whole coffee beans and like products which are characterized in that they emit gases and/or vapors.

It is a further object of the present invention to provide an improved pouch construction suitable for the packaging of whole or ground coffee beans and like products, wherein the pouch has integrally formed therein a one way pressure release valve operable to rid the package of built-up or excess gases.

Still another object of the present invention is to provide such a pouch wherein the cost of the same is maintained at a minimum such that the pouch is commercially attractive.

Briefly then, the present invention relates to a package of the type employing a pouch or bag constructed of flexible film or sheet, and more particularly to an improvement thereof wherein the package is fitted with a one-way pressure release valve for purposes of adapting the package for usage in handling gas or vapor dissipating products, as for example, roasted coffee beans in either ground or whole form. Normally the pouch comprises a tubular body secured closed at each end

by strip seals (i.e., relatively wide seals). A floating ribbon is disposed within the pouch and is anchored at each end, respectively, by flatwise securement with the pouch layers at the strip seals. The opposite faces of the two ribbon ends, four faces in all, each form an interface with the pouch layer adjacent thereto, and more specifically, that layer comprising the inner surface of the pouch. Each of these interfaces comprises a potential pressure release valve, and at least one is designed to release at an internal pressure below that at which the pouch would normally burst were it not for the provision of such a valve. Such release properties can be achieved by forming the ribbon of a material characterized in that it does not bond or seal as strongly to the inner surface material as does the inner surface material bond or seal to itself. The valve is substantially one way as will be explained in more detail hereinafter.

Yet additional objects and advantages of the present invention, and its numerous and cognate benefits, are even more apparent and manifest in and by the ensuing description and specification taken in conjunction with the accompanying drawing, in which, wheresoever possible, like characters of reference designate corresponding material and parts throughout the several views thereof in which:

FIG. 1 is a top view of a package having integrally formed therein a one way pressure release valve constructed according to the principles of the present invention;

FIG. 2 is a cross-sectional view of the package of FIG. 1 taken along reference line 2—2 thereof;

FIG. 3 is a cross-sectional view of the package of FIG. 1 taken along reference line 3—3 thereof; and

FIG. 4 is a view like FIG. 3 only enlarged and fragmented and showing the pressure release valve activated whereby internal pressures are allowed to escape from the confines of the package to the atmosphere.

Referring now more particularly to the drawings, there is shown in FIG. 1, a package 10 of generally "pillow" like configuration and including a pouch 12. A product 14 is hermetically enclosed within the pouch 12. Product 14 can represent, for example, ground or whole coffee beans or a like product characterized in that it emits gases and/or vapors.

The pouch 14 generally comprises a tubular body 16. The opposite ends 18 and 20 of the tubular body 16 are secured closed along first and second edgewise disposed strips 22 and 24, respectively, to provide the desired hermetically tight enclosure about product 14. More specifically, strip seals 22 and 24 extend edgewise across the width of pouch 12 uniting or sealing together therealong the pouch layers 40 and 42. With seals 22 and 24 in generally planar alignment with each other as shown in the drawings, the tubular body 16 of package 10 assumes a generally flatwise disposed configuration. If desired, the seals 22 and 24 can be non-aligned, as for example, by forming the seals along planes at right angles to each other whereby the tubular body 16 shapes up somewhat differently in what can be described generally as a tetrahedral configuration (not shown).

Tubular body 16 can be formed from extruded tubular material, or from two webs of film or sheeting placed in superposed relationship and edgewise sealed together to form a tubular shape. Conventionally, however, packages of this sort are formed from a single web of material which is wrapped around a hollow mandrel such that the opposite edges of the web overlap each other.

The tubular body 16 is then formed by joining or sealing together the overlapped edges of the web. It is customary to locate the seam along a center portion of the package as depicted by center seam or seal 26 of package

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10, as is best illustrated in FIG. 1. A conventional method of continuously forming and filling packages of the sort described above is set out in some detail in U.S. Pat. Nos. 2,260,064 and 2,257,823. Therein sophisticated package designs are illustrated where, for example, the tubular body is formed with inverse folds or gussets along the opposite sides thereof. Such designs can be employed in conjunction with the teachings of the present invention where suitably modified to conform to the principles thereof.

The material or web used to form the pouches of the present invention can comprise either single or multi-ply films or sheet material. In either case, the inner surface 28 of the pouch 14 comprises a material that can seal or bond to itself when subjected to applications of pressure and/or heat, as for example, when subjected to the usual heat sealing or ultrasonic sealing techniques.

