



US 20050100252A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0100252 A1**
Rivlin et al. (43) **Pub. Date: May 12, 2005**

(54) **HEAT-SEALED MULTI-WALL FLEXIBLE
CONTAINER**

Publication Classification

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(51) **Int. Cl.⁷** **B65D 33/00**

(52) **U.S. Cl.** **383/116; 383/105**

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(57) **ABSTRACT**

(21) Appl. No.: **10/704,655**

(22) Filed: **Nov. 12, 2003**

The invention relates to a multi-wall flexible container that includes an outer wall of a laminate of first and second sheets, and one or more heat sealed or heat sealable joints. The first sheet is made of a material that is different from that of the second sheet and the laminate is configured to form a tube with one of the sheets providing an outer surface of the container. The container also may include at least one additional wall member comprising a third sheet material.

HEAT-SEALED MULTI-WALL FLEXIBLE CONTAINER

BACKGROUND

[0001] The invention relates to a multi-wall flexible container for various products and to the laminates and methods used to make the same.

[0002] A typical flexible container is referred to as a bag. The prior art is replete with various bag constructions for certain end uses. Bags made of multiple layers of kraft paper are commonly used for retaining pellet, granular or particulate products such as inorganic materials of sand, cement, gypsum or the like, as well as bulk foods, and in particular, animal or pet foods. The multiple layers provide additional strength and rigidity to the bag, but the bags can be damaged due to contact with moisture or sharp objects, with deterioration or spillage of the bag contents as a result. Also, printing on the bag can be scuffed, scratched or otherwise damaged during handling or storage of the bag, resulting in a worn or used appearance which makes the product less desirable for purchase by consumers. U.S. Pat. Nos. 3,807,626, 3,910,488, 3,945,562, 3,958,749, and 4,515,273 are examples of these type bags to illustrate their constructions and closures.

[0003] It is also well known to use plastic films for the construction of bags. Both single and multiple layer plastic films have been used. These bags have better strength and moisture resistance than those of paper, but when thicker films or multiple, layers of film are used, the cost of the bag is increased, with the additional cost being passed onto the consumers of the bagged product. These type bags are commonly used for lawn fertilizers or similar chemicals where containment of the powder or liquid products therein is an important consideration, thus justifying their increased cost.

[0004] When a low cost, moisture resistant bag is desired, it is known to coat paper with a resinous material as disclosed in U.S. Pat. No. 3,412,771. The coating is sufficient to provide moisture resistance as well as to allow heat sealed seams to assist in closure of the bags, while retaining the low cost of the paper walls. U.S. Pat. No. 3,567,111 discloses a similar bag except that it includes 2 paper layers and an internal polymer coating. While such bags are more resistant to moisture from products contained therein, these have relatively low strength since the bag material is made from one or two paper plies or layers.

[0005] U.S. Pat. No. 3,184,149 discloses a bag made of a sheet of flexible material, such as a polymer, cellophane, paper or aluminum foil, that is folded and joined and sealed along three sides. While useful for containing lightweight objects or products, the strength of such bags is suspect since only a single sheet of flexible material is used and any rip or tear can propagate to complete failure.

[0006] There are composite multi-wall bag constructions where multiple layers or sheets of plastic and paper are used, but these are generally folded upon each other and joined as separate layers, or are constructed with a "bag in a bag" where a plastic bag is placed within a paper one or vice versa. U.S. Pat. No. 2,316,385 and U.S. patent application 2003/0035598A1 are examples of bags that include an inner moisture resistant layer or liner of a moisture proof material

or plastic film. The multiple sheets are included to combine the desirable properties of each material while still maintaining a reasonably low cost for the overall bag construction.

[0007] Bags made by laminating the edges of single or multi-ply webs of paper cloth, fabric or like webs are known as illustrated in U.S. Pat. Nos. 2,550,000 and 2,382,930. These bags are lacking in strength and moisture resistance and the laminated edges are suspect when different web materials are to be laminated.

[0008] Bags made with multiple layers of plastic that are laminated together, such as those disclosed in U.S. Pat. No. 3,623,653, are also known. These bags are more difficult to print and often do not have sufficient body to facilitate handling during filling of the bag with product. When heat sealed, these bags can be difficult to open, as noted by the solution to this problem that is disclosed in U.S. Pat. No. 3,254,829.

