MULTI-LAYER FILM AND RECLOSABLE FILM PACKAGE

Abstract: A multi-layer film and a film package made from the film are described herein that provide rescaling capabilities by utilizing a tacky layer within the multi-layer film. The multi-layer film can include an outer film portion including the embedded tacky layer and an inner film portion. An opening feature formed in the multi-layer film includes a flap configured to be manipulated by a user to create an opening through the multi-layer film. The inner film portion can include a release layer configured specifically to interact with the tacky layer to provide a desired separation peel force and rescaling functionalities. The outer film portion can include an outer film layer disposed on an opposite side of the tacky layer from the release layer that is configured to permanently adhere to the tacky layer.

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MULTI-LAYER FILM AND RECLOSABLE FILM PACKAGE

CROSS-REFERENCE TO RELATED APPLICATION


FIELD

[0002] A multi-layer film, as well as a package made from such a multi-layer film, is described herein, and more particularly, a multi-layer film having a reclosable opening feature.

BACKGROUND

[0003] Reclosable film packages can include a dual layer laminate with inner and outer die cuts that define a reclosable flap and a reseal margin. In such packages, two layers are typically joined together using multiple adhesives or deadening agents during a printing, coating, or laminating step, or a pressure sensitive label is applied to a package. Subsequently these adhesives or labels are cut into a predesigned shape or fashion to facilitate creation of a reseal flap in the packaging. The use of multiple adhesives, deadening agents, or labels, as well as a step for lamination or label application, leads to specific requirements and constraints which can add cost and complexity to the manufacturing process.

[0004] Another type of package includes a layer of pressure sensitive adhesive and utilizes traditional heat seals to provide a package reclose feature. As such, a consumer can pull the heat seal apart, which can fracture the film forming the package to expose the pressure sensitive adhesive in the area of the heat seal. The consumer can then press the film back together to reclose the package. The initial fracturing of the film during opening, however, can require a large amount of force, which can be difficult for a consumer to apply and control.

SUMMARY

[0005] A multi-layer film for forming a package and a film package formed from the multi-layer film are described herein that have resealing materials on a different plane or layer of the film than between the webs making up the film. With this configuration, only one type of
adhesive need be utilized between the webs of film rather than the dual patterns of a package using both permanent and resealing adhesive in the same layer between the webs of film. This advantageously can avoid the added costs and complexity associated therewith. Moreover, this approach avoids the use of separate reclosure labels.

[0006] A multi-layer film suitable as described herein includes: an outer film portion including an embedded tacky layer, and an inner film portion. At least a portion of the film can be formed via a single step, multi-layer coextrusion, which avoids the costs and extra steps of a lamination process. Additionally, the embedded tacky layer can be different from typical pressure sensitive adhesives. An opening feature formed in the multi-layer film includes a flap configured to be manipulated by a user to create an opening through the multi-layer film. The flap includes an upper portion at least partially defined by an outer cut extending at least partially through the outer film portion and a lower portion defined by an inner cut extending at least partially through the inner film portion. These cuts allow a consumer to easily open the package with less force as compared to fracturing a heat seal in prior packages.

[0007] In one form, the outer web of film includes a top film layer, the tacky layer, and a bottom film layer; the inner film portion is an inner web of film; and a permanent adhesive layer is disposed between and adheres the outer and inner webs of film together. For example, the tacky layer can be a tacky core encapsulated between the top film layer and the bottom film layer. In this form, the outer cut can extend through the top film layer into the middle tacky layer and the inner cut can extend through the inner web of film, the permanent adhesive layer, and at least portions of the bottom film layer.

[0008] The outer cut can include a tab portion, shoulder portions, and side portions extending longitudinally from ends of the shoulder portions. The permanent adhesive layer can then include an opening therein aligned with at least a portion of the tab portion of the outer cut so that the tab portion can be easily grasped by a consumer. Moreover, the outer web of film can be transparent or translucent and the permanent adhesive of the permanent adhesive layer can include ink visible through the outer web of film. The inner cut can include a forward edge, a rearward edge, and side edges extending therebetween to define the laminate opening.

[0009] The opening feature can further provide controlled easy opening and resealing via a combination of cuts extending partially through the laminate and application of permanent adhesive in the permanent adhesive layer.
By one approach, the inner cut further includes notches that extend rearwardly and outwardly from the forward edge thereof that are aligned with the tab portion of the outer cut. So configured, the notches direct an uncontrolled tear to the side edges of the inner cut so that the remaining tear propagates as desired.

By another approach, the opening feature can include a front cut extending through at least one of the inner web of film, the permanent adhesive layer, and the bottom film layer. The front cut can be disposed forwardly of the forward edge and aligned between the shoulder portions of the outer cut. As such, the permanent adhesive layer can include an opening therein aligned with a forward portion of the tab portion so that a permanent adhesive of the permanent adhesive layer surrounds the front cut.

By yet another approach, the opening feature can further include a middle tab cut extending through the bottom film layer aligned with the tab portion of the outer cut. The middle tab cut can further be spaced from the forward edge of the inner cut. Additionally, the forward edge of the inner cut in the bottom film layer can include a break aligned rearwardly of the tab portion of the outer cut. Next, the permanent adhesive layer can include an opening therein aligned with the tab portion of the outer cut and extending rearwardly to be spaced from the forward edge of the inner cut.

In another form, the package is formed from a coextruded film having an outer film portion, which can include one or more layers, an inner film portion, which can include one or more layers, and a tacky layer encapsulated or disposed therebetween. An opening feature formed in this multi-layer film includes a flap with an upper portion at least partially defined by an outer cut extending at least partially through the outer film layer and a lower portion at least partially defined by an inner cut extending at least partially through the inner film layer. The inner film portion can include a release layer configured specifically to interact with the tacky layer to provide a desired separation peel force and resealing functionalities. Moreover, the outer film portion can include an outer film layer disposed on an opposite side of the tacky layer from the release layer that is configured to permanently adhere to the tacky layer to ensure separation between the tacky and release layer during film opening.

Additionally, a package formed with the multi-layer film including any of the above is also described herein. The package can be formed using any suitable method to surround an interior of the package, which can optionally contain a food product, such as cookies or biscuits,
which can optionally be in a tray to support the food products therein for access through the opening provided by the opening feature described above. Other suitable applications for the packages described herein can include personal care, pharmaceutical, agriculture, and electronic industry packages.

[0015] A single-step coextruded multilayer film is also described having two adjacent layers that can be peeled apart with a predetermined peel strength, both upon initial peeling and after opening and reclosing. The separation of these two adjacent layers for package reclose is advantageously not limited to heat sealed areas and can instead extend to any desired portion of the film. This allows an opening feature to have any desired design, pattern, or shape as directed by cut or scored lines. As described herein, the two adjacent layers can be a tacky layer of a thermoplastic material, an elastomer material, or blends thereof and an adjacent release layer of a polyamide material or blends thereof. The tacky layer and release layer advantageously have an affinity for one another such that separating the layers requires a peel force as can be provided by a typical consumer, but that also provides reclose and resealing. The coextruded multilayer film can further include a third layer disposed on an opposite side of the tacky layer such that the release layer and the third layer sandwich the tacky layer therebetween. The third layer can be permanently attached to the tacky layer such that the tacky layer separates from the release layer and remains attached to the third layer upon peeling by a consumer.

[0016] A flexible package is described that is created using a multilayer coextruded film structure having an encapsulated tacky layer, such as of a extrudable thermoplastic and/or elastomers, and a release layer adjacent to the encapsulated tacky layer. An opening feature in the film structure includes offset inner and outer score lines that form a flap configured to be pulled back by a user. The inner score line defines an opening to an interior of the package exposed when the flap is pulled back. The offset between the inner and outer score lines defines a sealing margin where the encapsulated tacky layer is configured to separate from the release layer along the sealing margin when the flap is pulled back.

[0017] By one approach, a multilayer flexible coextruded film is provided that contains a peelable and resealable tacky encapsulated thermoplastic and/or elastomeric layer and is capable of being oriented in a tenter frame process. By another approach, a multilayer flexible coextruded film having the embedded or encapsulated tacky layer can be produced by any suitable film converting method, including, for example, cast film, blown film (typical blown,
double bubble, triple bubble, water quenching), machine direction orientation, biaxial orientation, extrusion coating. As such, the multilayer film can be used independently for food packaging applications or can be adhesive laminated for final food packaging applications. In one form, the multilayer film can be adhesive laminate to reverse printed biaxially oriented polypropylene or polyethylene terephthalate, including, for example, metalized, polyvinylidene chloride coated, aluminum oxide coated, silicon oxide coated.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0018] FIGURE 1A is a top perspective view of a film package having an opening feature including a flap adapted to be pulled back;

[0019] FIGURE 1B is a top perspective view of an alternative film package having two opening features both including flaps adapted to be pulled back;

[0020] FIGURE 1C is a top perspective view of an alternative film package having two opening features both including flaps adapted to be pulled back;

[0021] FIGURE 1D is a perspective view of an alternative upstanding film package configured having an opening feature on a front wall portion thereof;

[0022] FIGURE 2 is a top perspective view of the film package of FIGURE 1A showing the flap of the opening feature pulled back to reveal a tray and food products within a package interior;

[0023] FIGURE 2A is a top perspective view of an alternative film package having an opening feature including a flap adapted to be pulled back extending past an end seal of the package, showing the flap pulled back to reveal a tray and food products within a package interior;

[0024] FIGURE 3 is a perspective sectional view of a segment of a first embodiment of the top of package of FIGURE 1A showing the flap of the opening feature in an open configuration;

[0025] FIGURE 3A is a perspective sectional view of a first embodiment of a segment of film having an opening feature with a flap extending to a heat seal and a tab of the opening feature extending past the end seal showing the flap of the opening feature in an open configuration;
FIGURE 4 is a cross-sectional view of the segment of the top of the package of FIGURE 3 taken along the line 3-3 showing inner and outer cuts of the opening feature in a closed configuration;

FIGURE 5 is a cross-sectional view of the segment of the top of the package of FIG. 3 showing the inner and outer cuts separated in an open configuration;

FIGURE 6 is an top plan cut-out view of an upper web of film having three layers, a permanent adhesive, and a lower web of film showing details of an example opening feature;

FIGURE 7 is an top plan cut-out view of an upper web of film having three layers, a permanent adhesive, and a lower web of film showing details of a second example opening feature;

FIGURE 8 is an top plan cut-out view of an upper web of film having three layers, a permanent adhesive, and a lower web of film showing details of a third example opening feature;

FIGURE 9 is an top plan cut-out view of an upper web of film having three layers, a permanent adhesive, and a lower web of film showing details of a fourth example opening feature

FIGURE 10 is a perspective sectional view of a segment of a second embodiment of the top of the package of FIGURE 1A showing the flap of the opening feature in an open configuration;

FIGURE 10A is a perspective sectional view of a second embodiment of a segment of film having an opening feature with a flap extending to a heat seal and a tab of the opening feature extending past the end seal showing the flap of the opening feature in an open configuration;

FIGURE 11 is a cross-sectional view of the segment of the top of the package of FIGURE 10 taken along the line 11-11 showing inner and outer cuts of the opening feature in a closed configuration;

FIGURE 12 is a cross-sectional view of the segment of the top of the package of FIGURE 10 taken along the line 12-12 showing inner and outer cuts separated in an open configuration;

FIGURE 13 is a cross-sectional view of several example coextruded and coextruded and laminated film structures

FIGURE 14 is a cross-sectional view of an alternative film;
FIGURE 15 is a cross-sectional view of the alternative film of FIGURE 14 showing
an opening feature in the film in an open configuration;

FIGURE 16 is a perspective view of a flexible film package having an opening
feature;

FIGURE 17 is a perspective view of the flexible film package of FIGURE 16 showing
the opening feature in a partially open configuration;

FIGURE 18 is a perspective view of the flexible film package of FIGURE 16 in a
continuous flow-wrap configuration after formation of end seals;

FIGURE 19 is a perspective view of a package having a film sealed to a base;

FIGURE 20 is a perspective view of the package of FIGURE 19 showing the film
partially peeled back to provide an opening to the base;

FIGURE 21 is a top plan view of the package of FIGURE 19;

FIGURE 22 is a side cross-sectional view showing the film structure and base of the
package of FIGURE 19 as the film is peeled back to open the package;

FIGURE 23 is a perspective view of another package having a film sealed to a base;

FIGURE 24 is a perspective view of the package of FIGURE 23 showing the film
partially peeled back to provide an opening to the base;

FIGURE 25 is a top plan view of an alternative configuration of the package of
FIGURE 23 showing a pull tab of the film in a corner thereof; and

FIGURE 26 is a perspective view of an alternative configuration of the package of
FIGURE 23 showing an opening feature in the film with a pull tab extending past a heat seal of
the film to the base.