Disposed in package 10 is a ribbon 30 which extends from one end 18 of the tubular body 16 to the opposite end 20 thereof. The opposite ends 32 and 34 of ribbon 30 are flatwise secured with layers 40 and 42 of pouch 12 in the strip seals 22 and 24 as shown in FIG. 3. The ribbon ends 30 and 32 extend substantially through the width of seals 22 and 24, respectively, with the width measurement being designated by the reference letter X in the drawings. Each ribbon end at its opposite surfaces or faces forms an interface with the inner surface 28 of the pouch 12, these interfaces being designated by reference numerals 36 and 38 for the ribbon end 34 which is secured in seal 24. Ribbon 30 can be characterized as a "floating" ribbon since the middle or intermediate portion 43 thereof is preferably free of an attachment to the pouch 14, the only attachment being at the ends 32 and 34 of the ribbon as is described more fully hereinafter.

Ribbon 30 can comprise a thermoplastic strip material formed of either single or multi-ply construction. The latter structure is shown in the drawings including a first ply 44 associated with interface 36, and a second ply 46 in intimately joined relationship with the first ply 44 and associated with interface 38. At least one of the plies 44 or 46 of the ribbon 30 is composed of a material dissimilar to the material forming the inner surface 28 of the pouch 14.

By a dissimilar material it is meant that the compatibility of such material to the inner surface 28 material is of a lesser degree than the compatibility of the inner surface 28 material to itself. Thus, when internal pressure from "built-up" gases and/or vapors becomes too great, the interface portion of the seal releases due to its lesser degree of bonding strength whereby an opening or port 48 to the atmosphere is provided, as is shown by the "blown" interface 36 in FIG. 4. Where both faces of the two ribbon ends comprise a dissimilar material of the class described hereinbefore, there is in effect four potential pressure release points or valves each corresponding to one of the four interfaces mentioned above.

The reason the valve construction of the present invention does not permit any substantial amounts of gas and vapor to enter the package is thought to reside in several factors. During the forming of seals 22 and 24, it is known that the heat and pressure applied causes thermal plasticity and flowing between the opposite faces of the ribbon ends and the inner surface 28. An extremely tight intimate fit is thereby thought to be obtained at the four interfaces of a block or nearly block tolerances. That is, the surfaces forming these interfaces tend to cling to each other to prevent the inward penetration of gases once the pressure equilibrium is established. The natural resilience or memory oftentimes inherent especially in thermoplastic materials is also thought to play a part. In other words, layers 40 and 42 seem to form lips 50 and 52 about the ribbon ends 32 and 34 that apparently tend to close once the excess gases have escaped. Obviously, some materials have more of this character (i.e., resilience or memory,) than others. Pouches 14 having paper exteriors and thermoplas-

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tic interiors or inner surfaces 28 seem to function well in this regard, and the relatively stiff quality of such pouch materials seems to be a major contributing factor in obtaining a maximum degree of closure of lips 50 and 52 about ribbon ends 32 and 34. Correspondingly, thermoplastic materials like polypropylene or polyethylene terephthalates which are relatively stiff, hard thermoplastics in comparison to those of a "limp," soft nature such as low density polyethylene, are most beneficially employed to form the exterior of pouches 14.

Oftentimes, the stiffer, hard thermoplastic material such as the aforementioned polyethylene terephthalates, are highly crystalline in structure and exhibit a relatively sharply defined melting point. Accordingly, the temperature range at which these materials seal to themselves, or to materials they are compatible with, is usually quite narrow. To obtain a more practical temperature sealing range, such materials can be coated on one side with materials that seal at a relatively wider range of temperatures as for example, a low density polyethylene which would form the inner surface 28 of the pouch 14. Intermediate or core plies or coatings of barrier material to minimize gas and vapor transmission rates through the walls of pouch 14 can also be employed in combination with the foregoing exterior and interior constructions as will be discussed more fully hereinafter.

At least one face or side of ribbon 30 can also comprise a material generally considered as non-compatible with the material comprising the inner surface 28 of pouch 12. For example, an aluminum coating or foil is generally considered non-compatible (that is, non-heat sealable) with polyethylene, a material suitable for forming the inner surface 28. It has been found in practice, however, that some clinging, be it an actual fusing or bonding together or not, does appear to occur between a ribbon end of metal foil and a polyethylene inner surface 28. A tight fit at the interface is also seemingly obtained by the aforementioned action of "flow" whereby at least close gauge to block tolerances between the aluminum face and the inner surface 28 of the pouch seemingly results.

For exemplary purposes, a suitable width Y dimension for ribbon 30 is usually in the range of from about $\frac{1}{32}$ of an inch to about 1 inch, with the most preferred range being from about $\frac{1}{16}$ of an inch to about $\frac{3}{4}$ of an inch. A ribbon thickness in the range of between about 0.3 mil to about one mil is generally satisfactory.