[0009] U.S. Pat. No. 5,244,702 and U.S. patent application 2002/0160216A1 disclose paper-plastic and paper-plastic-paper laminate sheetings capable of being converted by conventional equipment into envelopes, grocery bags and other dilatable container products that initially are in a flat state and are normally made of paper. The sheeting is composed of a paper facing sheet cold-laminated by means of a water-based adhesive to a reinforcing film of synthetic plastic material, such as polypropylene, polyethylene or polyester. The film is oriented to impart exceptional tear and burst strength characteristics to the resultant waterproof product. Since the exterior surfaces of these container products are formed by the paper facing sheet, they are readily printable. For some applications, a second paper facing sheet is cold-laminated to the other side of the film to produce a three-ply laminate sheeting that has all exposed surfaces readily printable and able to accept conventional adhesives. While these laminates are useful for their intended purposes, those documents explain that the tensile strength of an oriented film is seriously impaired if heat is applied thereto, because heat acts to relax the film and cause it to lose its molecular orientation. For this reason, the use of hot melt adhesives to laminate a reinforcing film to the paper sheet is interdicted, since this can seriously diminish the strength and reinforcing characteristics of the film.

[0010] Despite the existence of these different constructions, there still remains a need for relatively low cost, durable and strong flexible container products, and these are now provided by the present invention.

SUMMARY OF THE INVENTION

[0011] The invention relates to a multi-wall flexible container comprising an outer wall of a laminate of first and second sheets, and one or more sealed joints. Generally, the first sheet is made of a material that is different from that of the second sheet and the laminate is configured to form a tube with one of the sheets providing an outer surface of the container. The container may also include at least one additional wall member comprising a third sheet material for providing additional structure to the container.

[0012] Advantageously, a first sealed joint is associated with one end of the tube to assist in forming a bottom portion of the container and a second sealed joint is associated with

the laminate for forming at least one side seam of the container. Generally, one of the first or second sheets comprises paper while the other comprises a sheet material that is capable of bonding to paper and that has increased strength and/or moisture resistance compared to a paper sheet.

[0013] In a preferred embodiment, the first sheet can be any one of a wide variety of sheet materials, including a polymeric film, a metal foil, or a plastic coated, fiber reinforced or metallized paper sheet, and the second sheet comprises paper. The at least one additional wall member can also be any one of a wide variety of materials, including a polymeric film, a metal foil, a fabric, a netting made of the previously recited materials, a plastic coated, fiber reinforced or metallized paper sheet, or a cushioning material comprising a foam or other gas filled cellular material. Generally, the additional wall member comprises a different material than that of the first sheet.

[0014] In another preferred embodiment, the at least one additional wall member forms a liner that is positioned within the laminate and configured to form an inner tube to provide additional strength to and reinforcement of the container and for contacting a product that is placed in the container, with the first sealed joint associated with one end of both the laminate and inner tubes to assist in forming a bottom portion of the container. Also, the liner can be spot-adhered to the laminate to hold the liner material in a desired orientation with regard to the laminate.

[0015] In yet another embodiment, the first sheet of the laminate provides the outer surface of the container and preferably comprises an oriented polymer film while the second sheet comprises the paper sheet. This allows visual information comprising one or more ink images to be provided between the polymer film and paper sheet. Preferably, the ink images are resistant to deterioration when in contact with moisture such as that introduced by a water-based lamination adhesive so that the visual information may be viewed through the polymer film while the polymer film protects the visual information and paper from damage during handling of the container.

[0016] While methods for manufacturing multi-walled bags are generally known, the invention relates to an improvement in such methods which comprises forming the outer wall of the bag of one of the laminates disclosed herein. The joints of the bags of the invention typically are made with a hot melt adhesive for optimum strength and reliability due to the presence of the paper/polymer film laminate. The method of the invention further comprises placing a product, item or article in the container, providing a strip of hot melt adhesive positioned on the laminate tube to facilitate formation and sealing of a top portion of the container, and sealing the top portion of the container after the product, item or article is placed therein to form a sealed container.

[0017] The multi-wall flexible container and the sealed and filled multi-wall flexible container produced by these methods represent additional embodiments of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The present invention relates to a flexible, multi-wall container of the type used for transporting, carrying or

storing various products, items or articles. As noted above, it is advantageous for the outermost wall member of the container to be made of a laminate of dissimilar sheet materials to provide the container with enhanced properties.