DETAILED DESCRIPTION

A film package is described herein that utilizes a film having a tacky or bonding layer
or core, which can include a material having a sticky or slightly sticky feel, disposed between
film layers and a select release layer. As used herein, the tacky or bonding layer has selective
room temperature tack to the adjacent release layer meaning the tacky or bonding layer exhibits a
selective tack or bond to the adjacent release layer and permitting a repeated room temperature
peel and reseal of the tacky or bonding layer to the selected release layer as discussed more
herein. As also used herein, the tacky or bonding layer is a layer sandwiched or interposed
between two other layers and that adheres to bond of the other layer. The release layer is a layer
adjacent the tacking or bonding layer which can be delaminated from the bonding layer, but retains sufficient adhesive bonding characteristics such that it will reseal to the bonding layer when the bonding layer and release layer re-contact each other. Via various opening features, such as those described herein, the tacky layer is configured to delaminate from one or both of the adjacent film layers to maintain its tackiness to provide resealing capabilities for opening and closing film packages. The tacky layer can be continuous throughout the film and preferably covers 100% of the film layer, thereby removing the need for resealable adhesive to be deposited, coated, or laminated in a specific pattern. Additionally, with such a construction, the film provides a reclosure mechanism without the need for a separate adhesive label or a pressure sensitive adhesive.

[0051] A package is also provided of a coextruded multi-layer film wherein two coextruded layers of the multi-layer film are separated by a coextruded center layer. The multi-layer film includes a peelable and resealable flap therein such that the multi-layer film can be peeled apart between the two coextruded layers with the coextruded center layer sticking to one or both of the two coextruded layers and resealed by reapplying the flap so that the coextruded center layer holds the two coextruded layers together. By one approach, the peeling apart and resealing can be done at least 10 times. By a further approach, the peeling apart and resealing can be done at least 20 times. In various forms, the coextruded center layer can be a extrudable thermoplastic and/or elastomers, such as the tacky layer materials described herein, and one of the two coextruded layers can be a polyamide material. In one approach or embodiment, the package contains a coextruded portion, wherein layers of the portion can be delaminated without damaging the layers. The portion contains score lines such that when the portion is separated along the score lines, an opening to the package is provided permitting access to the contents, the delaminated layers have sufficient residual adhesion to each other so that when the separated portions are returned to their original position, the package is resealed. In another approach, all layers of the film, laminate, or package herein may be coextensive. Layers of the film, laminate or package may be coextruded in a single operation or may co-extruded in separate extrusions and then laminated or assembled together.

[0052] The tacky layer can be can be encapsulated or embedded between adjacent film layers such that the tacky layer is coextensive with the adjacent film layers and exposed during the first opening of the package to thereby reseal the package. In one exemplary form, the tacky layer is
a polybutene-based resin. Of course, other tacky resins or natural cling materials, such as a copolymer of polypropylene and polyethylene plastomers and elastomers, or blends thereof, can also be utilized. In some approaches, the tacky layer may be blends of polybutene resins and olefinic elastomers and the release layer may be polyamide-based resins. As such, the tacky layer can stick or cling to the adjacent film layers so that the package can be easily and repeatedly resealed and reopened. More particularly, to open the package, the web of film can internally separate between the tacky layer and release layer utilizing cuts or other lines of weakness, such as scribed lines, perforated lines, or the like, exposing the tacky layer in desired areas for resealing. Additionally, alternative precision cut configurations are described herein that ensure hermetic sealing of the package, but also provide easy opening and desired tear propagation.

[0053] The films and packages described herein can further include a release layer next to the tacky layer in the coextruded multilayer structure. The release layer advantageously has enough affinity to the tacky layer to be coextruded as one single multilayer film, but the affinity is weak enough to be pulled apart or easily separated from the tacky layer at desired locations without undue peel strength, e.g., typical forces exerted by human hands opening a package in conjunction with a pull tab designed for the package. This delicate balance of desired affinity between the release layer and the tacky layer while still providing satisfactory separation force as described herein involves a polar polymer resin, such as a polyamide or a blend of polyamide, or other polar polymers including, but not limiting to, polystyrene, polyester, poly methyl methacrylate, polycarbonate, polycaprolactone, polyactic acid, polyhydroxy alkanoate and their copolymers or blends.

[0054] The films and packages described herein can also include an outer layer on an opposite side of the tacky layer from the release layer, such that the outer layer and the release layer have the tacky layer disposed therebetween. The outer layer can be permanently adhered to the tacky layer, such that the outer layer and tacky layer cannot be separated without damaging the film structure. As such, separation of the film is directed to a separation between the release layer and the tacky layer as desired.

[0055] The tacky layer and inner release layer disclosed herein can, in one form, be separated by a precut pull tab or portion, such that the tacky layer and release layer can be opened and resealed for more than 10 times, and, in another form, more than 20 times.

[0056] In a first form, the multi-layer film can be a laminated film. In this form, the tacky
layer provides resealing capabilities on a different plane or layer of a multi-layer film laminate than between the webs of film that are laminated together. During lamination, a permanent adhesive can be utilized to join two or more webs of film together to form the multi-layer film and one of the webs of film in the laminate can include the tacky layer. In a second form, the multi-layer film can be a coextruded film, which can advantageously be produced using a single-step coextrusion process. Coextrusion creates a multi-layer film with the built-in tacky layer embedded therein in one step rather than the multi-step process of creating laminates, which includes coating adhesive on the webs of film. A coextruded multi-layer film can be utilized to form a package by itself, or can be laminated to one or more additional webs or layers of film, both of which are described herein.

[0057] A package formed from such a multi-layer film can include lines of weakness that extend through portions of the film to create an opening feature therein. By one approach, the opening feature may be a flap or other grasping feature in the film or package. The lines of weakness can extend through a top of the film, through a bottom of the film, or combinations thereof and can be configured to direct tears and/or break portions of the film during opening to thereby delaminate the tacky layer during opening. In the form using a laminate, lines of weakness can also extend through the permanent adhesive layer. By one approach, the lines of weakness can utilize the permanent adhesive during opening, such that initial opening of the package requires breaking or delaminating a portion of the permanent adhesive to thereby provide a tactile indication of initial opening, or provide a tamper indicator feature, and/or start delamination of the tacky layer. Additionally, the permanent adhesive layer can have a deadened or patterned portion so that a gripping portion can be easily grasped by a consumer.

[0058] A film package 10 constructed from a multi-layer film 12 having these properties is shown in FIGS. 1A, 1B, 1C, and 1D. The film package 10 can be constructed using a standard flow pack process that includes creating forward and rearward transverse end seals 14, 16 and a longitudinal fin seal (not shown) extending therebetween and on an opposite side of the package as compared to the opening feature. In the illustrated form, the package 10 is generally box-shaped with a top wall portion 22, side wall portions 23, and a bottom wall portion 18. An optional tray 25 or the contents of the package 10 themselves can provide internal structure to the package 10, as desired. An opening feature 20 is disposed in the top wall portion 22 of the package 10 that allows a consumer to open and repeatedly reseal the package 10 during
sequential use. Of course, as shown in FIG. 1B and 1C, the package 10 can include two, or more, opening features 20, disposed as desired around the top, sides, or bottom of the package 10, or bridging therebetween, including extending transversely as shown in FIG. 1B or longitudinally as shown in FIG. 1C. Additionally, as shown in FIG. 1D, the package 10 can be configured to rest on one of the ends thereof in an upright orientation. As such, rather than a top wall portion 22, the opening feature 20 is disposed in a front wall portion.

[0059] The opening feature 20 includes a flap 24 of the top wall 22 that can be separated and partially pulled away from a remaining portion 26 of the top wall 22 to reveal an opening 28 into an interior 30 of the package 10. The flap 24 can include a gripping tab 32 that projects away from a main portion 34 of the flap towards the forward end seal 14. The tab 32 is configured to provide a consumer a convenient gripping surface for opening the package 10. As shown, the tab 32 includes a forward curved portion 33 and generally parallel longitudinal sides 35. Further, as shown in FIG. 1C, the opening feature 20 can extend from the top wall portion 22 to the end seal 14 with the tab 32 projecting past the end seal 14. In this configuration, a user would grip the tab 32 and pull the flap 24 generally away from the top wall 22, breaking through the end seal 14 and opening the package as described above. Additional, embodiments of opening features extending past an end seal are shown in FIGS. 3A and 10A.

[0060] In the illustrated form, the package is generally box-shaped with a generally rectangular cross-section. Of course other package shapes can also be utilized, such as other polygonal shapes, such as triangular, rectangular, square, pentagonal, etc., curved shapes, such as round, oval, etc., curvilinear shapes, such as track shaped, etc., or combinations thereof. Additionally, the shape of the package can be generally defined by the tray 25 and/or the contents disposed therein.

[0061] In one form, the film 12 can be a laminate 13. A cross-section of an example laminate 13 is shown in FIGS. 2-4. As shown, the laminate 12 includes outer and inner webs of film 36, 38 joined together with a permanent adhesive layer 40 disposed therebetween. The outer web 36 has a multi-layer construction that includes a tacky or bonding layer or core 44 for resealing purposes, which can be created by a suitable film extrusion process as described. This film producing process can be blown film (single double or triple bubble process), cast film, mono-axially stretched film, or biaxially stretched film (either simultaneous or sequentially stretched) and the final material may also be metalized, coated or otherwise treated to impart additional
functionality. In the illustrated form, the outer web 36 includes a top film layer 42, the tacky layer 44, and a bottom film layer 46. Of course, additional layers can also be utilized as desired or required for a particular application. The inner web 38 can be biaxially oriented polypropylene, polyethylene terephthalate, polyethylene, polylactic acid, polyhydroxy alkanoate, and blends of these polymers, metalized or coated variants of such films or indeed any other extruded multilayer or monolayer films. To create the laminate 12, the inner web 38 can be printed and adhesive laminated to the outer web 36 in a standard lamination process or other suitable process. Each layer of the film or the combined layers may have a thickness of at least 5µm, 10µm, 15µm, 20µm, 25µm, 30µm, 50µm or 100µm. Each layer of the film or the combined layers may have a thickness of no more than 750µm, 500µm, 400µm, 300µm or 250µm. A preferred range of thickness of the combined layers is 10µm-250µm or 20µm-200µm.

[0062] As shown, the tacky layer 44 is encapsulated or embedded between the top and bottom film layers 42, 46. As such, the tacky layer can bond to the top and bottom film layers 42, 46 so that the package 10 can be easily and repeatedly resealed and reopened. To this end, the tacky layer 44 has a stronger bond to the top film layer 42 than to the bottom layer 46. The outer and inner webs of film 36, 38 are shown with 3 layers and 1 layer respectively, but it will be understood that any of the layers can itself be a laminate with a multi-layer construction. More specifically, the multi-layer film with the embedded tacky layer can be laminated through adhesive, extrusion, or tandem lamination or extrusion coated other films to form a complex film. Additionally, although the cut is shown as perpendicular in the figures, angled tears or fractures through the tacky resin also result in a viable reseal. Moreover, the package can be resealed whether the tacky resin is entirely disposed on the flap 24, entirely on the bottom film layer 46, or portions on both such as when opening the package 10 fractures through the tacky resin 44 itself.

[0063] Described generally and shown in FIGS. 2-4, the opening feature 20 utilizes the tacky layer 44 for package reclose. Pulling the flap 24 generally away from the top wall 22 breaks or separates cuts in the outer web 36 and inner web 38 to expose the opening 28, as well as a reseal margin 47 of the middle tacky layer 44 and a reseal margin 49 of the bottom film layer 46. The reseal margins 47, 49 are created by cuts in the upper web top film layer 42 and middle tacky layer 44 being dimensionally larger than cuts in the inner web 38, permanent adhesive layer 40, and bottom film layer 46, as described in greater detail below. By non-limiting example, the
reseal margins 47, 49 can be between about 5 mm and about 40 mm wide, and more specifically between about 10 mm and about 15 mm, and more specifically between about 12 and about 13 mm wide to provide satisfactory resealing during use. Of course, other measurements and sizes can also be utilized for particular applications as needed or desired. For example, a relatively small package can utilize an approximately 5 mm reseal margin, while a larger package can utilize an approximately 10-15 mm reseal margin. So configured, a consumer is provided the convenience of a resealable package without the need for multiple adhesives being disposed in patterns on the same plane or layer within the laminate.

