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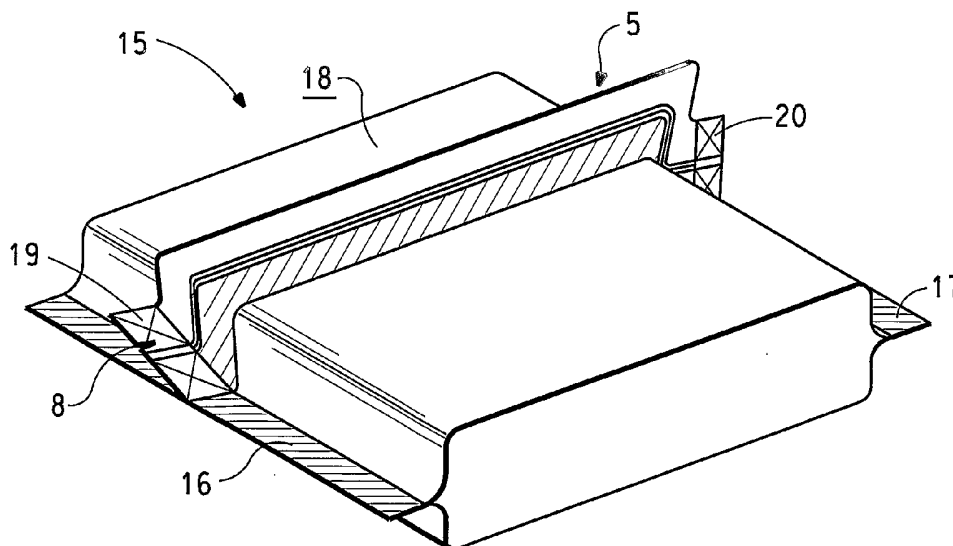
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(54) Title: RECLOSABLE PACKAGES AND METHOD AND APPARATUS FOR MAKING THEM



(57) Abstract: Reclosable packaging systems are disclosed. The package construction comprises a single sheet or wrapper having a face panel extending between opposite sides and end edges, said sheet material being folded from opposite sides of the face panel into a tubular envelope shape and with longitudinal margins of the sheet material sealed into (5) a seam opposite said face panel and extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion (7) comprising reclosable separable fastener profiles aligned parallel to the sealed edge, and cross seals at said opposite end edges of the envelope. Also disclosed are methods and apparatus for forming, filling and sealing such packages. These packages can be used for packaging such products as disposable wipes and food products.

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TITLE OF THE INVENTION

RECLOSABLE PACKAGES AND METHOD AND APPARATUS FOR MAKING THEM

TECHNICAL FIELD

5 This invention relates to reclosable packages and methods and apparatus for forming, filling and sealing such packages. These packages can be used for packaging for such products as disposable wipes and food products.

BACKGROUND ART

10 It is well known in the packaging art that, for certain products, efficiency in packaging, acceptable shelf life and customer convenience can be obtained by hermetically sealing the product in reclosable packages in a form/fill/seal (FFS) operation.

 In providing a commercially viable package through FFS operations,
15 several considerations need to be addressed. The package must be economical to produce and capable of being formed, filled and sealed at relatively high rates. The package must be durable to withstand the stresses of the FFS operation and subsequent shipping and handling without damage and/or loss of appearance. However, it must also be
20 convenient for the consumer to use. For example, it must be easy to unseal and open by the consumer and it is desirable that the package be resealable (e.g. by a zipper) to preserve the product therein after the package is first unsealed by the consumer. It is also desirable to allow for the incorporation of graphic elements such as printing, embossing, etc., to
25 provide information to the consumer about the product therein and/or to provide a pleasing appearance of the package.

 U.S. Patent Numbers 4,355,494 and 4,874,257 describe vertical-filled fin-zippered pouches.

 U.S. Patent Numbers 4,589,145 and 4,663,915 describe horizontal-
30 filled packages (and methods for packaging) with the zipper on a side-wall and a separate fin seal. The zipper is attached by means of a fold of the packaging web prior to the filling operation.

EP0531701 describes similar packages, but attaches the zipper to the packaging web as part of the overall filling operation.

DISCLOSURE OF THE INVENTION --

5 An object of the present invention is to provide a new and improved package and packaging material especially adapted for continuous on-line form, fill and seal production, the package being thoroughly sealed and provided with means for reclosing the package after being opened.

Another object of the present invention is to provide a new and improved method of and means for producing zipper equipped packages
10 on existing horizontal form, fill and seal machines with only relatively minor modifications and investment.

To this end, the present invention provides a package construction, comprising a single sheet or wrapper having a face panel extending between opposite sides and end edges, said sheet material being folded
15 from opposite sides of the face panel into a tubular envelope shape and with longitudinal margins of the sheet material sealed into a seam opposite said face panel and extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable
20 separable fastener profiles aligned parallel to the sealed edge, and cross seals at said opposite end edges of the envelope.

The present invention also provides a material especially adapted for packaging in a horizontal form, fill and seal machine a blocky product having opposite faces and edges between said faces, comprising
25 a wrapper sheet having a panel area for engagement with a face of said product;

said sheet having portions that extend beyond said panel area and which are adapted to be wrapped into an envelope about said product by bringing said portions along said product edges and into overlying relation
30 on the opposite face of said product;

said wrapper sheet being dimensioned to provide for cross seals at the ends of the envelope;

free margins of the wrapper sheet portions being adapted to be secured into a seam over said opposite face of said product having a pilfer-proof seal and adapted to be severed or ruptured to provide a package mouth opening for access to the product in the envelope, and the mouth opening being reclosable with reclosable zipper means aligned parallel to the pilfer-proof seal;

said zipper means comprising profiled resiliently flexible separable zipper strips.