[0019] One of the sheets of the laminate preferably comprises paper while the other comprises a sheet material that is capable of bonding to paper and that has increased strength and/or moisture resistance compared to paper. The second sheet is usually a paper sheet to facilitate formation of the laminate. The first sheet then can be any one of a wide variety of materials that can be laminated to the paper sheet. These materials include polymeric films, metal foils, or paper sheets that are treated by the addition of a plastic coating, fiber reinforcement or metallization. Each of these materials has enhanced properties compared to paper and this contributes to the overall improved properties of the container.

[0020] The polymer films for use as the first sheet can be in the form of single webs of any type of polymeric or plastic material, extrusions or coextrusions of different polymers, or multiple extruded layers of the same or different polymers, and preferably those that are joined together for dimensional stability. For example, a single web of a polyolefin or polyester material, whether oriented or not, is suitable, whether in the form of a film or foam. Polyesters such as MYLAR and polyamides such as nylon are preferred, while suitable polyolefins include polypropylene, polyethylene or copolymers thereof. Polyvinylchlorides or other thermoplastics can be used when moisture resistance rather than strength is the primary concern. An extruded multiple layer laminate of polyethylene and polyester is advantageous when the combination of properties of those polymers is desired, i.e., one for strength and temperature resistance and the other for bonding or heat sealing when forming the container. Similarly, the combination of a nylon layer and a polyvinyl alcohol layer can be used when high strength and an oxygen barrier is needed. Also, an extruded multiple layer laminate of polyethylene and polypropylene is useful when the combination of a strengthened film and one that is more easily joined by heat sealing is desired. Three layer extrusions are also possible, with the inner layer being regrind or recycle polymer material. These materials are conventionally made using a multiple head extruder as is known in the polymer art. Furthermore, composites of polymer or plastic films and other materials, with or without fiber or other reinforcement, can be used for even greater strength or rigidity of the container or bag.

[0021] Metal foils, such as aluminum or others, can be used as the first sheet when desired. These materials impart strength, moisture resistance and a desirable appearance to the laminate. These materials are easy to laminate to paper and when so laminated are typically used as the outer surface of the container in order to take advantage of its desirable appearance. Instead of foil, metallized paper or polymer films can be used to obtain these improved appearances. As metallizing techniques are well known in the art no further mention needs to be made of the processes for forming these materials.

[0022] Finally, the material to be laminated to paper can be a paper sheet that is treated by the addition of a plastic coating, fiber reinforcement or metallization. These treatments enhance the moisture resistance and/or strength prop-

erties of the paper and the enhancement is then imparted to the laminate and the container.

[0023] The second sheet is made of paper. Any type of paper can be used, including kraft paper, white paper or even cardboard. These materials can be of any desired weight for such containers.

[0024] The laminate can be formed in any conventional way. It is entirely suitable to laminate these materials using a hot melt adhesive or an reaction cure adhesive provided that care is taken to assure dimensional stability until the laminate is formed after those adhesives set and/or cure. For example, when hot melt adhesives are used, such as conventional heat-meltable polyethylene adhesives, care must be taken so that the paper and other material do not slip apart or otherwise move away from each other until the adhesive cools and sets to form the laminate. The reaction cure adhesives of the type disclosed in U.S. Pat. No. 5,037,700 can also be used, but these generally require the addition of heat to facilitate curing to form the laminate. Again, care must be taken with such adhesives so that the paper and other material do not slip apart or otherwise move away from each other until the adhesive sets and cures to form the laminate.

[0025] As noted, a preferred material for the outer wall member of the laminate is a polymer film, preferably one that is transparent and is uniaxially or biaxially-oriented for increased strength. Film materials suitable for this purpose are polypropylene, polyethylene, or a polyester such as MYLAR. The tensile strength of the film is substantially increased by orientation which results in molecular orientation of the film. In the case of biaxial orientation, orientation is in both the longitudinal and transverse directions. This is usually effected by controlled stretching of the unoriented film. The tensile strength of an oriented film is seriously impaired, however, if heat is applied thereto, for the heat acts to relax the film and cause it to lose its molecular orientation. Thus when oriented films are used, cold lamination is preferred for forming the laminate. The well known techniques disclosed in U.S. Pat. No. 5,244,702 and U.S. patent application 2002/0160216A1 are useful for this purpose and the content of each of those documents is expressly incorporated herein by reference thereto to the extent necessary to understand these techniques.