The opening feature 20 is defined by cuts or other lines of weakness formed by dies, lasers, or the like. In the illustrated embodiments, an outer cut 48 extends through the top film layer 42 and the middle tacky layer 44 to create a top portion of the flap 24. The outer cut 48 includes a top tab portion 50, outwardly extending shoulder portions 52, and opposite side portions 54 that run longitudinally down the package top wall 22 toward the rearward end seal 16. If desired, distal ends 55 of the side portions 54 can have tear stopping features, such as hooks or the like. In other embodiments, such as that shown in FIGS. 1C and 3A, the flap 24 can extend to the end seal 14 and the tab 32 can extend therepast.

Other embodiments do not require an outer cut such as those shown. For example, a tab portion 50 can be cut into the top film layer 42 and pulling on the tab can interact with cuts made in interior and/or bottom layers, such as those described below. With this configuration, the top film layer 42 tears during opening. In one form, this tearing can be controlled by utilizing a film with tear-directing properties.

Various embodiments for cuts made in the bottom film layer 46, the permanent adhesive layer 40, and the inner web 38 are shown in FIGS. 6-9. In a first form, the inner web 38 includes an inner cut 56 having a forward edge 58, a rearward edge 60, and side edges 62 that define the opening 28 into the package 10 and creating a bottom portion of the flap 24. In this form, the inner cut 56 has a rectangular shape with slightly rounded corners that help with controlled propagation during opening. Of course, other shapes can also be utilized, whether depending on the shape of the package, for specific package contents, or other desired aesthetic. For example, the bottom cut can include curvilinear portions creating rounded ends and/or sides, a waisted portion, or the like.

The permanent adhesive layer 40 includes an adhesive cut 64 that is substantially
identical to the inner cut 56. Permanent layer 40 forms a bond between layers 46 and 38 that does not separate upon pulling and package opening. Although shown as a separate layer for illustrated purposes, it will be understood that the adhesive layer 40 is applied to one or both of the webs of film 36, 38. In the illustrated form, the adhesive cut 64 includes the forward, rearward, and side edges 58, 60, 62. In one approach, the bottom and adhesive cuts 56, 64 are made simultaneously into the laminate 12 with any suitable method, such as with a laser or die. As shown, the permanent adhesive layer 40 can be applied in a pattern leaving an open portion 66 aligned with some or the entire tab 32 which leaves the tab unadhered for easy gripping by a consumer. Alternatively, a registered adhesive kill can be applied in the open portion 66.

[0068] The bottom film layer 46 includes a middle cut 68 that is largely identical to the bottom and adhesive cuts 56, 64. As used herein, the bottom film layer 46 may also be referred to as a release layer. More specifically, the rearward and side edges 60, 62 are identical, while the forward edge 58 has a different configuration in an area aligned with the tab 32. In this first form, the middle cut 68 includes a middle tab portion 70 that extends away from the forward edge 58 to align with the top tab portion 50, albeit with longer sides 72 than the top tab portion 50 that extend to connect to the smaller-dimensioned middle cut 68. So configured, when a consumer grips the tab portion 32 and pulls outwardly and rearwardly, the customer must pull to overcome the portion of permanent adhesive adhering the bottom film layer 46 to the between the open tab portion 66 and the forward edge 58. After that portion of permanent adhesive breaks, the consumer can then continue to pull the flap 24 backward thereby continuing to breaks the outer and inner cuts 48, 56 to reveal the opening 28. Bottom film layer 46 may be a polyamide. In some approaches, the layer 46 may be about 0.5 to about 50 microns thick, and preferably about 0.5 to about 30 microns thick, and more preferably about 0.5 to about 20 microns thick.

[0069] By one approach, the bottom film layer or release layer 46 directly contacts the tacky or bonding layer 44 as shown in FIGS. 5 and 6. The bottom film layer or release layer 46 includes a select polymer or blend including at least one of a polyamide polymer and blend thereof of the following structures:

$$-\text{fNH-(CH}_2\text{)}_m\text{-NH-CO-(CH}_2\text{)}_n\text{-CO}_\gamma$$


\[
^\text{NH-(CH}_2\text{)}_m\text{-NH-CO-(CH}_2\text{)}_n\text{-CC¾NH-(CH}_2\text{)_m-(\text{IH-CO-(CH}_2\text{)}_n<0†--}
\]

wherein, in the first structure, \(m\) and \(n\) are independently (can either be the same or different numbers) an integer from 4 to 64; in the second structure, \(m = 6\) and \(n\) is either 6 or 36, depending on if they are in a hard or soft region of the polymers, and/or includes an aromatic polyamide including one or more of the following structures

\[
\begin{align*}
\text{HO} & \quad \text{CO} & \quad \text{H or R} \\
\text{CO} & \quad \text{HN-(CH}_2\text{)_m-NH-CO-} & \quad \text{H or R} \\
\text{H} & \quad \text{HN-CH}_2 & \quad \text{CH}_2\text{-NH-CO-(CH}_2\text{)_m-CO} & \quad \text{OH}
\end{align*}
\]

wherein \(m\) is an integer from 4 to 64 and \(R\) is an alkyl group on the aromatic ring. By one approach, the release layer 46 may be a thermoplastic polyamide elastomer, which are high-performance thermoplastic elastomer block copolymer, based on polyamide and polyethers, polyesters, or polyolefins. They may contain alternating hard and soft segments joined by amide linkage functional bonds. In the formulas above \(x\) and \(y\) are preferably each greater than 1000, and in other approaches greater than 2000.

[0070] The tacky layer 44 may be a layer formed out of polybutene-1-based resins and, in some approaches, may be a layer formed out of olefinic specialty elastomers, and in further approaches, blends of polybutene-1 resins and olefinic elastomers. Although these resins may not be recognized for their tacky properties, we have discovered that the surface energy of these resins and/or blends display tacky behavior that can adhere to release layers as described herein with minimal pressure, such as the weight of the separated film, finger, or hand pressure, depending the tacky layer formulation. The design and formulation of both the tacky layer and the design and formulation of the release layer can be optimized as described herein to ensure reliable and satisfactory performance during opening, reseal, and reopening. Moreover, the resins and blends discussed herein have European and U.S. Food and Drug Administration compliance for use in direct food contact applications.
The polybutene-1 resin maybe a high molecular weight resin with a density of about 0.9g/cm³ and melt flow index (MFI) of 3.0 g/10min at 190°C, 2.16kg. In some approaches, the layer 44 may be about 5 to about 50 microns thick and preferably about 5 to about 30 microns thick, and more preferably about 5 to about 20 microns thick. In some approaches, the polybutene-1 resin can be high molecular weight isotactic, semi-crystalline thermoplastic polyolefins produced through the polymerization of butene-1 and ethylene, and/or propylene comonomers.

The tacky or bonding layer 44 may also be blends of polybutene-1-based resins and other olefinic specialty elastomer resins. Preferred blends include about 5 to about 95% of the polybutene-1 resins and about 95% to about 5% of the olefin resins. In some approaches, preferred ratios of the polybutene-1 to olefinic elastomer may be about 5% to about 20% polybutene-1 to about 95% to about 80% olefinic elastomers. Samples of the olefinic specialty elastomers may be Vistamaxx by ExxonMobil, Versify by Dow Chemical, Catalloy by LyondelBasell. In some approaches, the tacky or bonding layer may have a melt flow index from about 1 to about 3.5 g/10mins at 190°C/2.16kg, and in other approaches, about 1.4 to about 3 g/10mins at 190°C/2.16 kg. In another approach, the tacky or bonding layer including a at least one of polybutylene, polyethylene, and polypropylene, and blends and copolymers thereof;

By one approach, the tacky layer 44 can include propylene-based copolymers, either alone or blended with other resins. These copolymers can be produced using metallocene catalyst technology. The propylene-based copolymer includes semicrystalline copolymers of propylene and ethylene. The copolymers can have high propylene levels, for example greater than 80 wt%, with isotactic stereochemistry. The copolymers can further have uniform inter- and intramolecular composition and crystallinity distribution. The crystallinity can be modulated with ethylene to produce a very soft end product with an elasticity unlike other polyolefin polymers, blends, or alloys. For example, about 5 to about 25% crystallinity has a large amorphous fraction. Different grades of these copolymers can be created by varying the amount of polyethylene copolymers. Various grades, including 7010FL, 6102FL, 3980FL, 3020FL, were all found to provide suitable peel strength and resealing, albeit at varying levels.
While the above laminate described with respect to FIG. 6 can provide satisfactory results, alternative laminates shown in FIGS. 7-9 omit the added length of the sides 72 of the middle tab portion 68 so that there are no cuts that align through the entire thickness of the laminate 12. This ensures that a hermetic seal is maintained throughout storage, transportation, and display of the film package 10. As such, each form includes alternative structural detail in order to provide easy opening and desired propagation of the tear when opening the package 10 given the omitted side portions 74.

In a second form, shown in FIG. 7, in addition to the omitted portions 74 of the sides of the middle tab portion 70, the open portion 66 of the permanent adhesive layer 40 is larger and extends an additional distance toward the forward edge 58 of the adhesive cut 64 leaving a relatively small strip of permanent adhesive 76 disposed next to the forward edge 58. The width of the strip is reduced to encourage a tear during opening that will skip or bypass this area and propagate correctly along the forward, side and rearward edges, 58, 62, 60 exposing the reseal margins 47, 49. In one non-limiting example, the width of the strip can be between about 5 mm and about 40 mm wide, and more specifically between about 10 mm and about 15 mm, and more specifically between about 12 and about 13 mm wide to provide satisfactory resealing during use. Of course, it will be understood that particular applications, contents, and package sizes may require other sizes. Accordingly, the strip width can be optimized for each specific application.

Additionally, the forward edge 58 in the bottom film layer 46 is broken in an intermediate portion thereof, which as illustrated is aligned with the tab portion 70. Without the sides 72 of the middle tab portion 68, a tear created by a consumer while opening may propagate uncontrollably creating an undesirable opening. In order to avoid this, the opening feature 20 as
described in this second form breaks the forward edge 58 in the bottom film layer to avoid the tear undesirably propagating inwardly rather than outwardly towards the side portions 62. Moreover, the portion of permanent adhesive between the open tab portion 66 and the forward edge 58 is minimized while ensuring an initial hermetic seal which minimizes the force that a consumer has to apply during opening, which provides the consumer with more control over the tear after breaking this portion of permanent adhesive.

[0077] In a third form, shown in FIG. 8, in addition to the omitted portions 74 of the sides 70, the middle forward edge 58 is unbroken so that it is substantially identical to the bottom and adhesive cuts 56, 64. Moreover, each of the bottom, adhesive, and middle cuts 56, 64, 68 include notches or small cuts 78 that project inwardly from the forward edge 58 thereof. More specifically, the notches 78 extend at an angle with respect to the forward edge 58 and are directed towards their respective side edges 62. As shown, the notches 78 are generally longitudinally aligned with the sides 35 of the tab 32. So configured, if during opening, the tear does not propagate outwardly along the forward edge 58 correctly, the notches 78 direct the tear outwardly to intersect with the side edges 62 so that the remaining portion of the tear propagates correctly. Although the notches 78 are shown on the bottom film layer 46, the permanent adhesive layer 40, and the inner web 38, individual ones or combinations of two of each can alternatively be used.

[0078] In a fourth form, shown in FIG. 9, the middle tab portion 70 is entirely omitted. Instead, each of the bottom film layer 46, the permanent adhesive layer 40, and the inner web 38 includes a front cut 80 that is spaced forwardly of the forward edge 58 and runs generally parallel thereto. In the illustrated form, the front cut 80 is generally aligned between the shoulder portions 52 of the outer cut 48, and preferably is sized to extend substantially the entire length therebetween. Additionally, the open portion 66 of the permanent adhesive layer 40 is smaller so that the permanent adhesive surrounds the front cut 80. This maintains the hermetic seal of the film package 10 and creates a hard stop during opening against which a consumer must pull. The front cut 80 creates a break point that exposes the middle tacky layer 44 and therefore the reseal margins 47, 49 during opening and directs an opening tear to the inner cut 56. Although the front cut 80 is shown on the bottom film layer 46, the permanent adhesive layer 40, and the inner web 38, individual ones or combinations of two of each can alternatively be used. So configured, a consumer can grip the tab portion 32 and pull outwardly and rearwardly to open
the package 10. The consumer must first break the permanent adhesive disposed forwardly of the front cut 80 while opening. After breaking this portion of permanent adhesive, the front cut 80 provides a break point so that the opening then tears along the bottom film layer 46 to expose the tacky layer 44. This tear continues rewardingly to intersect with the forward edge 58 continue to propagate therealong as desired.