The present invention also provides a method of forming in a horizontal form, fill and seal machine a product-enclosing package having an envelope with a face panel extending between opposite sides and end edges, and including folding a single wrapper sheet from opposite sides of the face panel into a tubular envelope shape and bringing longitudinal margins of the sheet material into position opposite said face panel and sealing the margins together into a seam extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the sealed edge, and then effecting cross seals at said opposite end edges of the envelope.

The present invention also provides a method of producing a wrapped bulky product-enclosing package, comprising

forming a sheet into a wrapper having a face panel extending between opposite sides and end edges of the wrapper;

folding the wrapper from opposite sides of the face panel into a tubular envelope shape;

sealing longitudinal margins of the wrapper into a seam opposite said face panel and extending between said end edges of the wrapper, such that said seam is sealed at the edge to form a pilfer-proof seal;

providing zipper means comprising reclosable separable fastener profiles aligned parallel to the edge of said seam;

providing said zipper means in the form of profiled resiliently flexible separable zipper strips; and

forming cross seals at said opposite end edges of the wrapper.

The present invention further provides a form, fill and seal machine for enclosing a product in a package envelope and adapted to receive a single continuous strip of wrapper sheet, and for folding said wrapper sheet into an envelope about the product and sealing the envelope; and

5 comprising

means for receiving the sheet from source and with the sheet having a longitudinally extending panel area for engagement with a face of the product and longitudinal portions that extend laterally beyond the panel area with longitudinal margins of the sheet material;

10 means for delivering product to said panel area on said receiving means;

means for moving said longitudinal portions toward one another into envelope relation about the delivered product in cooperation with said panel area;

15 means for inserting a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the edges of said longitudinal portions and attaching said zipper strip within the margins of said longitudinal portions;

20 means for sealing margins of said longitudinal portions across said product;

means for cross sealing end edges of the envelope for fully enclosing the product within the envelope.

25 Other objects, features and advantages of the present invention will be readily apparent from the following description of certain representative embodiments thereof, taken in conjunction with the following drawings.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a top perspective view of a package envelope of this invention, with a product inside, prior to cross sealing of the package.

Figure 2 is a top perspective view of a package of this invention.

30 Figure 3 is a schematic perspective side-view of a machine for forming a package of this invention, filling it with product and sealing said package.

Figure 4 is a cross-sectional side-view of a machine of Figure 3 as seen through line 4-4.

Figure 5 is a cross-sectional view of the fin seal area of a machine of Figure 4 as seen through line 5-5.

5 DETAILED DESCRIPTION OF THE INVENTION

“Copolymer” means polymers containing two or more different monomers. The terms “dipolymer” and “terpolymer” mean polymers containing only two and three different monomers respectively. The phrase “copolymer of various monomers” means a copolymer whose units
10 are derived from the various monomers.

A pouch or package of this invention is effective for containing discrete objects that are not all consumed at one time. Of note are objects that need to be protected from exposure to the atmosphere to preserve freshness, maintain appropriate moisture levels, etc. For
15 example, a package of this invention can be used to contain food items such as, but not limited to, cookies, crackers, sausage patties or links, sliced meats and cheeses, and candies. A package of this invention also can be used to contain products such as a stack of cleaning wipes, tissues and the like. An internal tray, slab or board optionally may be
20 used to help contain said objects in a blocky form to be packaged, or to protect said objects from damage due to mechanical stresses or impacts during formation, subsequent handling and/or shipping of the package. The tray, slab or board may be formed from plastic, paper, cardboard, foil and the like and combinations thereof.

25 The present invention provides a package construction, comprising a single sheet or wrapper having a face panel extending between opposite sides and end edges, said sheet material being folded from opposite sides of the face panel into a tubular envelope shape and with longitudinal margins of the sheet material sealed into a seam opposite
30 said face panel and extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable

separable fastener profiles aligned parallel to the sealed edge, and cross seals at said opposite end edges of the envelope.

These embodiments of this invention can be understood by referring to Figures 1 and 2, which illustrate the construction of a package of this invention.

Figure 1 shows a top perspective view of a package envelope (1) consisting of a wrapper sheet of packaging film formed into a tubular envelope (2) around a blocky product (e.g. a stack of wipes) therein (3). A seam (4) joining the longitudinal edges of the packaging web is formed into a fin seal (5) substantially perpendicular to one face (6) of the envelope (2) and incorporates a recloseable zipper element (7). The fin seal forms a pilfer-proof seal and is preferably heat-sealed. For clarity, the packaging envelope (1) is illustrated with the fin seal (5) on the top face of the envelope (2) in this view, but the envelope may also be formed such that the fin seal (5) is formed on the bottom face of the envelope. Formation of the fin seal on either the top face or the bottom face of the envelope may be influenced by the general design of available horizontal FFS machines, the type of product to be contained in the package and/or other factors. The fin seal area may also comprise optional guides such as a notch (8) or perforations to help the purchaser sever the fin seal between the pilfer-proof seal and the zipper element to access the contents of the package. End margins (9 and 10) of the envelope, extending beyond the extent of the product (3), comprise areas for cross sealing the package.