As a general relationship, all other things being equal, the wider the ribbon the lower the internal pressure at which the interface releases.

As a particular illustration of the invention, pouch 12 is formed of a laminate construction comprising a paper/low density polyethylene/saran (a vinylidene chloride/vinyl chloride copolymer)/low density polyethylene combination with the polyethylene side of the laminate forming the inner heat sealable surface 28.

Ribbon 30 in conjunction with a tubular body 16 having a polyethylene inner surface 28 can comprise, as for examples only, saran, plasticized polyvinyl chloride, cellophane (regenerated cellulose), polyethylene terephthalate or a like material generally characterized as having less compatibility to polyethylene than does the polyethylene have to itself. Laminated combinations of materials corresponding to plies 44 and 46 can also form ribbon 30, as for example, a cellophane ribbon coated on one side with saran. If only two pressure release points are desired, the cellophane can be coated on one side with polyethylene, or in more general terms, the same material as comprises the inner surface 28 of the pouch which in this case happens to be polyethylene. This latter arrangement wherein only two pressure release points are formed is the most preferred form of the invention. In this preferred construction, one side or face of both ribbon ends (in the above illustration the polyethylene face) is securely attached to the inner surface 28 to posi-

tively avoid a "pull-out" of the ends 34 and 36 from the seal occasioned by abusive or rough handling as is frequently normal procedure in package distributions and sales.

By way of still further illustrations of the present invention, a suitable two-pound coffee package 10 includes a pouch 14 fabricated from fourteen-inch wide web stock. The web comprises a plurality of layers of materials arranged in relation to each other in the following order: a layer of kraft paper, either plain or super calendered, having a weight basis of 25 pounds per 3000 sq. feet; a polyethylene layer, thickness 1.75 mils, density 0.930, Melt Index 3.8; a layer of a copolymer of 72 weight percent ethylene, 28 weight percent vinyl acetate, thickness 0.15 mil, Melt Index 3.0; a layer of saran, thickness 0.25 mil, having a formulation comprising 93.75 parts by weight of a copolymer of 85 weight percent vinylidene chloride and 15 weight percent vinyl chloride and mixed with 4.50 parts by weight acetyltributyl citrate, 1.00 part by weight of an epoxidized soyabean oil commercially available under the trade designation of Paraplex G-60, 0.75 part by weight of 4-tertiarybutyl salol; a layer of a copolymer of 72 weight percent ethylene, 28 weight percent vinyl acetate, thickness 0.15 mil, Melt Index 3.0; a polyethylene layer, thickness 1.75 mils, density 0.930, Melt Index 3.8.

The last-mentioned polyethylene layer forms the inner heat sealable surface 28 of pouch 14. The plastic portion of the laminate (excluding the exterior layer of kraft paper) can be prepared by conventional coextrusion techniques, as for example, a technique like that illustrated in Belgian Pat. No. 683,208, French Pat. No. 1,484,153, Italian Pat. No. 771,743, Mexican Pat. No. 88,521, and Spanish Pat. No. 328,596.

The foregoing patents teach, in some depth, various formulations and preparations for multi-layered films having a common ply or layer arrangement of polyethylene/saran/polyethylene or polyethylene/adhesive/saran/adhesive/polyethylene whereby a film highly beneficial for packaging coffee and like products is obtained. Such films can be combined with the kraft paper layer by suitable and conventional methods, as for example, by employing a suitable glue layer such as a polyethyleneimine.

In connection with a pouch 14 construction as described above, a suitable ribbon 30 comprises a saran substrate or ply 44 coated on one side with a copolymer of 72 weight percent ethylene, 28 weight percent vinyl acetate. Still more specifically, one example of a suitable formulation for the saran ply 44 is 93.275 parts by weight of a copolymer of 85 weight percent vinylidene chloride and 15 weight percent vinyl chloride, and mixed with 4.5 parts by weight of acetyltributyl citrate, 1 part by weight Paraplex G-60, 0.75 part by weight tertiarybutyl salol, 0.10 part by weight finely divided tetrasodium pyrophosphate, and 0.375 part by weight of a mixed fatty acid amide containing a major portion of stearamide. A proper ribbon 30 thickness is in the range of from about .5 mil to about one mil with the saran ply 44 comprising from about 75 percent to about 93 percent of the total thickness of the ribbon. A satisfactory width Y for ribbon 30 is between from about 1/4 to about 1/2 inch. Seals 22 and 24 closing the ends 18 and 20 of the package are suitably formed by applications of pressure and heat with X dimension of the same measuring approximately 1/2 inch. In the foregoing example, the saran face of the ribbon ends 32 and 34 comprises the release material, while the ethylene-vinyl acetate copolymer faces of ends 32 and 34 form a tight or strong bond with the inner surface 28 to positively insure against a "pull-out" of one of the ribbon ends from the seal as was discussed generally above.