[0079] In a further approach, the outer web 36 can be transparent or translucent and the permanent adhesive layer 40 can include ink or other printing/indicia thereon. As such, a consumer would see through the outer web 36 to the permanent adhesive layer 40. This would clearly identify the gripping tab 32 due to the open portion 66 of the permanent adhesive layer 40. Moreover, the inner web 38 can be opaque in order to prevent light from entering the package interior 30. Alternatively, the printing can be done on the outer web 36 in surface or by reverse printing.

[0080] Additionally, the opening feature 20 as described herein provides tamper evident features due to the permanent adhesive breaking during initial opening of the flap as well as the alignment of the flap 24 during reseal. Further, the transparent or translucent approach discussed above can clearly display to a consumer when a package has been previously opened due to damage to the permanent adhesive during opening.

[0081] In another form, the film 12 can be a coextruded film. As shown in FIGS. 1A, IB, 1C, and 10-13, the package 10 of this form utilizes a coextruded film 82. As discussed above, a single step coextrusion produces a film with at least an outer film layer 84 and an inner film layer 86 with the tacky layer 44 encapsulated or disposed therebetween. As such, the tacky layer can stick or cling to the outer and/or inner film layers 84, 86 so that the package 10 can be easily and repeatedly resealed and reopened. By one approach, the outer film layer 84 is permanently adhered or attached to the tacky layer 44 and the inner film layer 86 is a release layer configured to provide separation from and reseal to the tacky layer 44. The film layers can be produced in any of the ways described above. Example coextruded film cross-sections are shown in FIGS. 11-13. In another embodiment, such as that shown in FIG. 10A, the flap 24 can extend to the end seal 14 and the tab 32 can extend therepast.

[0082] "Traditional" pressure sensitive adhesives are usually based on acrylics, bio-based acrylate, butyl rubber, natural rubber, silicone rubber with special tackifiers, styrene block copolymers (SBC), styrene-butadiene-styrene (SBS), styrene-ethylene/butylene-styrene (SEBS),
styrene-ethylene/propylene (SEP), styrene-isoprene-styrene (SIS), vinyl ethers, ethylene-vinyl acetate (EVA) with high vinyl acetate content, and nitriles. These traditional pressure-sensitive adhesives can be manufactured with either a liquid carrier or in 100% solid form. Articles such as tapes and labels are made from liquid pressure sensitive adhesives (PSAs) by coating the adhesive on a support material and evaporating the organic solvent or water carrier, usually in a hot air dryer. The dry adhesive may be further heated to initiate a cross-linking reaction and increase molecular weight. 100% solid pressure sensitive adhesive may be low viscosity polymers that are coated and then reacted with radiation to increase molecular weight and form the adhesive (radiation cured pressure sensitive adhesive); or they may be high-viscosity materials that are heated to reduce viscosity enough to allow coating, and then cooled to their final form (hot melt pressure sensitive adhesive (HMPSA)). In some cases, the traditional pressure sensitive adhesive has odor due to lower molecular weight components or uncured components, i.e., unreacted monomers remaining in cured products.

[0083] The benefits of a coextruded film as described herein include no odor in the resulting film, as compared to "traditional" pressure sensitive adhesives as described above. The benefits of a using polybutene and olefinic specialty elastomers and their blends as coextruded film layers as described herein include no odor in the resulting film because these are polyolefins that do not need to cure and do not need time for setting.

[0084] The benefits of a coextruded film as described herein further include a single step converting process, a contact sensitive reclose where the weight of the flap of the opening feature effectively recloses the opening feature without the need for additional pressure. Repeated reclose is realized at least in part by the engineering design of the chemistry of the tacky layer and the adjacent release layer, which has an affinity for one another, but less attraction to contamination. Moreover, the tacky layer as described herein is less tacky than "traditional" pressure sensitive adhesives and, as such, is less prone to contamination than traditional pressure sensitive adhesives to thereby provide more opening and reclosing cycles than traditional pressure sensitive adhesives. Additionally, the tacky layer as described herein provides a better compliance with the U.S. Food and Drug Administration and the European Food Safety Authority for use in direct food contact applications.

[0085] Moreover, as illustrated in FIG. IB, a film package 10 made from a coextruded film includes a coextensive encapsulated tacky or bonding layer and, as such, opening features as
described herein can be disposed anywhere on the package including on the top, sides, and bottom of the package, and extending therebetween. Although two opening features 20 are shown in FIG. 1B, the package could be adapted to specific uses, including for portion control, multiple serving, multi-compartment packages, specialty uses, and/or to create distinctive packaging to create consumer goodwill.

[0086] The coextruded film with the tacky layer as described herein can be challenging to make. For example, it is challenging to engineer the release layer to have the right polarity with regard to the tacky layer to achieve the desired balance between affinity between the release layer and the tacky layer and subsequent peel force. In addition, due to the single step process, printing is done on the outer surface of the film and, as such, may require additional protection over traditional laminated films that can have clear outer layers laminated after printing or a clear coating over the outer layer after printing. Moreover, an opening feature like those described herein is formed by cutting on both sides of a single coextruded web, rather than on separate films that can be laminated together at a later step.

[0087] An opening feature 20 is shown in FIGS. 1 and 10-13. As with the previous form, the opening feature 20 is at least partially defined by cuts or other lines of weakness formed by dies, lasers, or the like. Additionally, although the lines of weakness are shown as perpendicular in the figures, angled tears or fractures through the tacky resin also result in a viable reseal. Moreover, the package 10 can be resealed whether the tacky resin is entirely disposed on the outer film layer 84, entirely on the inner film layer 86, or portions on both such as when opening the package 10 fractures through the tacky resin 44 itself. The opening feature 20 includes the flap 24 of the top wall 22 that can be separated and partially pulled away from the remaining portion 26 of the top wall 22 to reveal the opening 28 into the interior 30 of the package 10. The flap 24 can include the gripping tab 32 that projects away from the main portion 34 of the flap towards the forward end seal 14. The tab 32 is configured to provide a consumer a convenient gripping surface for opening the package 10. As shown, the tab 32 includes the forward curved portion 33 and the generally parallel longitudinal sides 35.

[0088] Unlike the earlier form, the tab 32 of this form is adhered to the tacky layer 44. As such, a consumer can peel the tab 32 to delaminate the tacky layer 44 from the outer and/or inner film layers 84, 86. Accordingly, after peeling the tab 32 away from the top wall 22, the consumer can continue to pull the flap 24 away from the top wall to open the package 10.
Pulling the flap 24 generally away from the top wall 22 breaks or separates cuts in the outer film layer 84 and the inner film layer 86 to expose the opening 28, as well as the reseal margin 47 of the middle tacky layer 44 and the reseal margin 49 of the inner film layer 86. Alternatively, the tab 32 can extend past the end seal 14, such as in the embodiment shown in FIG. 10A, and the consumer can grip and pull the tab 32 so that the film breaks at the end seal 14 to break or separate cuts in the outer film layer and the inner film layer 86 to expose the opening 28, as well as the reseal margin 47. The reseal margins 47, 49 are created by lines of weakness in the outer film layer 84 being dimensionally larger than cuts in the inner film layer 86, as described in greater detail below. By non-limiting example, the reseal margins 47, 49 can be between about 5 mm and about 40 mm wide, and more specifically between about 10 mm and about 15 mm, and more specifically between about 12 and about 13 mm wide to provide satisfactory resealing during use. Of course, other measurements and sizes can also be utilized for particular applications as needed or desired. For example, a relatively small package can utilize an approximately 5 mm reseal margin, while a larger package can utilize an approximately 10-15 mm reseal margin. So configured, a consumer is provided the convenience of a resealable package without the need for multiple adhesives being disposed in patterns on the same plane or layer within the laminate.

The opening feature 20 of this form includes an outer cut 88 that extends at least partially through the outer film layer 84 and an inner cut 90 that extends at least partially through the inner film layer 86. In another form shown in FIGS. 11 and 12, the inner cut 90 can also extend through a tie layer 178 and a polyethylene layer 180 disposed adjacent to the inner film layer 86. In yet another form shown in FIGS. 14 and 15, the film includes the outer film layer 84, the tacky layer 44, the inner film or release layer 86, the sealant layer 162, and optional cold seal areas 164. Moreover, portions or all of the outer and/or inner cuts 88, 90 can extend into or through the tacky layer 44. The outer cut 88 includes a top tab portion 91, outwardly extending shoulder portions 92, and opposite side portions 93 that run longitudinally down the package top wall 22 toward the rearward end seal 16. If desired, distal ends 94 of the side portions 93 can have tear stopping features, such as hooks or the like. The inner cut 90 can include a forward edge 95, a rearward edge 96, and side edges 97 that define the opening 28 into the package 10 and creating a bottom portion of the flap 24. In this form, the inner cut 90 has a rectangular shape with slightly rounded corners that help with controlled propagation during opening. Of
course, other shapes can also be utilized, whether depending on the shape of the package, for specific package contents, or other desired aesthetic. For example, the bottom cut can include curvilinear portions creating rounded ends and/or sides, a waisted portion, or the like.

[0090] Other embodiments do not require an outer cut such as those shown. For example, the tab portion 91 can be cut into the outer film layer 84 and pulling on the tab can interact with cuts made in the inner film layer 86. With this configuration, the outer film layer 84 tears during opening. In one form, this tearing can be controlled by utilizing a film with tear-directing properties.

[0091] The films as described herein can be formed into a package, such as a food package, via heat seals utilizing a sealant layer or via cold seals utilizing a pattern coated cold seal.

[0092] Two issues can arise when creating an opening feature in a coextruded film with an intermediate tacky layer, such as those described above. One issue is that the opening force required to initially separate the layers of film to delaminate the film layer from the tacky layer and expose the tacky layer for subsequent reclose may be too strong such that controlled opening may not occur. For example, if the opening force is too strong, the film may not open along designated cuts or scribed lines and instead tear uncontrollably. Likewise, if the opening force is too weak, the package may be opened unintentionally or may not provide a satisfactory seal. Another issue that can occur is that, once exposed, the tacky layer and adjacent film layer may not readhere together sufficiently to reclose the package after opening.

[0093] Accordingly, the object of the present disclosure is to provide a coextruded film for packaging that includes an embedded or encapsulated tacky layer of thermoplastic and/or elastomeric material with an adjacent release layer that can be utilized to produce an opening feature with smooth and consistent peel strength during opening and during multiple reclose operations. To achieve this, the tacky layer delaminates or separates from an adjacent "release" film layer between die cuts. In one form, the tacky layer is a contact sensitive adhesive such that simply bringing the tacky layer and adjacent film layer into contact with one another is sufficient to reseal the opening feature. In another form, the coextruded film described herein is capable of being oriented in a tenter frame process. Moreover, the coextruded film described herein can be produced using most common film processing equipment and converting methods including, but not limited to, multilayer blown film processes (typical blown, or double bubble or triple bubble), multilayer cast film, machine direction orientation (MDO), biaxial orientation, extrusion...
coating, and the like. Optionally, the coextruded films described herein with encapsulated, coextensive tacky layers can be combined with typical biaxially-oriented polyethylene terephthalate (BOPET), biaxially-oriented polypropylene (BOPP), blown film, or cast film, with or without ink, with or without metallization or high barrier coating through lamination to form a further film. In addition, the coextruded films described herein can be metalized or treated with higher barrier coating for final application.

While not wishing to limited by theory, it is believed that the polarities of the material of the tacky layer and the adjacent release layer affect both the initial bond between the layers, and therefore the required opening force, and subsequent resealing adherence or tackiness. Additionally, it is believed that polarity is a larger factor than crystallinity in this regard. The tacky layer materials described herein are non-polar. Suitable materials for the tacky layer 44 include a polybutene resin, olefinic elastomers, and blends thereof. The following examples are included to illustrate the disclosure herein and not to limit it. Unless noted otherwise, all parts, percentages, and ratios in the disclosure and examples are by weight.

Table 1 below includes the known or estimated polar component of surface free energy (shown in mJ/m² (equivalent to dynes/cm)). Materials having similar, i.e., a difference of about 1-5, in these polar component values will exhibit satisfactory peeling and resealing.

<table>
<thead>
<tr>
<th>Material</th>
<th>( \gamma_s^p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>paraffin</td>
<td>0</td>
</tr>
<tr>
<td>Polyethylene</td>
<td>1.4</td>
</tr>
<tr>
<td>vistamaxx</td>
<td>2.1 estimated value</td>
</tr>
<tr>
<td>PP</td>
<td>2.4</td>
</tr>
<tr>
<td>PB-1</td>
<td>2.6 estimated value</td>
</tr>
<tr>
<td>EMA</td>
<td>3.2</td>
</tr>
<tr>
<td>nylon 636</td>
<td>4.4 estimated value</td>
</tr>
<tr>
<td>nylon 6,12</td>
<td>4.7</td>
</tr>
<tr>
<td>nylon 12</td>
<td>5.2</td>
</tr>
<tr>
<td>EPDM</td>
<td>5.8</td>
</tr>
<tr>
<td>PET</td>
<td>7.2</td>
</tr>
<tr>
<td>nylon 6</td>
<td>9.6</td>
</tr>
<tr>
<td>nylon 6,6</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Example coextruded film structures are shown in FIG. 13. In each example, a polypropylene material can be an outer film layer 84 and a polyamide material can be the release
layer. Moreover, in each example, the tacky layer 44 can be a polybutene-1 resin, a copolymer of polypropylene and polyethylene plastomers and elastomers, or blends thereof.