Figure 2 shows a package of this invention (15) in which the end margins previously described have been sealed into cross seals (16) and (17) to fully enclose the product. Preferably, the fin seal (5) is folded into an orientation substantially parallel to the top face (18) of the package and in contact with said top face. When the fin seal is folded in said manner, the ends of the fin seal (19) and (20), including the zipper element, are sealed by the cross-sealing operation. The fin seal ends (19) and (20) optionally may be adhesively attached to the cross seals (16) and (17) by, for example, a hot melt adhesive. The outer web may be heat sealable to

itself to enable tacking the fin seal ends (19) and (20) onto the package surface at the cross seals (16 and 17). Such attachment of the fin seal ends to the cross seals is preferably made in such a manner that the fin seal is readily detached from the cross seals to facilitate opening of the package.

5 A package of this invention may optionally comprise pleats or gussets on the sides of the tubular envelope. Such pleats or gussets are particularly useful if the product to be packaged has a relatively large height. The pleats are formed in the sides of the tubular envelope shown
10 in Figure 1 by pushing the side portions of the end margins inward and bringing the top and bottom portions of the end margins together to encompass the pleat. The optional pleat is typically introduced into the tubular envelope prior to cross sealing the end margins.

When the purchaser wishes to access the product contained in the
15 package, the purchaser severs the pilfer-proof seal by tearing the fin seal lengthwise in the area between the seam and the zipper element. As described above, optional guides such as notches or perforations may be present to facilitate tearing of the film seal in the appropriate area. The zipper means can then be opened to form a package mouth opening to
20 access the interior of the package and expose the product. When the purchaser has consumed as much of the product as desired, the remainder of the product can be re-enclosed in the package by closing the package mouth opening by re-engagement of the zipper means.

As indicated above, the present invention provides a material
25 especially adapted for packaging in a horizontal form, fill and seal machine a blocky product having opposite faces and edges between said faces, comprising

a wrapper sheet having a panel area for engagement with a face of said product;
30 said sheet having portions that extend beyond said panel area and which are adapted to be wrapped into an envelope about said product by bringing said portions along said product edges and into overlying relation on the opposite face of said product;

said wrapper sheet being dimensioned to provide for cross seals at the ends of the envelope;

free margins of the wrapper sheet portions being adapted to be secured into a seam over said opposite face of said product having a pilfer-
5 proof seal and adapted to be severed or ruptured to provide a package mouth opening for access to the product in the envelope, and the mouth opening being reclosable with reclosable zipper means aligned parallel to the pilfer-proof seal;

said zipper means comprising profiled resiliently flexible separable
10 zipper strips.

The wrapper sheet typically comprises a web of packaging film preprinted with desired labeling and/or instructional text to inform the purchaser of the steps required for opening, resealing the package, and consuming the product therein. Other graphic elements such as pictures,
15 designs, embossing and the like may also be present on said wrapper sheet. Packaging films suitable for forming the wrapper sheet are more fully described below.

Zipper elements are well known in the packaging art. They are formed of profiled, resiliently flexible separable zipper strips comprising
20 interlocking elements that can be mechanically closed to provide a tight seal and opened as desired. The profiled interlocking elements typically have generally flat backing portions. The backing portion may optionally extend beyond one side of the interlocking profile (a "single-flange" zipper) or both sides of the interlocking profile (a "double-flange" zipper). They
25 are typically prepared from flexible thermoplastic polymeric material, such as polyethylene, wherein the backing portions can be adhesively bonded (e.g. by application of heat and pressure) to films that are suitable for packaging. To facilitate bonding of the zipper to the packaging material, and to facilitate maintenance of hermetic seals at the intersections of the
30 ends of the zipper and the cross seals, the zipper strips or portions thereof may be coated or coextruded with a polymeric adhesive layer such as ethylene vinyl acetate (EVA) that is compatible with the seal layer of the packaging film. In other embodiments of this invention, the zipper strips

may have a hot melt adhesive applied to the exterior faces of the backing portions (i.e. the faces of the zipper strips opposite the zipper profiles). In some instances, the zipper strips may be uncoated, with adhesion provided by heat sealing to a compatible seal layer of the packaging film.

5 One skilled in the polymer art can readily select the appropriate adhesive embodiment based on the materials used in the zipper and the seal layer of the packaging film.

The dimensions of the package of this invention are dependent on the size of the product to be contained therein. For nonlimiting examples,
10 packages of this invention may have lengths from about 10 cm to about 30 cm, widths from about 10 cm to about 15 cm and heights from about 3 cm to about 10 cm. Heat sealed edges (i.e. the cross seams and the pilfer-proof seal of the fin seal) are typically but not exclusively from about 0.5 cm to about 3 cm wide. As a consequence of the dimensions desired
15 for the finished package, the dimensions of the wrapper sheet must be such that the wrapper sheet will completely form the package, including allowance for overlapping portions that form the end seals and fin seal.

For purposes of the present invention, the sheets of polymeric film employed to make the wrapper sheet of the resealable pouch or package,
20 in principle, can be either a single layer or multilayer polymeric film. Also, in principle, any such film grade polymeric resin or material as generally known in the art of packaging can be employed. Preferably, a multilayer polymeric film structure is to be employed. Typically the multilayer polymeric sheet will involve at least three categorical layers including, but
25 not limited to, an outermost structural or abuse layer, an inner barrier layer, and an innermost layer making contact with and compatible with the intended contents of the package and capable of forming the necessary end seals and resealable fin seal (e.g. most preferably heat-sealable). Other layers may also be present to serve as adhesive or "tie" layers to
30 help bond these layers together.

The outermost structural or abuse layer is typically oriented polyester or oriented polypropylene, but can also include oriented polyamide (nylon). This layer preferably is reverse printable and

advantageously unaffected by the sealing temperatures used to make the package, since the package is sealed through the entire thickness of the multilayer structure. This layer optionally may have a seal initiation temperature such that it allows for tacking down the fin seal. The thickness
5 of this layer is typically selected to control the stiffness of the pouch, and may range from about 10 to about 60 μm , preferably about 50 μm .