[0026] When a transparent outer surface is not needed, the film or first sheet may be metallized. When a transparent film is to be metallized, this may be done on the side of the film that is laminated to the paper so that the metallized surface is protected against abrasion, wear or damage due to rough handling.

[0027] Preferably, the polymer or plastic film is cold laminated to the paper sheet under pressure and at ambient temperature (i.e., without the intentional addition of heat) by means of a water-based adhesive. A polyacrylate copolymer adhesive, or by any other water-based adhesive having similar bonding properties and having an affinity both for the paper sheet and the polymer or plastic film or metal foil can be used. Preferably, the water-based adhesive is a vinyl acetate ethylene copolymer.

[0028] Since paper tends to absorb water in the laminating process, before the paper sheet and the film are together fed into pressure rolls and subjected to pressure to effect lami-

nation, a surface of the film is first coated with the water-based adhesive which does not encounter the first surface of the paper sheet until these two surfaces meet in the pressure rolls. In this way, the period during which absorption of the adhesive into the interior of the paper sheet can take place is limited. And to render the first surface of the film more receptive to the water-based adhesive applied thereto, it is preferably first subjected to ionization to enhance the dynes on this surface. Hence, when the adhesive-coated film web and paper web together enter the combining station and are subjected to pressure by pressure rolls, lamination is effected by this action. The paper layer absorbs the water from the adhesive so that a high strength lamination can be rapidly achieved as the paper and film exit the pressure rollers. These features are disclosed in the incorporated documents so that they do not require further explanation herein.

[0029] The cold lamination process enables the present laminate sheeting to be manufactured at much higher speeds than when other adhesives, such as hot melt adhesives, are utilized, for example due to the additional time required for cooling of the hot melt adhesive before a secure bond is achieved. Another benefit of the use a water-based adhesive in a cold lamination process is that this type of adhesive does not require the use of volatile organic solvents. Thus, adverse health and environmental effects are avoided because such solvents are not used. Also, additional costs for recovering or disposing of solvents are not incurred.

[0030] The paper sheet of the laminate preferably has a thickness of from about 3 to about 6 mils. The other sheet preferably has a thickness of from at least about 0.5 to 12 mils, although for the preferred polymer film it is about 0.5 to 3 mils. The thickness ratio of paper to other sheet is in the range of between 6:1 to 1:2, and preferably is between 3:1 to 1:1. Other thicknesses for the first and second sheets and other thickness ratios can be used if desired depending upon the desired use of the final container or bag.

[0031] A most preferred embodiment includes a first sheet comprising a transparent, oriented polymer film which provides the outer surface of the container while the second sheet comprises paper so that the paper may be viewed through the polymer film and the polymer film protects the paper from damage during handling of the container. In this embodiment, visual information comprising one or more ink images provided between the polymer film and paper sheet. These images include colors, printing, symbols or designs, including trademarks or tradenames and other advertising information, and the like. The visual information is protected by the polymer film so that it remains intact as the container is transported or moved from one location to another and while displayed in a store or other facility for purchase by consumers.

[0032] When cold lamination is used to form the laminate, the second sheet preferably comprises an oriented polymer film that has a surface that is energized to have increased dynes and an affinity for adhesives, and the film is laminated to the paper sheet by a water-based adhesive that contacts the treated surface of the film and has its water absorbed by the paper sheet to effect lamination thereof. As water from the water-based adhesive is present during the lamination, it is preferable for the one or more ink images to be resistant to deterioration when in contact with this water or moisture.

[0033] This can be achieved in a number of ways. When the ink images of the visual information comprise water-

based inks that are conventionally applied to the paper sheet, a varnish coating can be applied over the inks and paper to resist deterioration from the moisture of the adhesive when the paper sheet is contacted by the water-based adhesive. A conventional printing varnish can be used for this purpose. As this is a standard material that is known to skilled artisans, there is no need for further detail of it herein.

[0034] Another way to provide moisture resistant ink images is to use those that comprise organic solvent based inks and to apply them to the polymer film. These can be applied by spraying, silk screening or other conventional ink printing processes. As the inks contain organic solvents and are hydrophobic, there is no deterioration when coming in contact with the water of the adhesive.