[0097] Additional example layers are shown in the various cross-sections of FIGS. 13A-13F. As shown, each film cross-section includes the tacky or bonding layer 44 with one or more layers above and below the tacky layer 44. Beginning with FIG. 13A, an outer film portion 150 can include a top film layer 152, an ink and/or lamination layer 154, and an outer layer 156. An inner film portion 158 can include a release layer 160, a barrier sealant or inner layer 162, and optional cold seal areas 164. As shown in FIG. 13B, in another form, the outer film portion 150 can include a protective coating layer 166, an ink layer 168, an optional metallization layer 170, and the outer layer 156. In this form, the inner film portion 158 can include the release layer 160, the barrier sealant or inner layer 162, and the optional cold seal areas 164. As shown in FIG. 13C, in another form, the outer film portion 150 can include the top film layer 152, the ink layer 168, the optional metallization layer 170, and the release layer 160. In this form, the inner film portion 158 can include the barrier sealant or inner layer 162 and the optional cold seal areas 164. As shown in FIG. 13D, in another form, the outer film portion 150 can include the protective coating layer 166, the ink layer 168, the optional metallization layer 170, the outer layer 156, and the release layer 160. In this form, the inner film portion 158 can include the barrier sealant or inner layer 162 and the optional cold seal areas 164. As shown in FIG. 13E, in another form, the outer film portion 150 can include the protective coating layer 166, the ink layer 168, and the optional metallization layer 170. In this form, the inner film portion 158 can include the release layer 160, the barrier sealant or support layer 162, and the optional cold seal areas 164. As shown in FIG. 13F, in another form, the outer film portion 150 can include the protective coating layer 166, the ink layer 168, the optional metallization layer 170, and the release layer 160. In this form, the inner film portion 158 can include the barrier sealant or inner layer 162 and the optional cold seal areas 164.

[0098] Another embodiment of a package is 200 shown in FIGS. 16-18. In this form, a continuous strip of film or closure layer 202 extends from a first end seal 204 to a second end seal 206. The package 200 can further include a fin or longitudinal seal 208 extending between the first and second end seals 204, 206. The package 200 includes an opening cut or score 210 in a top 212 thereof and a tab cut or score 214 in or adjacent to the first end seal 204. The closure layer 202 is applied to the film to cover both the opening cut or score 210 and the tab cut or score
As such, a consumer can grip a tab 216 of the closure layer 202, which includes a portion of the film of the package by virtue of the tab cut or score 214, and pull the closure layer 202 away from the top 212 and rearwardly along the package 200 to expose the opening cut or score 210. The closure layer 202 can adhere to a portion 218 of the top 212 to expose an opening 220 to the package interior. The films 222, 224 of the package 200 and closure layer 202 can take any of the forms described herein, except that the top 212 of the package is the release layer described herein and that the bottom layer of the closure layer 202 is the tacky or bonding layer described herein. As such, the closure layer 202 can be applied to the package top 212 and release easily therefrom.

As shown, the closure layer 202 extends only partially over the width of the flexible film that forms the film package 200. It is also contemplated, however, that the closure layer 202 may extend the entire width of the package but only be partially disposed over the length of the film. More particularly, the closure layer 202 preferably does not extend both the entire width and the entire length of the package. The closure layer 202 is partially disposed in either direction (i.e., the length or width) and continuously disposed in the other of the directions. In one approach, the closure layer 202 is continuously applied along one axis of the film and is only partially applied along the axis normal to the continuously applied axis. Thus, the flexible film packages 200 may have a closure 202 that runs the entire length of the package and over only a portion of the width or a closure 202 that runs the entire width of the package and over only a portion of the length of the package.

Advantageously, packages 200 configured as discussed above with respect to FIGS. 16 and 17 can be produced using a continuous flow wrap process. As noted, the closure layer 202 can be applied continuously along the longitudinal length of the flow or web of the package film 222. Once products are at least partially enveloped and sealed within the web of film 222, the film 222 and closure film 224 may be cut into individual packages 200. FIG. 18 illustrates a series of formed packages that have not been separated from one another. As shown, the tabs 216 may be formed, in part, by the arcuate tab score or cut 214 formed, in part, on a roll of film, and disposed at least partially at leading end seal 204. When the individual packages 200 are cut from the film 222, 224, a leading edge or profile of the tab 216 may be formed. For example, the leading seal on a first package has a profile matching a trailing seal on a second package. Thus, the tab 216 may have a front edge that is arcuate and defined, in part, by the leading edge of the
package and may have a rear, trailing edge that is arcuate and defined, in part, by the arcuate score line 214.

[00101] As discussed herein, the method of manufacturing and assembling the packages can employ heat seal mechanisms, cold seal mechanisms, extension and adhesive lamination mechanisms, and co-extrusion mechanisms. The equipment employed may depend on the desired package configuration. For example, if a tab includes a cut-out portion of film adhered to the closure layer, the tab may be created by adhering or applying the closure layer to the film and scoring and/or cutting the tab. In addition, various score configurations may be employed, and the equipment for forming the score line may depend on the score configuration thereof.

[00102] A film 300, having any of the configurations described herein, can also be utilized in a package 302 having a rigid or semi-rigid base 304. The base 304 can include a bottom wall portion 306, a sidewall portion 308 upstanding from the bottom wall portion 306, and a flange 310 projecting outwardly from a top of the sidewall portion 308. As shown, the film 300 is sealed to the base 304 along the flange 310 thereof creating a heat seal region 312 of the film 300 corresponding to the flange 310. For simplicity, the film 300 is shown in FIG. 22 as including three layers, the outer film portion 150, the tacky or bonding layer 44, and the inner film portion 158. It will be understood, however, that the outer and inner film portions 150, 158 can take any form as described herein.

[00103] To provide an opening feature, the film 300 can include a die cut or score 314 extending completely or partially around the flange 310 inwardly adjacent thereto. Additionally, the film 300 can include a tab 316 to provide a consumer with an easy gripping portion. So configured, a user can grip the tab 316 and pull the film 300 generally away from the base 304. The film 300 breaks at the heat seal region 312 such that the inner film portion 158 remains sealed to the flange 310 and the tacky or bonding layer 44 is exposed. Thereafter, opening reaches the die cut or score 314 and the inner film portion 158 inwardly of the die cut or score 314 remains adhered to the tacky or bonding layer 44. Accordingly, the tacky or bonding layer 44 is only exposed in the region coinciding to the flange 310 and can be repeatedly reapplied and removed therefrom as desired.

[00104] The package 302 can take any desired form. In the form of FIGS. 19-22, the base 304 includes a circular bottom wall portion 306 and an annular sidewall portion 308. In the form of FIGS. 23-25, the base is generally box-shaped with a rectangular bottom wall portion 306 with
four sidewall portions 308. With a configuration having multiple sidewall portions 308, the tab 316 can be configured to project along an edge, as shown in FIG. 23, or a corner, as shown in FIG. 25, thereof.

[00105] In another form, the film 300 can include an opening feature 20, as described herein. For example, the package 302 can include an opening feature such as that shown in FIG. 1A with the opening feature spaced inwardly from the flange 310 and the heat seal region 312 of the film 300. Alternatively, as shown in FIG. 26, the film 300 can include an opening feature 20 such as that shown in FIG. 1C with the flap 24 extending to the heat sealed region 312 and the tab 316 extending past the heat sealed region 312.

[00106] A rolling ball tack test was also performed on samples of the bonding or tacky material, which was a modified version of ASTM D3121 and followed the test method parameters of ASTM D3121, unless otherwise specified. Tack is generally determined by the rolling ball method, where a steel ball is released from the top of an incline, allowed to accelerate down the incline and roll across the horizontal surface of the pressure-sensitive adhesive. The relative tack is determined by measuring the distance the ball travels across the adhesive before stopping. Relative degree of tack is compared among formulation variations according to the distance the ball travels from the end of the ramp. The longer the distance, the less tacky the surface. So, the shorter the travel distance, the higher the tack. In this modified version, a glass ball was used instead of a steel ball and the release point on the incline was shortened due to the low tack nature of our surfaces. The modified test measured how strong the surface of the coating adhered to non-like materials, such as the polar surface of a rolling glass ball. In the modified rolling back tack test herein, the smallest steel ball (5/32 inch) was used and the release point was 2.25 to 2.5 inches up the ramp. Make sure the tester is well leveled before testing. Also make sure the testing table is leveled as well for film to stay flat. Use tapes at both ends to secure the flatness of the film before testing. The bonding or tacky layer herein is preferably about 4 to about 100 mm of rolling ball tack.

[00107] The rolling ball method included: releasing a glass ball or steel ball which was placed two inches to 2.5 inches up the standard incline specified in the ASTM method and allowing the ball to accelerate down the incline and roll across a horizontal surface of the pressure sensitive adhesive sample. The modified test version included using a glass ball instead of a metal ball, the glass ball having a diameter of about ½ inch, and using a shortened release point off of the
inclined (i.e., as indicated above, two inches up the incline). As used herein, a steel ball 5/32 inch was used placed approximately 2.25 to 2.5 inches up the ramp (preferably 2.25 inches). The relative tack was determined by measuring the distance the ball traveled across the adhesive before stopping, beginning from the end of the ramp. A longer rolling ball travel distance indicated lower tack to the polar surface of the glass ball, and indicated that the coating has a lower tendency to stick to rollers and metal surfaces on packaging machines, compared to coatings with a shorter rolling ball travel distance which indicated a higher tack level. A longer rolling ball travel distance may also correlate to a lower tendency to adhere to food crumbs. In this measurement, the measurement was limited to a maximum of 4 inches because the maximum sample size available for testing was 4.0 inches > 4.0 inches. Results from the rolling ball tack test are shown in the Table below.

The surface energy of a substrate was measured by contact angle. The equipment used for this test included a G 10 contact angle measuring goniometer, diiodomethane, double distilled water, two syringes, a timer, and a micrometer. The procedure of the test is as follows:

1. Place the substrate on the sample stage and draw a vacuum to flatten the surface. Turn on a light behind the stage, using the knurled knob on the back of the apparatus, to illuminate the stage. Remove the lens cap directly in front of the stage.
2. Apply a 1-2 mm max. diameter sessile drop of either DI water or diiodomethane via the syringe to the surface. Do this by squeezing a small drop from the syringe, then raising the stage until close enough for the drop to transfer to the surface, while not touching the needle itself to the surface. Use a micrometer to gauge drop size. Then lower the stage until the drop is visible through the eyepiece.
3. Position the cross hairs on the contact point of the liquid drop and the surface being measure. Move the stage using (e) and (f) to line up the origin of the cross hairs with the right end of the drop, at the contact pint (i.e., the point at which the bottom of the drop meets the drop reflection. Focus the drop using (a), or more preferably, (h).
4. Rotate the cross hair to the position of the tangent point to the drop surface from the contact point of the drop and the surface, using (d).
5. From the angular scale, record the tangent angle in degrees (0 to 180). Note the time it takes from placing the drop to recording the angle because surface energy is a time-dependent phenomenon. With practice, repeat measurements can be comfortably made in 1.5
minutes.

[00114] (6) Repeat five times to obtain five values keeping the same time interval as in (5).

[00115] (7) Change to the other liquid and repeat steps (2) through (6).

[00116] (8) Average the values obtained and calculate the surface energy of the substrate using the Fowkes Equation to calculate the polar and dispersive surface energies, as well as overall surface energy.

[00117] The surface energy was also measured using another test. The surface energy of a substrate is an indication of how easily the substrate wets out with an adhesive or coating. In polyolefins, it measures the degree of treatment and suitability for use with a given adhesive or coating. The equipment needed for this test includes cotton swabs and commercial treatment check solutions (such as AccuDyne test marker pens from Diversified Enterprises or equivalents). The procedure of the test is as follows:

[00118] (1) Choose a treatment check solution either from an educated guess of what the surface energy will be or start with a 38 dyne/cm² solution.

[00119] (2) Dip a clean cotton swab (never use a swab twice, not even in the same solution) in the solution and squeeze out excess solution on the side of the bottle below the rim.