The inner layer can include one or more barrier layers, depending on which atmospheric conditions (oxygen, humidity, light, and the like) that potentially can affect the product inside the pouch. Barrier layers can be,
10 for example, metallized polypropylene (PP) or polyethylene terephthalate (PET), ethylene vinyl alcohol (EVOH), polyvinyl alcohol (PVOH), polyvinylidene chloride, aluminum foil, nylon, blends or composites of the same as well as related copolymers thereof. Barrier layer thickness will depend on the sensitivity of the product and the desired shelf life.

15 The structure and barrier layers can be combined to comprise several layers of polymers that provide effective barriers to moisture and oxygen and bulk mechanical properties suitable for processing and/or packaging the product, such as clarity, toughness and puncture-resistance. Examples of multilayer barrier structures suitable for use in this invention
20 include, from outermost to innermost:

polyethylene/tie layer/polyamide/tie layer/polyethylene;
polypropylene/tie layer/polyamide/EVOH/polyamide; and
polyamide/tie layer/polyethylene/tie layer/polyamide.

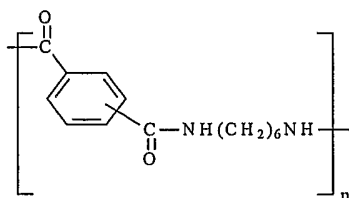
The innermost layer of the package is the sealant. The sealant is
25 selected to have minimum effect on taste or color of the contents, to be unaffected by the product, and to withstand sealing conditions (such as liquid droplets, grease, dust, or the like). The sealant is typically a polymeric layer or coating that can be bonded to itself (sealed) at temperatures substantially below the melting temperature of the outermost
30 layer so that the outermost layer's appearance will not be affected by the sealing process and will not stick to the jaws of the sealing bar. Typical sealants used in multilayer packaging films useful in this invention include ethylene polymers, such as low density polyethylene (LDPE), linear low

density polyethylene (LLDPE), metallocene polyethylene (mPE), or copolymers of ethylene with vinyl acetate (EVA) or methyl acrylate or copolymers of ethylene and acrylic (EA) or methacrylic acid (EMA), optionally as ionomers (i.e., partially neutralized with metal ions such as Na, Zn, Mg, or Li). Typical sealants can also include polyvinylidene chloride (PVDC) or polypropylene copolymers. Sealant layers are typically from about 25 to about 100 μm thick.

Polyamides (nylon) suitable for use herein include aliphatic polyamides, amorphous polyamides, or a mixture thereof. "Aliphatic polyamides" as the term is used herein can refer to aliphatic polyamides, aliphatic copolyamides, and blends or mixtures of these. Preferred aliphatic polyamides for use in the invention are polyamide 6, polyamide 6.66, blends and mixtures thereof. Polyamides 6.66 are commercially available under the tradenames "Ultramid C4" and "Ultramid C35" from BASF, or under the tradename "Ube5033FXD27" from Ube Industries Ltd. Polyamide 6 is commercially available under the tradename Nylon 4.12 from E.I. du Pont de Nemours and Company, for example.

The film may further comprise other polyamides such as those described in U.S. Pat. Nos. 5,408,000; 4,174,358; 3,393,210; 2,512,606; 2,312,966 and 2,241,322.

The film may also comprise partially aromatic polyamides. A suitable partially aromatic polyamide is the amorphous copolyamide 6-I/6-T of the following formula:



25

Some suitable partially aromatic copolyamides for use in the present invention are the amorphous nylon resins 6-I/6-T commercially available under the tradename Selar® PA from E.I. du Pont de Nemours and Company or commercially available under the tradename Grivory® G 21 from EMS-Chemie AG, for example.

30

Polyolefins suitable for use in the present invention are selected from polypropylene or polyethylene polymers and copolymers comprising ethylene or propylene. Polyethylenes useful for use herein can be prepared by a variety of methods, including well-known Ziegler-Natta catalyst polymerization (see for example U.S. Patent No. 4,076,698 and U.S. Patent No. 3,645,992), metallocene catalyst polymerization (see for example U.S. Patent No. 5,198,401 and U.S. Patent No. 5,405,922) and by free radical polymerization. Polyethylene polymers useful herein can include linear polyethylenes such as high density polyethylene (HDPE), linear low density polyethylene (LLDPE), very low or ultralow density polyethylenes (VLDPE or ULDPE) and branched polyethylenes such as low density polyethylene (LDPE). The densities of polyethylenes suitable for use in the present invention range from 0.865 g/cc to 0.970 g/cc. Linear polyethylenes for use herein can incorporate alpha-olefin comonomers such as butene, hexene or octene to decrease their density within the density range so described. The impermeable film useful in the present invention can comprise ethylene copolymers such as ethylene vinyl acetate and ethylene methyl acrylate and ethylene (meth)acrylic acid polymers. Polypropylene polymers useful in the practice of the present invention include propylene homopolymers, impact modified polypropylene and copolymers of propylene and alpha-olefins.