[0035] The at least one additional wall member or liner can also be any one of a wide variety of materials, including all those mentioned above for the first sheet. In addition, the additional wall member can be a fabric. The fabric can be knitted, woven or even braided so long as there is sufficient filaments or fibers for lamination to the paper sheet. The fibers or filaments in the fabric can be natural or synthetic with polyester, nylon or KEVLAR being preferred when reinforcement or high strength is desired. Alternatively, inorganic materials, such as fiberglass or carbon fibers, can be used for this purpose.

[0036] Instead of fabrics, nettings or screenings made of any of the previously recited materials can be used when greater flexibility of the container is intended. These items are preferably made of polymers or metal.

[0037] This wall member is generally provided in the form of a liner that is used to provide additional strength to the container and protection of its contents. It can be made of a simple material such as kraft paper, or instead can be made of a foam or celled material for cushioning, or of a mesh or netting to help retain the container contents away from the laminate. Generally, the additional wall member is comprised of a different material than that of the first sheet of the laminate. To assist in maintaining the correct portion of the additional wall member in the container, it can be spot-adhered with adhesive or by spot welding to the laminate. The skilled artisan can best determine what materials to select for the first sheet and additional wall member depending upon the specific products or contents of the container.

[0038] In one particular embodiment of the invention, the container is in the form of a sealable or sealed bag for containing products or other merchandise, while in other embodiments, it can be an sealable envelope or mailing package.

[0039] The bags of the invention can be used to contain a wide variety of products. In particular, when the inner surface of the laminate is paper, and the third sheet is paper, the product normally would be one that does not contain or exude moisture or liquid. While the outer polymer film of the laminate can contain such moisture, prolonged storage can affect the paper layer. Dry products such as animal feed or pet food, rock salt, sand, cement, gravel, or other inorganic materials, lawn chemicals, or foods such as beans, corn, wheat, rice, flour, coffee, tea, salt, pepper, spices or other particulates, potatoes, onions, apples, oranges, or other fruits or vegetables can be mentioned as typical and non-limiting examples. The polymer film protects the paper portion of the

laminate and prevents external moisture from entering the bag to deleteriously affect the product therein.

[0040] Dry materials in pellet or particulate form can be placed in the bags of the invention. The terms "pellet" and "particulate" are used to indicate various suitable forms of dry material that can be contained within the bags of the invention. "Particulates" generally refers to smaller sized materials, such as those provided by wheat flour, talcum powder, sand, or rice, while "pellets" refer to larger size materials, such as beans, peas, coal, gravel, whole fruit or the like.

[0041] To counter the effects of moisture in the sealed package, an additional wall member or insert of paper, tissue, cloth or another absorbent material can be included. When a moist or liquid product is to be contained, a three-ply laminate of plastic-paper-plastic can be used. The inner plastic layer would then protect the paper of the laminate from the deleterious effects of moisture or liquid.

[0042] The container of the invention may also be used as a mailing envelope, where the laminate provides the outer wall of the envelope. When the outermost surface is paper, the envelope can be printed or otherwise marked with indicia, while when the outermost surface is a polymer film, a waterproof envelope is provided. The inner liner can be used to protect the contents of the envelope. When the envelope is to be used to transport an item that is not resistant to shock, impact or rough handling, the liner can be made of a cushioning material comprising a foam or other gas filled cell material. In particular, when a foam or bubble-wrap material is used as the liner, the interior of the envelope is well protected for mailing items such as computer diskettes, glass articles or other items requiring protection from shock or impact during travel and transport through the mail.

[0043] Yet another use for the present container is as a package mailing container. If a moist or wet material is to be mailed, an inner liner of a water or moisture resistant material with the plastic/paper laminate forms a mailing package that is internally resistant to the moist or wet material to be mailed, while the plastic exterior of the package provides additional moisture resistance to the package during shipping. As in the envelope embodiment, a cushioning material can be used as the liner to protect fragile articles to be shipped.

[0044] In certain embodiments, the paper second sheet is used in the laminate to provide the outer surface of the container so that it may be readily printed while first sheet is used to provide a strength or moisture resistance interior for the container. For example, when the laminate is one of paper and plastic film, the film is provided in the interior of the bag to prevent moisture in the bag from contacting the paper portion of the laminate. When the surfaces to be joined to form the container are both made of paper, it is possible to use conventional, commercially available adhesives for this purpose, rather than the special adhesives that would be dictated if the surfaces to be sealed together included a plastic film surface or other surface that is more difficult to bond. And because these exposed surfaces are paper, they can be readily printed.