[00120] (3) Wipe the side edge of the swab on the surface to be check to cover approximately one square inch (not necessarily a one inch square) and immediately start timing or counting by thousands to approximate seconds.

[00121] (4a) If the solution breaks up in less than two seconds, the surface energy is less than the dyne number on the bottle used. Discard the swab, choose a lower numbered dyne/cm² solution bottle, a clean swab, and a fresh area on the surface of the substrate, and repeat steps (2) and (3).

[00122] (4b) If the solution has not broken up in three seconds, the surface energy is higher than the dyne/cm² solution bottle, a clean swab, and a fresh area on the surface of the substrate, and repeat steps (2) and (3).

[00123] (4c) If the solution breaks up between two and three seconds, record the dyne/cm² number of the solution used as the surface energy of the substrate.

[00124] Table 2: Rolling Ball and Surface Energy Measurement Results

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Polybutene-1</th>
<th>Olefinic Elastomer</th>
<th>Additive</th>
<th>Inner Layer</th>
<th>Rolling Ball on bonding</th>
<th>Dynes Pen on bonding</th>
</tr>
</thead>
</table>

Page 30 of 50
<table>
<thead>
<tr>
<th></th>
<th>(%)</th>
<th>(%)</th>
<th>(%)</th>
<th>(Formula)</th>
<th>(mm)</th>
<th>(Dynes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Comparative)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>PP/PET</td>
<td>2.38</td>
<td>36</td>
</tr>
<tr>
<td>2 (Comparative)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>PP/PET</td>
<td>3.46</td>
<td>36</td>
</tr>
<tr>
<td>3 (Inventive)</td>
<td>75</td>
<td>25</td>
<td>-</td>
<td>PA</td>
<td>4.46</td>
<td>32</td>
</tr>
<tr>
<td>4 (Inventive)</td>
<td>50</td>
<td>50</td>
<td>-</td>
<td>PA</td>
<td>5.13</td>
<td>32</td>
</tr>
<tr>
<td>5 (Inventive)</td>
<td>25</td>
<td>75</td>
<td>-</td>
<td>PA</td>
<td>5.65</td>
<td>&lt;32</td>
</tr>
<tr>
<td>6 (Inventive)</td>
<td>0</td>
<td>100</td>
<td>-</td>
<td>PA</td>
<td>7.28</td>
<td></td>
</tr>
<tr>
<td>7 (Comparative)</td>
<td>10</td>
<td>85</td>
<td>5% A/B</td>
<td>PA + 10% OCMB + 10% CaC03 MB</td>
<td>&gt;17</td>
<td>&lt;32</td>
</tr>
</tbody>
</table>

* A/B = Antiflack Master Batch

[00125] The rolling ball tests following the methods described in paragraph 107 above as shown in Table 2 above. Comparative sample 1 is commercially available shipping tape under the trade name Tarten. Comparative sample 2 is a commercially available Oreo cookie package. The rolling ball tack tests show that the tacky or bonding layer by blending PB with olefinic elastomer blends has much lower energy than the surface energy of the adhesive used on a commercially available package of OREO cookies. The steel ball stuck to the OREO packaging adhesive or the sipping tape PSA very quickly when in contact with the surface, indicating a higher tacky surface. Where for PB blends with Olefinic elastomers, the ball traveled too far if release from the very top of the ramp. When lower the ball’s release point to much lower position, (2.25 inch ramp distance from the release point to the top of the table), the distance traveled by the ball became measurable. Still, when measured at the same release height, the ball traveled much further on the surface of the blend of PB with Olefinic elastomer than on the surface of the Oreo PSA or shipping tape. As to samples V30, which has no reclose-ability, the ball traveled across a much longer distance on the surface (it was recorded as >17 mm) While for PA side of the release layer, the ball can travel all the way across the film surface and then continue off the surface. (>12 inch). On the other side, the surface energy recorded by the Dynes pen also showed lower surface energy of the bonding layers that were formed by blending PB with olefinic elastomers. Also, the PA
surface (release layer) has much higher surface energy. Such as the PA636 from Nycoa 2012 is 50 dynes and blend of PA2012 with PA666 is 54 dynes.

**EXAMPLES**

[00126] The Examples herein are included to illustrate the disclosure herein and not to limit it. Unless otherwise noted, all percentages, ratios, and parts used throughout this disclosure are by weight.

[00127] Example 1:

[00128] Exemplary outer films 36 were prepared with different blends for the tacky layer 44. Although, polybutene-1 (PB-1) and olefinic elastomers alone can provide peel and reseal at certain peel strengths, and PB-1 generally provide higher strength than the olefinic elastomer, it was determined that a blend of polybutene-1 and olefinic elastomers can help tailor the properties to produce a more desirable peel force than the materials alone. In addition, a bonding surface made from PB provides a zippery experience and blending with an olefinic elastomer usually helps to smooth the peel open experience. In order to determine an ideal blend, example blends of materials for the tacky layer 44 were tested for their peel force properties, which are shown in the examples of Table 2 below. The tested polybutene-1 is manufactured by LyondellBasell with a grade name of Toppyl RC3000. The tested olefinic specialty elastomer is manufactured by ExxonMobil with a trade name of Vistamaxx 6102FL. As shown, olefinic resins were blended with a polybutene-1 resin in the ratios identified in the second column. The outer layer 156 of polypropylene, the inner layer 162 of polyamide manufactured by Nycoa, with the grade name Nycoa 2012, and the thicknesses of each layer were kept constant for all tests. Polybutene-1 (PB-1) resins are high molecular weight isotactic, semi-crystalline thermoplastic polyolefins produced through the polymerization of butane-1 and ethylene, and/or propylene comonomers. A typical structure for polybutene-1 is as follows:

![Structure of Polybutene-1](image)

[00129] As shown in Table 3, a blend of 75% olefinic resin and 25% polybutene-1 resin had
initial peel force of 5.38 lbf/in and a reopen peel force of 1.05 lbf/in after reclose. A blend of 50% olefinic resin and 50% polybutene-1 resin had an initial peel force of 5.58 lbf/in and a reopen peel force of 1.63 lbf/in. A blend of 25% olefinic resin and 75% polybutene-1 resin had, an initial peel force of 6.38 lbf/in, and a reopen peel force of 1.71 lbf/in. A blend of 90% olefinic resin and 10% polybutene-1 resin had an initial peel force of 4.5 lbf/in, and a reopen peel force of 1.22 lbf/in. Accordingly, the tested blends provided a range of 4.5-6.38 lbf/in for an initial peel force, and a range of 1.05 - 1.71 lbf/in for a reopen peel force. Based on these results, it was determined that about a 75% to about 90% olefinic resin and about a 25% to about 10% polybutene-1 resin blend produced the most desirable initial and reopen peel force, and, in one specific example, about 90% olefinic resin and about 10% polybutene-1 resin. The initial peel force was also defined by many factors and they can be tailored to be much lower than current initial peel force. Another observation was that the initial delamination force varied depending on the samples prepared, such that the data reported in Table 3 can be different when the samples are prepared at a different film width, in a package format instead of a 1 inch wide film strip, etc.

**Table 3: Peel force for initial delamination and peel strength after reclose**

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Outer Layer</th>
<th>PB-1</th>
<th>Olefinic Elastomer</th>
<th>Inner Layer</th>
<th>Total Thickness</th>
<th>Initial open Force to trigger delamination</th>
<th>Reclose peel strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>75</td>
<td>25</td>
<td>Nycoa 2012</td>
<td>65</td>
<td>5.38</td>
<td>1.05</td>
</tr>
<tr>
<td>4 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>50</td>
<td>50</td>
<td>Nycoa 2012</td>
<td>65</td>
<td>5.58</td>
<td>1.63</td>
</tr>
<tr>
<td>5 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>25</td>
<td>75</td>
<td>Nycoa 2012</td>
<td>65</td>
<td>6.38</td>
<td>1.71</td>
</tr>
<tr>
<td>7 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>10</td>
<td>90</td>
<td>Nycoa 2012</td>
<td>65</td>
<td>4.5</td>
<td>1.22</td>
</tr>
</tbody>
</table>

**Example 2:** Another variable that can be optimized is the tacky layer 44 thickness. It was determined that varying the thickness of the tacky layer produced different resulting peel forces and peel operations. As shown in Table 3 below, thicknesses varying between 10 um and 30 um were tested for a polybutene-1 resin layer and for an olefinic resin layer. The tested polybutene-
1 is manufactured by LyondellBasell with a grade name of Toppyl RC3000. The tested olefinic specialty elastomer is manufactured by ExxonMobil with a trade name of Vistamaxx 6102FL.

The polybutene-1 resin layers provided the following values: a 30 um thickness produced an initial peel force of 6.25 lbf/in and a reopen peel force of 1.2 lbf/in; a 25 um thickness produced an initial peel force of 7.06 lbf/in, and a reopen peel force of 1.28 lbf/in; a 20 um thickness produced, an initial peel force of 5.32 lbf/in, and a reopen peel force of 1.33 lbf/in; a 15 um thickness produced an initial peel force of 4.35 lbf/in, and a reopen peel force of 1.16 lbf/in; and a 10 um thickness produced an initial peel force of 6.02 lbf/in, and a reopen peel force of 1.26 lbf/in. The olefinic resin layers provided the following values: a 30 um thickness produced an initial peel force of 2.34 lbf/in and a reopen peel force of 0.32 lbf/in; a 25 um thickness produced, an initial peel force of 3.63 lbf/in, and a reopen peel force of 0.39 lbf/in; a 20 um thickness produced, an initial peel force of 4.10 lbf/in, and a reopen peel force of 0.48 lbf/in; a 15 um thickness produced an initial peel force of 4.50 lbf/in and a reopen peel force of 0.28 lbf/in with a tape backing and 0.8425 lbf/in without a tape backing; and a 10 um thickness produced an initial peel force of 5.39 lbf/in and a reopen peel force of 0.661bf/in. An opening feature that includes a polybutene-1 tacky layer 44 and a polyamide layer 46 or 86 produced a "zippering" opening functionality. More specifically, as the layers are pulled away from one another, the layers sequentially released in small portions along the length of the opening feature. An opening feature that includes an olefinic tacky layer 44 and a polyamide layer 46 or 86 produced a silent smooth opening, albeit with a relatively smaller opening force. Finally, a blend of polybutene-1 and olefinic specialty thermoplastic elastomer (such as about 75% to about 95% olefinic resin and about 5% to about 25% polybutene-1 resin) produced an improved opening feature with smooth sequential opening and a satisfactory opening force, and this peel force is more reliable and repeatable.

Table 4: Peel force from different tacky layer thicknesses

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Tacky Layer thickness (um)</th>
<th>Initial open Force to trigger delamination (lbf/in)</th>
<th>Reclose peel strength (lbf/in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (Inventive)</td>
<td>30</td>
<td>6.25</td>
<td>1.2</td>
</tr>
</tbody>
</table>
In a first example, a coextruded film 82 was tested where the inner film layer 86 was also non-polar and was one of: low-density polyethylene (LDPE), high-density polyethylene (HDPE), leaner low density polyethylene (LLDPE), or their blends. Examples of LDPE resins tested were NOV APOL LF-0222-F by Nova Chemicals. Examples of HDPE tested were Marflex 9656 by Chevron Philips. Examples of LLDPE tested were Dowlex 2045G from Dow Chemical.

The tacky layer was either 100% Polybutene-1, or 100% Vistamaxx or their blend at different ratio. It was found that the bond strength between the tacky layers with the polyethylene based inner layer bonds together so strongly that the force required for separation is too strong and the layers cannot be satisfactorily separated. It was found that only in a sealed area, where the film is sealed together or to another structure, the film and tacky layers delaminate from one another, exposing the tacky layer, and allowing resealing capabilities. The force for delamination, however, is undesirably strong, could not be 100% delaminated even at the heat seal area, and the delamination was not clean or smooth, so that the configuration does not provide satisfactory separation and reseal beyond the heat-sealed area.
In a second example, the tacky layer was tested adjacent to a blend of polylactic acid and polyhydroxyalkanoates. It was found that the coextruded multilayer film can be easily separated between the tacky layer and the polylactic acid and Polyhydroxyalkanoates blend, but that there was no reseal ability or reclosability of the tacky layer to the polylactic acid and Polyhydroxyalkanoates blend.

Accordingly, it has been determined that a material having a polarity intermediate of polyethylene and polyester would provide a relatively easy package opening and satisfactory package reclose. By one approach, a polyamide material for the release layer as described herein provides a polarity that is sufficiently different from the tacky layer for the creation of a satisfactory package opening feature while still providing suitable package reclose. Example polyamide materials that can be used in such an opening feature include various types of Nylon, such as PA6, PA666, PA66, PA69, PA610, PA612, PA636, PA6I6T, PA11, PA12, PAMXD6, and blends thereof.