Ionomeric resins ("ionomers") are ionic copolymers of an olefin such as ethylene with a metal salt of an unsaturated carboxylic acid, such as acrylic acid, methacrylic acid, or maleic acid, and optionally softening monomers. At least one or more alkali metal, transition metal, or alkaline earth metal cations, such as sodium, potassium or zinc, are used to neutralize some portion of the acidic groups in the copolymer resulting in a thermoplastic resin exhibiting enhanced properties. For example, "Ethylene/(meth)acrylic acid (abbreviated E/(M)AA)" means a copolymer of ethylene (abbreviated E)/acrylic acid (abbreviated AA) and/or ethylene/methacrylic acid (abbreviated MAA) which are at least partially neutralized by one or more alkali metal, transition metal, or alkaline earth metal cations to form an ionomer. Terpolymers can also be made from an

olefin such as ethylene, an unsaturated carboxylic acid and other comonomers such as alkyl (meth)acrylates to provide "softer" resins that can be neutralized to form softer ionomers. Ionomers are known conventionally and their method of preparation is described in, for
5 example, U.S. Pat. No. 3,344,014.

Anhydride or acid-modified ethylene and propylene homo- and copolymers can be used as extrudable adhesive layers (also known as "tie" layers) to improve bonding of layers of polymers together when the polymers do not adhere well to each other, thus improving the layer-to-
10 layer adhesion in a multilayer structure. The compositions of the tie layers will be determined according to the compositions of the adjoining layers that need to be bonded in a multilayer structure. One skilled in the polymer art can select the appropriate tie layer based on the other materials used in the structure. Various tie layer compositions are commercially available
15 under the tradename Bynel® from E.I. du Pont de Nemours and Company, for example.

Polyethylene vinyl alcohol ("EVOH") having from about 20 to about 50 mole % ethylene can be suitable for use herein. Suitable polyethylene vinyl alcohol polymers are commercially available under the tradename
20 Evalca® from Kuraray or commercially available under the tradename Noltex® from Nippon Goshei, for example.

Polyvinylidene chloride (PVDC) suitable for use herein can be obtained commercially from Dow Chemical under the tradename Saran®,
for example.

25 Films useful in the present invention can additionally comprise optional materials, such as the conventional additives used in polymer films including: plasticizers, stabilizers, antioxidants, ultraviolet ray absorbers, hydrolytic stabilizers, anti-static agents, dyes or pigments, fillers, fire-retardants, lubricants, reinforcing agents such as glass fiber and
30 flakes, processing aids, antiblock agents, release agents, and/or mixtures thereof.

A laminate film useful in the present invention can be prepared by coextrusion as follows: granulates of the various components are melted in

extruders. The molten polymers are passed through a die or set of dies to form layers of molten polymers that are processed as a laminar flow. The molten polymers are cooled to form a layered structure. Molten extruded polymers can be converted into a film using a suitable converting
5 technique. For example, a film useful in the present invention can also be made by coextrusion followed by lamination onto one or more other layers. Other suitable converting techniques are, for example, blown film extrusion, cast film extrusion, cast sheet extrusion and extrusion coating.

A laminate film useful in the present invention can be further
10 oriented beyond the immediate quenching or casting of the film. The process comprises the steps of coextruding a multilayer laminar flow of molten polymers, quenching the coextrudate and orienting the quenched coextrudate in at least one direction. "Well-quenched" as the term is used herein describes an extrudate that has been substantially cooled below its
15 melting point in order to obtain a solid film material.

The film may be uniaxially oriented, but is preferably biaxially oriented by drawing in two mutually perpendicular directions in the plane of the film to achieve a satisfactory combination of mechanical and physical properties.

20 Orientation and stretching apparatus to uniaxially or biaxially stretch film are known in the art and may be adapted by those skilled in the art to produce films useful in the present invention. Examples of such apparatus and processes include, for example, those disclosed in U.S. Patent Nos. 3,278,663; 3,337,665; 3,456,044; 4,590,106; 4,760,116; 4,769,421;
25 4,797,235 and 4,886,634.

A film useful in the present invention may be oriented using a double bubble extrusion process, where simultaneous biaxial orientation may be effected by extruding a primary tube which is subsequently quenched, reheated and then expanded by internal gas pressure to induce
30 transverse orientation, and drawn by differential speed nip or conveying rollers at a rate which will induce longitudinal orientation.

The processing to obtain an oriented blown film is known in the art as a double bubble technique, and can be carried out as described by

Pahlke in U.S. Patent No. 3,456,044. More particularly, a primary tube is melt extruded from an annular die. This extruded primary tube is cooled quickly to minimize crystallization. It is then heated to its orientation temperature (for example, by means of a water bath). In the orientation zone of the film fabrication unit a secondary tube is formed by inflation, thereby the film is radially expanded in the transverse direction and pulled or stretched in the machine direction at a temperature such that expansion occurs in both directions, preferably simultaneously; the expansion of the tubing being accompanied by a sharp, sudden reduction of thickness at the draw point. The tubular film is then again flattened through nip rolls. The film can be reinflated and passed through an annealing step (thermofixation), during which step it is heated once more to adjust the shrink properties.

The thermoplastic film may also be laminated to a substrate such as foil, paper or nonwoven fibrous material to provide a packaging material useful in this invention. The packaging material may also be processed further by, for example but not limitation, printing, embossing, and/or coloring to provide a packaging material to provide information to the consumer about the product therein and/or to provide a pleasing appearance of the package.

Preferably, a film useful in this invention can be processed on a film fabrication machine at a speed from about 50 meters per minute (m/min) to a speed of about 200 m/min.

As indicated above, the present invention provides a method of forming in a horizontal form, fill and seal machine a product-enclosing package having an envelope with a face panel extending between opposite sides and end edges, and including folding a single wrapper sheet from opposite sides of the face panel into a tubular envelope shape and bringing longitudinal margins of the sheet material into position opposite said face panel and sealing the margins together into a seam extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the

sealed edge, and then effecting cross seals at said opposite end edges of the envelope.