As yet another illustration of the present invention, a suitable pouch 14 for use in packaging 2 pound lots of ground coffee beans is formed of a multilayered film com-

prising a 1.25 mil thick exterior layer of polypropylene, a 0.10 mil thick core layer of saran, and a 0.5 mil thick inner surface 28 layer of low density polyethylene. A saran/ethylene-vinyl acetate copolymer ribbon 30 of the character as set out specifically above is beneficially employed in combination with the aforementioned package construction to obtain the desired pressure release valve of the general type disclosed hereinbefore.

By strip seals it is meant to distinguish the invention from those seals made by heated wires or the like that cut through the material leaving a seal having, for all practical purposes, no width dimension at all. A satisfactory seal width as measured by the reference letter X, is in a range of between about 1/64 of an inch to about 1 inch with the preferred range being from about 1/8 to about 3/4 of an inch.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope of the invention. Such changes can be in other structures and materials which serve to achieve the principles of this invention.

Accordingly, what is claimed as new is:

1. In a package generally of a type including a pouch constructed of flexible material, the pouch including first and second generally edgewise disposed seals joining together the layers of the pouch at respectively positioned edge portions thereof, the improvement of which comprises, a pressure release valve comprising a ribbon interiorly disposed within said pouch, the opposite ends of said ribbon being flatwise arranged with the layers of said pouch in said seals with one of said opposite ribbon ends being in said first seal and the other of said opposite ends being in said second seal, whereby the middle portion of said ribbon extends between said first and second seals, said ribbon ends extending substantially through said seals, the opposite faces of said ribbon ends being in engagement with the inner surface of said pouch, the adherence between at least one of said ribbon end faces and said inner surface being less than that in regions of said seal where portions of said inner surface are joined together.

2. The package of claim 1, wherein a product is disposed within said pouch, said pouch forming a substantial liquid and gas tight enclosure about said product, said product being characterized by its tendency to emit gases and/or vapors.

3. The package of claim 2, wherein said inner surface is heat sealable, said seals being formed by application of heat and pressure, at least one of said ribbon faces comprising a material characterized as being less compatible to the inner surface material than the inner surface material is to itself whereby said adherence between said ribbon end face and said inner surface is of a lesser degree than the adherence in said seal where said inner surface material is joined to itself.

4. The package of claim 3, wherein said seals are characterized as being strip seals.

5. The package of claim 1, wherein said middle portion of said ribbon is not attached to said pouch such that said ribbon is characterized as a floating ribbon.

6. The package of claim 1, wherein one face of each of said ribbon ends is sufficiently compatible to said inner surface such that the bond between said compatible faces and said inner surface is sufficiently strong to avoid a pull-out of either of said ribbon ends from said seals.

7. In a package including a pouch constructed of flexible material, the pouch comprising a tubular body and first and second seals joining together the layers of said tubular body at its opposite ends, respectively, so as to close said opposite ends, a pressure release valve comprising a ribbon disposed within said pouch and extending from one end of said tubular body to the opposite end thereof, the opposite ends of said ribbon being flatwise

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arranged with the layers of said pouch in said seals with one of said ribbon ends being in said first seal and the other of said ribbon ends being in said second seal, whereby the opposite faces of said ribbon ends respectively engage the inner surface of said tubular body, the degree of adherence between at least one of said ribbon end faces and said inner surface being less than the adherence in regions of said seal where portions of said inner surface are joined together.

8. The package of claim 7, wherein said ribbon ends extend substantially through said seals.

9. The package of claim 7, wherein a product is disposed within said pouch, said pouch forming a substantial liquid and gas tight enclosure about said product, said product being characterized by its tendency to emit gases and/or vapors.

10. The package of claim 9, wherein said inner surface is heat sealable, said seals being formed by application of heat and pressure, at least one of said ribbon faces comprising a material characterized as being less compatible to the inner surface material than the inner surface material is to itself whereby said adherence between said ribbon end face and said inner surface is of a lesser degree than the adherence in said seal where said inner surface material is joined to itself.

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11. The package of claim 9, wherein said seals are characterized as being strip seals.

12. The package of claim 7, wherein said middle portion of said ribbon is not attached to said pouch such that said ribbon is characterized as a floating ribbon.

13. The package of claim 7, wherein one face of each of said ribbon ends is sufficiently compatible to said inner surface such that the bond between said compatible faces and said inner surface is sufficiently strong to avoid a pull-out of either of said ribbon ends from said seals.

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