[0045] Alternatively, a paper-polymer film laminate where the polymer film forms the outer surface of the container can

be further treated to prevent moisture in the container from contacting and deteriorating the paper sheet of the laminate. One convenient way to do this is to include a further oriented polymer film in the laminate. This film can be provided with a surface that is energized to have increased dynes and an affinity for adhesives, and then be laminated to the exposed paper surface of the paper sheet by a water-based adhesive. As above, the water-based adhesive is applied to the treated surface of the film and has its water absorbed by the paper sheet to effect lamination thereof and provide polymer films on both sides of the paper sheet. The second polymer film forms an inner surface of the laminate that provides moisture resistance inside the container. Either the film of the outer protective layer, the inner protective layer, or both are preferably biaxially oriented when the highest strength is needed for the container. Polypropylene, polyethylene, or polyester films are preferably used for this purpose.

[0046] The laminates of the invention can be used to form the container in exactly the same manner as ordinary paper in a stock roll for standard equipment adapted to fabricate envelopes, bags or other dilatable paper products, by slitting, folding and whatever other operations are dictated by the form of the product.

[0047] The size and shape of the containers of the invention can vary over a wide range. Also, the manufacturing techniques, which are already well known for containers made of multiple walls of paper, can be used with the simple substitution of a laminate for the outermost paper wall. Preferably, methods of manufacturing these containers include providing a laminate comprising a first sheet that will form an outer wall member of the bag, the first sheet being laminated to a second sheet of a material that is different from that of the first sheet; providing at least one additional wall member comprising a third sheet material; folding the laminate and at least one additional wall member to a tubular shape; providing a first sealed joint on one end of the laminate and one additional wall member that assists in forming a bottom portion of the bag; providing a second sealed joint between side portions of the laminate for forming a side seam of the bag, with the first and second joints each being provided by applying and melting a hot melt adhesive that bonds the laminate ends or portions sheets together to form the joint; and arranging and configuring the sealed joints to enable the laminate and at least one additional wall member to define an interior space that is capable of receiving a product therein. As noted, one of the first or second sheets comprises paper while the other comprises a material that is capable of bonding to paper and that has increased strength or moisture resistance compared to paper.

[0048] In the container of the invention, the first and second sealed joints are preferably made by a hot melt adhesive, as this material is the most compatible with the different types of materials used for the first and second sheets. Even when a laminate that includes an oriented film is used, the hot melt adhesive can be used to successfully form the seams and ends of the container because the amount of heat needed to form the seal is small compared to the overall size of the laminate, and the laminate is already formed so that the paper layer acts as a heat sink for the polymer to avoid a significant loss of strength of the film.

[0049] Also, a hot melt adhesive is preferably positioned on an open end of the laminate and additional wall member

tubes to facilitate formation and sealing of a top portion of the container after a product is filled therein. These hot melt adhesives are conventional, but a polyamide hot melt adhesive available from National Starch is preferred.

[0050] Again, while any type of laminate can be used, it is most preferred to use one that is obtained by cold lamination of the paper and polymer film in order to obtain optimum strength at a relatively low cost.

[0051] The multi-wall containers or bags produced by these methods represent another embodiment of the invention, as do the final filled and sealed bags that contain one or more products therein. The most preferred multi-wall container or bag of the present invention has an outer wall of a polymer film-paper laminate with the polymer film forming the outer surface of the bag. It also includes visual information, i.e., printing and coloration, between the polymer film and paper, and an inner wall of a paper liner.

[0052] The container or bag may be made by cutting the laminate and additional wall member(s) to the desired size, folding the sides and bottom edges as desired and joining the folded portions by placing a strip of solid or liquid hot melt adhesive between the folded portion followed by heating at least those portions and the adhesive. As this technique is well known in the art, no further elaboration is needed herein. After the product is placed in the bag, the top end can be sealed by folding and heat sealing that end.