The present invention also provides a method of producing a wrapped bulky product-enclosing package, comprising

5 forming a sheet into a wrapper having a face panel extending between opposite sides and end edges of the wrapper;

folding the wrapper from opposite sides of the face panel into a tubular envelope shape;

10 sealing longitudinal margins of the wrapper into a seam opposite said face panel and extending between said end edges of the wrapper, such that said seam is sealed at the edge to form a pilfer-proof seal;

providing zipper means comprising reclosable separable fastener profiles aligned parallel to the edge of said seam,

15 providing said zipper means in the form of profiled resiliently flexible separable zipper strips; and

forming cross seals at said opposite end edges of the wrapper.

The present invention further provides a form, fill and seal machine for enclosing a product in a package envelope and adapted to receive a single continuous strip of wrapper sheet, and for folding said wrapper sheet into an envelope about the product and sealing the envelope; and
20 comprising

25 means for receiving the sheet from source and with the sheet having a longitudinally extending panel area for engagement with a face of the product and longitudinal portions that extend laterally beyond the panel area with longitudinal margins of the sheet material;

means for delivering product to said panel area on said receiving means;

30 means for moving said longitudinal portions toward one another into envelope relation about the delivered product in cooperation with said panel area;

means for inserting a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the edges of said longitudinal

portions and attaching said zipper strip within the margins of said longitudinal portions;

means for sealing margins of said longitudinal portions across said product;

5 means for cross sealing end edges of the envelope for fully enclosing the product within the envelope.

These embodiments of this invention can be understood by referring to Figures 3, 4 and 5. In these Figures, direction of travel is indicated by dashed arrows and direction of rotation is indicated by curved dashed
10 arrows.

Figure 3 shows a top perspective view of a FFS apparatus (30). A continuous web of wrapper sheets (31) is supplied in the form of a roll (32) supported on a rotatable wheel that has a horizontal axis oriented perpendicular to the direction of web travel through the apparatus. The
15 web (31) comprises a series of contiguous wrapper sheet blanks, optionally printed as previously described and repeated at regular intervals corresponding to the length of the wrapper sheet blank. One or more optional festoon or film feed rollers (33) provide effective breaking and web tension control. The web of wrapper sheets (31) is typically supplied from
20 the supply roll (32) as a flat sheet.

A package former (35), typically made of stainless steel or aluminum, is sized to form the web into a tubular envelope of the desired dimensions to enclose the bulky product (36). The web travels through the package former such that the center area (38) of the web forms the top
25 face of the tubular envelope, the two areas adjacent to the center area (39) and (40) form the opposed sides of the envelope and the two outermost areas (41) and (42) form the bottom face of the envelope. The package former folds the longitudinal margins of the wrapper sheet into a position substantially perpendicular to the bottom face of the tubular envelope and
30 parallel to the direction of web travel so that said longitudinal margins have interior faces adjacent to one another. Concurrently, a continuous strip of zipper means (42) comprising interengaged zipper profiles is supplied from a supply roll (43). The zipper strip is drawn into the package former (35)

between the longitudinal margins of the wrapper sheet web (31) and engages said longitudinal margins so that the exterior faces of the zipper strip contact a portion of each of the interior faces of said longitudinal margins to form a fin seal. A sealing platen (not shown), comprising a metal plate with a slot to hold the zipper, aligns the zipper parallel to the longitudinal margins.

In one embodiment of this invention, the zipper is drawn into the former such that it extends the entire length of the wrapper sheet blank and is subsequently cut to length during the end seal and cutting operation described below. In this embodiment, the ends of the zipper are sealed into the sealed ends of the fin seal.

In an alternative embodiment, the zipper is drawn from its source, indexed to the wrapper sheet, cut to discrete lengths and inserted between the longitudinal margins of the wrapper sheet such that the zipper does not extend into the ends of the longitudinal margins that are subsequently sealed during the end seal and cutting operation. This embodiment eliminates the need to form the end seal through the zipper. For example, in a package in which the fin seal has 0.5 cm- wide end seals, the zipper is cut to a length at least 1 cm shorter than the length of the wrapper sheet and inserted between the longitudinal margins of the wrapper sheet such that each end of the zipper is positioned at least 0.5 cm away from the end of the wrapper sheet. This embodiment provides for insertion of the zipper in a manner that allows the ends of the fin seal to be sealed without sealing the ends of the zipper.

The product (36) is conveyed into the package former (35), typically by means of a horizontal input conveyor belt (44), to engage and be contained within the tubular envelope. A conveyor chain may also be used in similar fashion. The conveyor belt extends to the input end of the package former (35) so as to load the product at regularly spaced intervals corresponding to the longitudinal dimension of the wrapper sheet blanks. The input conveyor belt may be driven in timed relation to the web of wrapper blanks by, for example, a timing belt or chain connecting the respective drives.

The tubular envelope containing the product is drawn from the package former through the fin seal area (45) comprising one or more pairs of heated rotary fin seal wheels (46) situated below the web on opposite sides of the fin seal. Each rotary fin seal wheel is profiled with a circumferential groove or channel to accommodate the wider profile of the zipper and help align the zipper parallel to the longitudinal margins. The heated rotary fin seal wheels seal the fin seal by application of heat and pressure, adhering the exterior faces of backing portions of the zipper strip to the interior faces of the longitudinal margins and fusing the interior faces of the longitudinal margins to each other to form a pilfer-proof seal in the fin seal. A product (48) is illustrated in cutaway view to show the fin seal (50) below the tubular envelope. The fin seal wheels may be driven in timed relation to the web of wrapper blanks by, for example, a timing belt or chain connecting the respective drives.