As with the tacky layer material, the release layer as described herein can be a blend of materials to provide more consistent and smoother opening operation. Accordingly, example blends were for the release layer were tested for their peel force properties, which are shown in Table 3 below. As shown, PA636 (Nycoa 2012) was blended with organoclay additives (from PolyOne master batch, a proprietary formulation containing about 60% organoclay, under trade name of MB231-615) and PA6I6T (manufactured by DuPont under trade name Selar 3426). Additionally, PA636 or PA666 (from BASF) was blended with Selar 3426. The ratios of materials are shown in the second column. The outer layer of polypropylene, the tacky layer of 90% olefinic resin 10% polybutene-1 resin, and the thicknesses of each layer were kept constant for all tests.

Nycoa 2012 is a copolyamide thermoplastic elastomer. It has medium viscosity and it is particularly suitable for extrusion and excellent processability to create resilient packages. The expressions of Nycoa 2012 is as follows:

$$-[NH-(CH_2)_m-NH-CO-(CH_2)_n-CO]^{4}_{A}H-(CH_2)_m-NH-CO-(CH_2)_n-CO]^{y}_{y}$$

wherein m is 6 and n is either 6 or 36, depending on if they are in the hard or soft region of the polymers.

In order to further tailor the peel force of initial and reopen strength, blends of polyamide or polyamide additives were experimented with to observe the resulting peel force,
the results of which are shown in Table 4 below. A blend of 90% Nycoa 2012/10% organoclay master batch (manufactured by PolyOne under the trade name OCMB231-615) produced an initial peel force of 4.42 lbf/in and a reopen peel force of 0.43; a blend of 50% Nycoa 2012/50% Sesar 3426 produced an initial peel force of 4.45 lbf/in and a reopen peel force of 0.42 lbf/in; and a blend of 70% PA 666/30% Sesar 3426 produced an initial peel force of 4.89 lbf/in and a reopen peel force of 1.18 lbf/in. Accordingly, the tested blends produced a range of 4.42 - 4.89 lbf/in for an initial peel force and a range of 0.42 - 1.18 lbf/in for a reopen peel force. Based on these results, while most of the blend formulations can provide satisfactory peel and reseal performance, it was determined that the blend of 50% Nycoa 2012/50% Sesar 3426 produced the most consistent reclose and reopen peel force.

A similar peel and reseal film was also produced with a cast sheet line, then through biaxial orientation. A five layer structure was made with Davis Standard extruders, with a multilayer structure design of PA2012/EVOH/PA2012 w10% OCMB/Toppyl RC3000/Adsysl 5C 30 at layer distribution of 25%/5%/5%/40%/25%. The total sheet thickness was 1000um. The produced sheet was then stretched at a lab Karo stretcher manufactured by Bruckner. During the stretch, variable conditions were tested including: stretching oven temperature (start with 100°C, with 10° steps till 180°C); preheat time (60,80,100 sec); speed MD/TD (various from 2% up to 400%); Stretching Ratio (3x3, 5x5, 7x7); and the cast sheet was stretched to 5x5 at the following

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Outer Layer</th>
<th>Tacky Layer thickness</th>
<th>Inner Layer</th>
<th>Total Thickness</th>
<th>Initial open Force to trigger delamination</th>
<th>Reclose peel strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>90%Vistamaxx 6102FL/10%RC3000</td>
<td>90%PA2012 +10% OCMB</td>
<td>65 um</td>
<td>4.42</td>
<td>0.43</td>
</tr>
<tr>
<td>19 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>90%Vistamaxx 6102FL/10%RC3000</td>
<td>50%PA2012 +50% Sesar 3426</td>
<td>65um</td>
<td>4.45</td>
<td>0.42</td>
</tr>
<tr>
<td>20 (Inventive)</td>
<td>Lyondell Basell SR257M</td>
<td>90%Vistamaxx 6102FL/10%RC3000</td>
<td>70%PA666 +30% Sesar 3426</td>
<td>65um</td>
<td>4.89</td>
<td>1.18</td>
</tr>
</tbody>
</table>

A similar peel and reseal film was also produced with a cast sheet line, then through biaxial orientation. A five layer structure was made with Davis Standard extruders, with a multilayer structure design of PA2012/EVOH/PA2012 w10% OCMB/Toppyl RC3000/Adsysl 5C 30 at layer distribution of 25%/5%/5%/40%/25%. The total sheet thickness was 1000um. The produced sheet was then stretched at a lab Karo stretcher manufactured by Bruckner. During the stretch, variable conditions were tested including: stretching oven temperature (start with 100°C, with 10° steps till 180°C); preheat time (60,80,100 sec); speed MD/TD (various from 2% up to 400%); Stretching Ratio (3x3, 5x5, 7x7); and the cast sheet was stretched to 5x5 at the following...
conditions: oven preheat for 60 second at 170°C, and stretch at 400%/s MD/TD simultaneously with clip temp at 70°C. The resulted film was able to have a peel and reseal functionality as observed before.

[00144] Another coextruded multilayer film was produced on simultaneous biaxial orientation line. An example of a typical film structure is shown as the following: 50% PA2012 and 50% sealr3426 blend/90% Vistammaxx6102FL with 10% RC3000 blend/Homo PP LyondellBasell HP525J can be produced at layer thickness of 5/20/10 microns. In another test, this coextruded multilayer film is produced based on the similar film design of Vistammaxx 3588 as sealant/tie/PA2012+Selar 3426 (50:50)/Vistammaxx6102FL+RC3000(90:10)/HomoPP HP525J. The film was then adhesive laminated to reverse printed polyethylene terephthalate at the polypropylene side and the final film was die cut and to realize the peel and reseal functionality. In yet another approach, a similar film structure can be produced from a sequential biaxial orientation process by a 5 layer or 7 layer coextrusion process. Other film structures are also made with the similar peel and reseal core in the structure and varies skin layers and sealant layer formations and thickness. A careful design is also taken into consideration of producing flat films without much curling.

[00145] Another coextruded multilayer film was produced on an 11 layer triple bubble line. For examples, a film is designed as PET/tie layer/homoPP/Vistammaxx+PBl (90:10)/PA2012+Selar3426(50:50)/tie/Surlyn or LLDPE sealant, with total film thickness of 72 um and layer thickness of 14/7/5/17/1 2/5/10um. This multilayer was coextruded on Kuhne triple bubble line.

[00146] Another coextruded multilayer film is produced on a Reifenhauser multilayer cast film line. As an example, a typical cast film structure is PET/tie/PP/ Vistammaxx+PBl (90:10)/PA2012+Selar3426(50:50)/tie/Surlyn or LLDPE sealant; or PET/tie/PP/ Vistammaxx+PBl (90:10)/PA2012+Selar3426(50:50)/tie/EVOH/tie/Surlyn or LLDPE sealant.

[00147] EXAMPLE 4

[00148] Films as set forth in the able below were made on a blown film production line and all the layers, including the outer layer, bonding layer, the release layer, and the heat seal layer, were produced from single step coextrusion. The film was post adhesive laminated to standard PET film. The film was die cut into shape for peel initiation and reseal.

[00149] Table 6
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Outer Layer</th>
<th>Tacky Layer thickness</th>
<th>Release Layer</th>
<th>Sealant Layer</th>
<th>Total Thickness</th>
<th>Initial open Force to trigger delamination</th>
<th>Initial peel force after delamination started</th>
<th>Reclose peel strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Lyondell Basell Profax HP 403G</td>
<td>90% Vistamaxx 6102FL/10% RC3000</td>
<td>50% PA2012 +50% PA66</td>
<td>tie/PP/coPP sealant</td>
<td>50</td>
<td>5.43</td>
<td>0.88</td>
<td>0.47</td>
</tr>
<tr>
<td>22</td>
<td>Lyondell Basell Profax HP 403G</td>
<td>90% Vistamaxx 6102FL/10% RC3000</td>
<td>50% PA2012 +50% PA66</td>
<td>tie/HDPE/PE sealant</td>
<td>50</td>
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[00150] The backbone stiffness of the film, as listed in Table 6, PP vs. HDPE actually had certain influence on the peel force, when all the other layers were kept unchanged.

[00151] Those skilled in the art will recognize that a wide variety of modifications, alterations, and combinations can be made with respect to the above described embodiments, and that such modifications, alterations, and combinations are to be viewed as being within the ambit of the inventive concept. For example, the configurations and concepts described herein can be applied to the construction of bags, pouches, and flow packs. More generally, the configurations and concepts described herein can be utilized on any flexible closure or package. Additionally, although some film and opening configurations as disclosed herein as described using a laminate film, skilled artisans will appreciate that these configurations can be applied to non-laminate films as appropriate. Further, although some films are described herein as being suited for heat sealing, it will be understood that any of the films described herein can also be coated with a cold seal for food package applications. Additionally, skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions and/or relative positioning of some of the elements in the figures, such as the cross section views, may be exaggerated relative to other elements to help to improve understanding of various embodiments of the present invention.
Claims:

1. A package comprising a coextruded multi-layer film wherein two coextruded layers are separated by a coextruded center layer,
   wherein said multi-layer film has a peelable and resealable flap therein such that the multi-layer film is peelable between the two coextruded layers with the coextruded center layer adhering to one or both of the two coextruded layers, and resealable by reapplying the flap so that the coextruded center layer holds the two coextruded layers together, and
   wherein said peelable and resealable flap peels and reseals at least 10 times.

2. The package of claim 1, wherein said peelable and resealable flap peels and reseals at least 20 times.

3. The package of claim 1, wherein the coextruded center layer comprises a thermoplastic, or blends of two or more thermoplastics.

4. The package of claim 3, wherein one of the two coextruded layers comprises a polyamide material, or blends of two or more different grades of polyamides.

5. The package of claim 1, wherein the multi-layer film further comprises a sealant layer.

6. The package of claim 1, wherein the multi-layer film further comprises a pattern coated cold seal.

7. A coextruded multi-layer film suitable for creating at least a part of a package, the coextruded multi-layer film comprising:
   a coextruded bonding layer;
   a coextruded inner or intermediate film that enables release of the bonding layer, the coextruded bonding layer being disposed adjacent the coextruded inner or intermediate film;
   an opening feature formed in the coextruded multi-layer film
8. The coextruded multi-layer film of claim 7, further comprising a coextruded outer film portion and the coextruded bonding layer being disposed between the coextruded outer and inner film portion and wherein the flap includes an upper portion defined by an outer cut extending at least partially through the outer film portion and a lower portion defined by an inner cut extending through the inner film portion.

9. The coextruded multi-layer film of claim 7, formed by a simultaneous, single-step coextrusion process, wherein the outer film portion comprises an outer film layer and the inner film portion comprises an inner film layer, the bonding layer is between the outer and inner film layers.

10. The coextruded multi-layer film of claim 9, wherein the inner film layer comprises an inner release film layer configured to delaminate from the bonding layer, the inner release film layer comprising a polyamide material or polyamide blends.

11. The coextruded multi-layer film of claim 10, wherein the polyamide material comprises a nylon material or nylon blends.

12. The coextruded multi-layer film of claim 9, wherein the bonding layer consists of a polybutene-1 resin, a copolymer of polypropylene and polyethylene plastomers and elastomers, or blends thereof.

13. The coextruded multi-layer film of claim 12, wherein the bonding layer comprises a blend of a polybutene-1 resin and a copolymer of polypropylene and polyethylene plastomers and elastomers.

14. The coextruded multi-layer film of claim 9, wherein the inner film layer and the bonding layer have different polarities.
15. The coextruded multi-layer film of claim 14, wherein the bonding layer is non-polar and the inner film layer is polar.

16. The coextruded multi-layer coextruded film of claim 7, wherein the coextruded bonding layer comprises a thermoplastic, or blends of two or more thermoplastics.

17. The coextruded multi-layer film of claim 7, having a sealant layer thereof sealed to form a package having an interior and a top wall, the opening feature disposed in the top wall of the package such that the flap can be pulled back to expose the opening through the multi-layer film and into the package interior and expose a reseal margin of the bonding layer surrounding the opening, and can be resealed against the reseal margin to reclose the package.

18. The coextruded multi-layer film of claim 7, wherein the outer cut includes a tab portion.

19. The coextruded multi-layer film of claim 7, wherein the outer cut includes a tab portion, shoulder portions extending from ends of the tab portion, and side portions extending longitudinally from ends of the shoulder portions.

20. The coextruded multi-layer film of claim 19, wherein the outer cut further comprises tear delimiting features at distal ends thereof.