[0053] The bottom of the bag is formed by folding the front and rear portions of the laminate upon either the front or rear of the bag, placing the necessary strip(s) of adhesive between the folded portions and then heat sealing the joint together. For bags that contain relatively lightweight products, a portion of the end of the bag, i.e., the front or rear, can be cut away and removed so that the joint is made with only a single laminate portion that is folded upon and then joined to the front or rear of the bag. This alternate construction is preferably used for the top portion of the bag after filling the bag with the product, since that simplifies and facilitates the final heat seal closure of the bag.

[0054] If desired, the laminate can be folded upon itself to form a continuous tube around an inner tube of the additional wall member(s) with a portion of the outer wall joined to an overlapping portion of the inner wall. This can be achieved by placing the hot melt adhesive strip along the inner or outer layers in the area of overlapping portions followed by heat sealing together the adhesive and overlapping portions. Alternatively, the side portions of the laminate can be folded so that either two outer wall portions or two inner wall portions face each other in contact with the strip of hot melt adhesive that is placed between them. The bag can be made by cutting the tube to the desired length, followed by folding and heat sealing one of the ends. After filling the bag with the desired product, the top portion of the bag can be heat sealed and closed in one of the previously described manners.

EXAMPLE

[0055] A container in the form of a 40 pound multi-wall bag of cat litter is made in accordance with the invention. As noted herein, the bag includes a first of a transparent, oriented polypropylene film which provides the outer surface of the container while the second sheet comprises paper

so that the paper may be viewed through the film and the film protects the paper from damage during handling of the container. In this embodiment, visual information comprising an identification of the product by tradename and in desired colors are provided on the paper sheet, followed by a coating of a standard varnish to prevent the water-based inks from running when contacted by the water-based adhesive that is applied to the film when the film and paper are joined together during the lamination step. A standard kraft paper is used as an additional wall member on the interior of the bag, and is used to retain the pellets of cat litter therein.

[0056] A comparison of the bag of the invention to one made of multiple layers of paper is summarized in the following details. The empty bag itself when made according to the invention has a number of unexpected advantages compared to the paper bag of the prior art. The inventive bag is lighter and thinner than the paper bag, and its appearance is shinier and smoother whereas the paper bag appearance is duller and rougher. In addition, the inventive bag is tougher and is more scuff resistant than the paper bag. This enables the present bag to retain its appearance for a longer time thus increasing its salability in stores.

What is claimed is:

1. A multi-wall flexible container comprising:
 - an outer wall member comprising a laminate of first and second sheets, with the first sheet made of a material that is different from that of the second sheet and the laminate configured to form a tube with one of the sheets providing an outer surface of the container;
 - a first sealed joint associated with one end of the tube to assist in forming a bottom portion of the container; and
 - a second sealed joint associated with the laminate for forming at least one side seam of the container,
 wherein one of the first or second sheets comprises paper while the other comprises a sheet material that is capable of bonding to paper and that has increased strength or moisture resistance compared to a paper sheet.
2. The container of claim 1, wherein the first sheet comprises a polymeric film, a metal foil, or a plastic coated, fiber reinforced or metallized paper sheet, and the second sheet comprises paper.
3. The container of claim 2, which further comprises at least one additional wall member comprising a third sheet material for providing additional structure to the container.
4. The container of claim 3, wherein the at least one additional wall member comprises a polymeric film, a metal foil, a fabric, a netting made of the previously recited materials, a plastic coated, fiber reinforced or metallized paper sheet, or a cushioning material comprising a foam or other gas filled cellular material.
5. The container of claim 3, wherein the additional wall member is a different material than that of the first sheet.
6. The container of claim 2, wherein the first sheet provides the outer surface of the container and comprises an oriented polymer film while the second sheet comprises paper so that the paper may be viewed through the polymer film while the polymer film protects the paper from damage during handling of the container.

7. The container of claim 6, which further comprises visual information comprising one or more ink images provided between the polymer film and paper sheet.

8. The container of claim 7, wherein the polymer film is adhesively cold laminated to the paper sheet by a water-based adhesive.

9. The container of claim 8, wherein the water-based adhesive comprises a vinyl acetate ethylene copolymer.

10. The container of claim 8, wherein the one or more ink images are resistant to deterioration when in contact with moisture.

11. The container of claim 8, wherein the ink images of the visual information comprise water-based inks that are applied to the paper sheet and which include a varnish coating to resist deterioration when the paper sheet is contacted by the water-based adhesive.