The tubular envelope, with a fused fin seal, is drawn to the rotary end crimp and cut-off assembly (52). The end crimp assembly, also known as an end sealer and cutter, comprises a set of opposed, heated rotary wheels placed above and below the packaging web, (54) and (55) respectively, and oriented perpendicular to the direction of web travel. The wheels rotate so that crimper bars (56) and (57) apply heat and pressure to the web to form cross seals. As indicated previously, the fin seal (50) is preferably folded from perpendicular to the face of the package to substantially parallel to the face of the package and in contact with said face. When the fin seal is folded in said manner, the ends of the fin seal (19 and 20 of Fig. 2), which in one embodiment include the ends of the zipper strip, are sealed by the cross-sealing operation. In an alternative embodiment (see above), the ends of the zipper are not included in the ends of the fin seal and are not sealed in this operation. The crimper bars (56) and (57) also comprise opposed knife and anvil cut-off means (not shown) to cut and separate the web into individual packages (60) of the invention. In this view, the fin seal is on the bottom face of the completed package. The end crimper wheels (54) and (55) may be driven in timed

relation to the web of wrapper blanks by, for example, a timing belt or chain connecting the respective drives.

A discharge conveyor (61) removes the finished package from the end sealer area.

5 Figure 4 shows a side perspective view of an apparatus similar to that illustrated in Figure 3. The products (36) are conveyed to the package former (35) by a conveyor belt (44). The web (31) and zipper (42) are drawn into the package former as previously described for Figure 3. The fin seal area (45) illustrated in Figure 4 comprises two pairs of rotary fin seal wheels (46 and 64) and their respective drive motors (65) and (66).
10 The pair of fin seal wheels (46) closest to the package former (35) applies heat and pressure to adhere the zipper element to the longitudinal margins of the tubular envelope. This set of wheels is profiled so that, in cooperation with a sealing platen, it can align the zipper parallel to the
15 longitudinal edges as it adheres the zipper to the envelope. The second pair of fin seal wheels (64) seals the longitudinal margins below the zipper into a hermetic pilfer-proof seal. Also shown is an optional wheel (67) and its drive (68) to fold the fin seal from an orientation perpendicular to the bottom face of the tubular envelope to an orientation parallel to said bottom
20 face prior to entering the end crimp and cut-off area (52). As indicated above, the crimper bars (56) and (57) also comprise opposed knife and anvil cut-off means to cut and separate the web into individual packages (60) of the invention. In this Figure, the upper crimper bar (56) comprises a knife (70) and the lower crimper bar (57) comprises a surface to serve as
25 an anvil. The knife (70) is designed to extend from the crimper bar (56) and engage the package web against the anvil to cut the package (60) off the web. In alternative arrangements, the knife may be situated in the crimper bar below the web and the anvil situated in the crimper bar above the web.

30 It is desirable that the individual package forming, filling and sealing operations described above be conducted in timed relationship to one another, such that the machine operates efficiently throughout the entire process.

Figure 5 shows a schematic detail of the fin seal area (45) of the apparatus described above in Figure 3, viewed from the dashed line A-A' toward the package former area (35). The fin seal area comprises a deck plate (80), a pair of heated rotary fin seal wheels (46), and a seal platen (82). The deck plate supports the tubular envelope (2) of the wrapper sheet (31) that encloses the bulky product (36). It also has a slot (83) to allow the longitudinal margins of the wrapper sheet to enter the space between the rotary fin seal wheels (46) from the top surface of the deck plate. The slot also helps align the longitudinal margins of the wrapper sheet in an orientation perpendicular to the bottom face of the tubular envelope (2). The zipper strip, comprised of interlocking profiles (85) and (86), enters the area between the rotary fin seal wheel below the deck plate. In this Figure, a double-flange zipper is illustrated. The seal platen (82) in the slot (83) serves to align the zipper strip and the longitudinal margins of the wrapper sheet in a parallel orientation.

The fin seal wheels (46) have profiles comprising circumferential grooves or channels (47). The grooves accommodate the wider profile of the zipper strip (85) and (86) and help align the zipper parallel to the longitudinal margins. The grooves are profiled such that the exterior face of the zipper backing and the interior face of the longitudinal margins of the tubular envelope are in close contact without crushing the zipper. The specific profile of the grooves will be dependent on the dimensions of the zipper and the width of the desired fin-seal employed in a particular package. One skilled in the art of packaging machine design will be able to readily ascertain the groove profile necessary and modify the fin seal wheel accordingly. As indicated above, the rotary fin seal wheels are heated to seal the fin seal by application of heat and pressure. By these means, the exterior faces of the zipper strip are adhered to the interior faces of the longitudinal margins in the area between the grooves. The remainder of the interior faces of the longitudinal margins are held in close contact by the wider portions of rotary fin seal wheels and are fused to each other to form a pilfer-proof seal in the fin seal.

In addition to the components described above, machines of this invention may also comprise additional components such as drive motors and wheels, control equipment, safety equipment, and the like to enable proper operation of the packaging functions. Machines may be equipped with apparatus to provide an optional notch in the fin seal to guide severing the seal and exposing the zipper. For example, the notch can be provided by scoring the end of the fin seal during the end seal operation. Machines may be equipped with apparatus to provide an optional pleat or gusset in the sides of the tubular envelope prior to end sealing. Machines may also be provided with additional components pertinent to the proper treatment of the particular product to be packaged. For example, machines may be provided with apparatus for evacuating or backflushing the packages in accordance with known techniques. These components can be readily ascertained and provided by one skilled in the art of designing and operating horizontal FFS machines.