21. The coextruded multi-layer film of claim 19, wherein the inner cut includes a forward edge, a rearward edge, and side edges extending therebetween to define the opening.

22. A package formed with the coextruded multi-layer film of any one of claims 7-21 surrounding a package interior.

23. The package of claim 22, further comprising food products disposed within the package interior.
24. The package of claim 23, further comprising a tray disposed within the package interior, the tray supporting the food products for access through the opening.

25. A multi-layer film suitable for creating a package, the multi-layer film comprising:
   a first film portion;
   a thermoplastic layer;
   a second film portion that enables release of the thermoplastic layer, the thermoplastic layer being disposed between the first and second film portions;
   a resealable opening feature formed in the multi-layer film to create an opening through the multi-layer film and expose a delaminated portion of the thermoplastic layer and a reseal margin for subsequent package reclose by reattaching the delaminated portion of the thermoplastic layer to the reseal margin.

26. The multi-layer film of claim 25, wherein the multi-layer film comprises a coextruded multi-layer film, the first film portion comprises a coextruded first film portion, the thermoplastic layer comprises a coextruded thermoplastic layer, and the second film portion comprises a coextruded second film portion.

27. The coextruded multi-layer film of claim 26, formed by a single-step coextrusion process, wherein the coextruded first film portion comprises a first film layer and the coextruded second film portion comprises a second film layer, the first and second film layers encapsulating the coextruded thermoplastic layer.

28. The coextruded multi-layer film of claim 27, wherein the second film layer comprises a release film layer configured to delaminate from the coextruded thermoplastic layer, the release film layer comprising a polyamide material or polyamide blends.

29. The coextruded multi-layer film of claim 28, wherein the polyamide material comprises a nylon material or nylon blends.
30. The coextruded multi-layer film of claim 27, wherein the second film layer and the coextruded thermoplastic layer have different polarities.

31. The coextruded multi-layer film of claim 30, wherein the coextruded thermoplastic layer is non-polar and the second film layer is polar.

32. The coextruded multi-layer film of claim 26, wherein the coextruded thermoplastic layer consists of a polybutene-1 resin, a copolymer of polypropylene and polyethylene plastomers and elastomers, or blends thereof.

33. The coextruded multi-layer film of claim 32, wherein the coextruded thermoplastic layer comprises a blend of a polybutene-1 resin and a copolymer of polypropylene and polyethylene plastomers and elastomers.

34. The multi-layer film of claim 25, wherein the resealable opening feature includes an upper portion defined by an outer cut extending at least partially through the first film portion and a lower portion defined by an inner cut extending through the second film portion.

35. A package formed with the multi-layer film of claim 25, sealed in seal areas and surrounding a package interior.

36. The package of claim 35, further comprising food products disposed within the package interior.

37. The package of claim 36, further comprising a tray disposed within the package interior, the tray supporting the food products for access through the opening.

38. The package of claim 35, wherein the delaminated portion extends beyond the seal areas.

39. A flexible package comprising:
a multilayer coextruded film structure having a bonding layer and a polyamide layer adjacent to the bonding layer;
an opening feature in the multilayer film structure comprising at least one score line;
the at least one inner score line defining an opening to an interior of the package;
a sealing margin adjacent the at least one score line, the bonding layer configured to delaminate from the polyamide layer along the sealing margin when the opening feature is pulled back.

40. The flexible package of claim 39, wherein the bonding layer comprises a polybutene-1 resin, olefinic elastomer resin, or a blend thereof.

41. The flexible package of claim 40, wherein the bonding layer comprises a blend of polybutene-1 resin and olefinic elastomer resin within a range of 1:3 —1:9 ratios.

42. The flexible package of claim 40, wherein the bonding layer has a thickness in the range of about 1 to about 50 microns, and preferably about 2 to about 30 microns.

43. The flexible package of claim 39, wherein the polyamide material comprises a polyamide polymer and/or a blend thereof of the structures

\[ -f\text{NH}-(\text{CH}_2)^m\text{-NH-}-\text{CO}-\text{(CH}_2)^n\text{-CO}\} \chi \)

\[ ^\text{NH}-(\text{CH}_2)^m\text{-NH-}-\text{CO}-\text{(CH}_2)^n\text{-CC%fNH}-(\text{CH}_2)^m\text{-NH-}-\text{CO}-\text{(CH}_2)^n\text{-C}O\]^

wherein, in the first structure, m and n are independently an integer from 4 to 64; in the second structure, m is 6 and n is either 6 or 36, depending on if they are in a hard or soft region of the polymers, and/or includes an aromatic polyamide including one or more of the following structures

\[
\begin{align*}
\text{HO} & \begin{cases}
\text{CO} & \text{H or R} \\
\text{CO-HN-(CH}_2)^m\text{-NH-}-\text{CO} & \text{X} \\
\text{X} & \text{H or R}
\end{cases} \\
\text{O}
\end{align*}
\]

Page 45 of 50
wherein m is an integer from 4 to 64 and can include an optional one or more than one side alkyl group(s) on the aromatic ring.

44. The flexible package of claim 39, wherein the opening feature is configured to be opened and reseal at least 10 times with not less than 0.2 lbf/in of peel force.

45. The flexible package of claim 39, wherein the bonding layer comprises a contact sensitive adhesive.

46. The flexible package of claim 39, wherein an initial peel force of delaminating the bonding layer from the release layer is within the range of about 0.5 to about 5 lbf/in, and preferably about 0.5 to about 2 lbf/in.

47. The flexible package of claim 39, wherein a reopen peel force of delaminating the bonding layer from the release layer is with the range of about 0.2 to about 4 lbf/in, and preferably about 0.2 to about 2 lbf/in, and more preferably about 0.5 to about 1 lbf/in.

48. The flexible package of claim 47, wherein the reopen peel force stays within the range of about 0.2 to about 2 lbf/in for at least 10 open and reseal operation cycles.

49. A multilayer flexible coextruded film having been oriented in a tenter frame process and containing a peelable and resealable tacky encapsulated thermoplastic and/or elastomeric layer.

50. A multilayer film capable of peel and re-bonding between layers of the multi-layer film, the multilayer film comprising:
   a bonding layer including a at least one of polybutylene, polyethylene, and polypropylene,
   and blends and copolymers thereof;
a release layer directly contacting the bonding layer and including at least one of a polyamide polymer and blend thereof of the structures

\[
^{\text{a}}\text{NH-} \text{iCH}_2 \text{m-NH-CO-(CH}_2 \text{n-CO)}^x \text{;}
\]

\[
^{\text{b}}\text{NH-(CH}_2 \text{)}^6 \text{m-NH-CO-(CH}_2 \text{n-CO)}^x \text{;}
\]

wherein, in the first structure, m and n are independently an integer from 4 to 64; in the second structure, m is 6 and n is either 6 or 36, depending on if they are in a hard or soft region of the polymers, and/or includes an aromatic polyamide including one or more of the following structures

\[
\begin{align*}
\text{HO} & \quad \text{H or R} \\
\text{CO} & \quad \text{H or R} \\
\text{CO-HN-(CH}_2 \text{m-NH-CO-(CH}_2 \text{n-CO)}^x & \quad \text{; and/or} \\
\text{H} & \quad \text{H or R} \\
\text{HN-CH}_2 & \quad \text{CH}_2-\text{NH-CO-(CH}_2 \text{m-CO)}^x & \quad \text{OH} \\
\end{align*}
\]

wherein m is an integer from 4 to 64 and can include an optional one or more than one side alkyl group(s) on the aromatic ring.

51. The multilayer film of claim 50, wherein the non-tacky bonding layer includes a blend of about 5 to about 75 weight percent polybutylene and about 25 to about 95 weight percent of an olefin blend including polypropylene and about 10 to about 20 weight percent polyethylene.

52. The multilayer film of claim 51, wherein the olefin blend has a density from about 0.86 to about 0.88 g/cm3 and a melt flow index from about 0.9 to about 7.4 g/10min.

53. The multilayer film of claim 51, wherein the polybutylene has a melt flow index of about 1 to about 4 gm/10mins at 190C, 2.16 kg.
54. The multilayer film of claim 50, wherein the bonding layer is about 5 to about 30 microns thick.

55. The multilayer film of claim 50, wherein n is about 34 to about 64.

56. The multilayer film of claim 50, wherein the release layer further includes an amorphous, semi-crystalline polyamide.

57. The multilayer film of claim 56, wherein the release layer includes about 50 to about 70 weight percent of the polyamide polymer and about 30 to about 50 weight percent of the amorphous, semi-crystalline polyamide.

58. The multilayer film of claim 50, wherein the polyamide includes the aromatic polyamide and blends thereof:

\[
\begin{align*}
&\text{HO} \quad \text{CO} \quad H \text{ or } R \\
&\text{CO-HN-(CH}_2\text{)}_m\text{-NH-CO-} \quad \text{CO}_x \quad \text{H or R} \\
&\text{H} \quad \text{HN-CH}_2\text{-(CH}_2\text{)}_m\text{-NH-CO-(CH}_2\text{)}_x\text{-OH}
\end{align*}
\]

wherein m is an integer from 4 to 64 and can include an optional one or more than one side alkyl group(s) on the aromatic ring.

59. The multilayer film of claim 50, wherein the release layer further includes about 1% to about 15% organically modified clay.

60. The multilayer film of claim 50, wherein the release layer is about 1 micron to about 30 microns thick, and preferably, about 1 micron to about 7 microns thick.
61. The multilayer film of claim 50, wherein the bonding layer and the release layer are coextruded in a single step.

62. The multilayer film of claim 50, wherein the bonding layer is extrusion coated onto the release layer.

63. The multilayer film of claim 50, wherein the bonding layer has a surface energy of about 32 dynes.

64. The multilayer film of claim 50, wherein the bonding layer is polar and the release layer includes a non-polar moiety.

65. A film or package of any preceding claim produced by any of the following methods: multi-layer cast film, blown film (typical blown, double bubble, triple bubble, water quenching), machine direction orientation, slot cast film, and biaxial orientation.

66. The film or package of claim 65 forming a food package.

67. The film or package of claim 65 further adhesive laminated to reverse printed biaxially-oriented polypropylene or polyethylene terephthalate film, including metalized, polyvinylidene chloride coated, aluminum oxide coated, silicon oxide coated, to create a laminated multilayer flexible film for food packages.

68. A film or package of any preceding claim wherein the bonding layer has a rolling ball tack of about 4 to about 10 mm.
**INTERNATIONAL SEARCH REPORT**

**International application No**

PCT/US2016/018072

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**A. CLASSIFICATION OF SUBJECT MATTER**

INV. B32B7/06 B32B7/12 B32B27/08 B32B27/32 B32B27/34 B32B3/26 B65D5/72 B65D17/00

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**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B32B B65D

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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**X** Further documents are listed in the continuation of Box C.  **X** See patent family annex.

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* Special categories of cited documents:

- **A** document defining the general state of the art which is not considered to be of particular relevance
- **E** earlier application or patent but published on or after the international filing date
- **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- **O** document referring to an oral disclosure, use, exhibition or other means
- **P** document published prior to the international filing date but later than the priority date claimed

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**Date of the actual completion of the international search**

12 April 2016

**Date of mailing of the international search report**

29/06/2016

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**Name and mailing address of the ISA/IB**

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk

Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016

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**Authorized officer**

Flores de Paco, M
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Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-38, 43-48 (completely) ; 39, 40, 50, 65-68 (partially)

Remark on Protest

□ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

□ No protest accompanied the payment of additional search fees.
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This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-38, 43-48 (completely); 39, 40, 50, 65-68 (partially)

   A coextruded multi-layer film suitable for creating at least one part of a package, the coextruded multi-layer film comprising: a coextruded bonding layer; a coextruded inner or intermediate film that enables release of the bonding layer, the coextruded bonding layer being disposed adjacent the coextruded inner or intermediate film; an opening feature formed in the coextruded multi-layer film.

   ---

2. claims: 41, 42, 51-64 (completely); 39, 40, 50, 65-68 (partially)

   A flexible package comprising: a multilayer coextruded film structure having a bonding layer comprising a polybutene-1, and a polyamide layer adjacent to the bonding layer; an opening feature in the multilayer film structure comprising at least one score line; the at least one inner score line defining an opening to an interior or of the package; a sealing margin adjacent the at least one score line, the bonding layer configured to delaminate from the polyamide layer along the sealing margin when the opening feature is pulled back.

   ---

3. claims: 49 (completely); 65-68 (partially)

   A multilayer flexible coextruded film having been oriented in a tenter frame process and containing a peelable and resealable tacky encapsulated thermoplastic and/or elastomeric layer.

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