12. The container of claim 9, wherein the ink images of the visual information comprise organic solvent based inks that are applied to the polymer film.

13. The container of claim 2, wherein the paper second sheet provides the outer surface of the container while the first sheet comprises the polymer film, the metal foil, or the plastic coated or metallized paper sheet, so that the second paper sheet provides the outer surface of the container which may be readily printed while the first sheet provides a moisture resistant interior for the container.

14. The container of claim 3, wherein the at least one additional wall member forms a liner that is positioned within the laminate and configured to form an inner tube to provide additional strength to and reinforcement of the container and for contacting a product that is placed in the container, with the first sealed joint associated with one end of both the laminate and inner tubes to assist in forming a bottom portion of the container.

15. The container of claim 14, wherein the first sheet provides the outer surface of the container and comprises an oriented polymer film while the second sheet comprises paper, and further comprising visual information comprising one or more ink images provided between the polymer film and paper sheet, wherein the one or more ink images are resistant to deterioration when in contact with moisture so that the visual information may be viewed through the polymer film and the polymer film protects the visual information and paper from damage during handling of the container, and the liner is paper and is spot-adhered to the laminate to hold the liner material in a desired orientation with regard to the laminate.

16. The container of claim 6, wherein the first sheet of the laminate comprises an oriented polymer film that has a surface that is energized to have increased dynes and an affinity for adhesives, and wherein the film is laminated to the paper sheet by a water-based adhesive that contacts the treated surface of the film and has its water absorbed by the paper sheet to effect lamination thereof.

17. The container of claim 16, wherein the laminate further comprises an additional oriented polymer film that has a surface that is energized to have increased dynes and an affinity for adhesives, wherein the additional film is laminated to the paper sheet by a water-based adhesive that contacts the treated surface of the additional film and has its water absorbed by the paper sheet to effect lamination thereof and provide an inner surface of the laminate that provides moisture resistance inside the container.

18. The container of claim 17, wherein the polymer film of the outer surface, the inner surface, or both, is polypropylene, polyethylene, or polyester.

19. The container of claim 18, wherein the film of the outer protective layer, the inner protective layer, or each layer, is biaxially oriented.

20. The container of claim 1, wherein the first and second sealed joints are made by a hot melt adhesive.

21. The container of claim 1, which further comprises a hot melt adhesive positioned on an open end of the laminate tube to facilitate formation and sealing of a top portion of the container after a product is filled therein.

22. In a method of making a multi-wall flexible container that includes at least two wall members, the improvement which comprises forming an outer wall member of the container of a laminate of first and second sheets, with the first sheet made of a material that is different from that of the second sheet and the laminate configured to form a tube with one of the sheets providing an outer surface of the bag, wherein one of the first or second sheets comprises paper while the other comprises a sheet material that is capable of bonding to paper and that has increased strength or moisture resistance compared to paper.

23. A method of forming a multi-wall flexible container for containing a product therein, which comprises:

providing a laminate comprising a first sheet that will form an outer wall member of the bag, the first sheet being laminated to a second sheet of a material that is different from that of the first sheet;

folding the laminate to a tubular shape;

providing a first sealed joint on one end of the laminate and one additional wall member that assists in forming a bottom portion of the bag;

providing a second sealed joint between side portions of the laminate for forming a side seam of the bag, with the first and second joints each being provided by applying and melting a hot melt adhesive that bonds the laminate ends or portions sheets together to form the joint; and

arranging and configuring the sealed joints to enable the laminate to define an interior space that is capable of receiving a product therein;

wherein one of the first or second sheets comprises paper while the other comprises a sheet material that is capable of bonding to paper and that has increased strength or moisture resistance compared to paper.

24. The method of claim 23 which further comprises providing at least one additional wall member comprising a third sheet material, wherein folding the laminate and at least one additional wall member are folded to a tubular shape, and the sealed joints are arranged and configured to enable the laminate and at least one additional wall member to define an interior space that is capable of receiving a product therein.

25. The method of claim 23 which further comprises placing a product, item, or article in the container, providing a strip of hot melt adhesive positioned on the laminate tube to facilitate formation and sealing of a top portion of the container, and sealing the top portion of the container after the product, item or article is placed therein to form a sealed container.

26. A multi-wall flexible container produced by the method of claim 23.

27. A sealed and filled multi-wall flexible container produced by the method of claim 25.

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