Figures 3, 4 and 5 illustrated machines in which the packaging wrapper sheet enters the package former from above and the zipper means enter the package former from below, such that the package envelope is formed with the fin seal on the bottom face of the package. However, machines of this invention may also be configured so that the packaging wrapper sheet enters the package former from below and the zipper means enter the package former from above, such that the package envelope is formed with the fin seal on the top face of the package. As indicated above, formation of the fin seal on either the top face or the bottom face of the envelope may be influenced by the general design of available horizontal FFS machines that can be modified in accordance with this invention. Furthermore, the type of product to be contained in the package and/or other factors may influence whether it is desirable to have the fin seal formed on the top or bottom face and, consequently, the choice of machine configuration.

Existing horizontal form, fill, and seal machines, also called horizontal flow wrappers, can be readily adapted to serve as an apparatus to prepare packages of this invention with only relatively minor

modifications and investment. Such modifications include, for example, placing rotary fin seal wheels with appropriate grooves or channels in the fin seal area and providing means for supplying zipper strips and guiding them into the fin seal area. Examples of horizontal form, fill, and seal machines suitable for adaptation for use in this invention include but are not limited to the following:

- Mustang and Mustang II, manufactured by SIG Dobby, New Richmond, Wisconsin;
- FW-340A, manufactured by Fuji-Formost Packaging Machines, Woodinville, Washington;
- FMC WA-120, manufactured by Circle Packaging Machine Co., Green Bay, Wisconsin;
- RT-113, manufactured by Hayssen Inc., Duncan, South Carolina; and
- Delta P, manufactured by Delta Packaging Systems, Rogers, Arkansas.

CLAIMS

What is claimed is:

1. A package construction, comprising a single sheet or wrapper having a face panel extending between opposite sides and end edges, said sheet material being folded from opposite sides of the face panel into a tubular envelope shape and with longitudinal margins of the sheet material sealed into a seam opposite said face panel and extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the sealed edge, and cross seals at said opposite end edges of the envelope.

2. The package according to Claim 1 wherein said seam has means for guiding severance or rupture for opening the pilfer-proof seal.

3. The package according to Claim 2 wherein said guiding means comprises at least one notch at the end of the seam aligned between the pilfer-proof seal and the zipper strip.

4. A material especially adapted for packaging in a horizontal form, fill and seal machine a blocky product having opposite faces and edges between said faces, comprising

a wrapper sheet having a panel area for engagement with a face of said product;

said sheet having portions that extend beyond said panel area and which are adapted to be wrapped into an envelope about said product by bringing said portions along said product edges and into overlying relation on the opposite face of said product;

said wrapper sheet being dimensioned to provide for cross seals at the ends of the envelope;

free margins of the wrapper sheet portions being adapted to be secured into a seam over said opposite face of said product having a pilfer-proof seal and adapted to be severed or ruptured to provide a package mouth opening for access to the product in the envelope, and the mouth

opening being reclosable with reclosable zipper means aligned parallel to the pilfer-proof seal;

said zipper means comprising profiled resiliently flexible separable zipper strips.

5 5. A method of forming in a horizontal form, fill and seal machine a product-enclosing package having an envelope with a face panel extending between opposite sides and end edges, and including folding a single wrapper sheet from opposite sides of the face panel into a tubular envelope shape and bringing longitudinal margins of the sheet
10 material into position opposite said face panel and sealing the margins together into a seam extending between said end edges of the envelope, such that said seam is sealed at the edge to form a pilfer-proof seal and said seam comprises a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the sealed edge, and then
15 effecting cross seals at said opposite end edges of the envelope.

6. The method according to Claim 5, wherein said seam is formed by bringing said margins together in a projecting relation away from the said face panel, inserting and adhering a zipper strip portion and heat sealing the margins together.

20 7. The method according to Claim 6, which comprises providing said seam with means for guiding severance or rupture for opening the pilfer-proof seal.

8. A method of producing a wrapped bulky product-enclosing package, comprising

25 forming a sheet into a wrapper having a face panel extending between opposite sides and end edges of the wrapper;

 folding the wrapper from opposite sides of the face panel into a tubular envelope shape;

30 sealing longitudinal margins of the wrapper into a seam opposite said face panel and extending between said end edges of the wrapper, such that said seam is sealed at the edge to form a pilfer-proof seal;

 providing zipper means comprising reclosable separable fastener profiles aligned parallel to the edge of said seam,

providing said zipper means in the form of profiled resiliently flexible separable zipper strips; and

forming cross seals at said opposite end edges of the wrapper.

9. A form, fill and seal machine for enclosing a product in a
5 package envelope and adapted to receive a single continuous strip of wrapper sheet, and for folding said wrapper sheet into an envelope about the product and sealing the envelope; and comprising

means for receiving the sheet from source and with the sheet having a longitudinally extending panel area for engagement with a face of
10 the product and longitudinal portions that extend laterally beyond the panel area with longitudinal margins of the sheet material;

means for delivering product to said panel area on said receiving means;

means for moving said longitudinal portions toward one another into
15 envelope relation about the delivered product in cooperation with said panel area;

means for inserting a zipper strip portion comprising reclosable separable fastener profiles aligned parallel to the edges of said longitudinal portions and attaching said zipper strip within the margins of said
20 longitudinal portions;

means for sealing margins of said longitudinal portions across said product;

means for cross sealing end edges of the envelope for fully enclosing the product within the envelope.

25

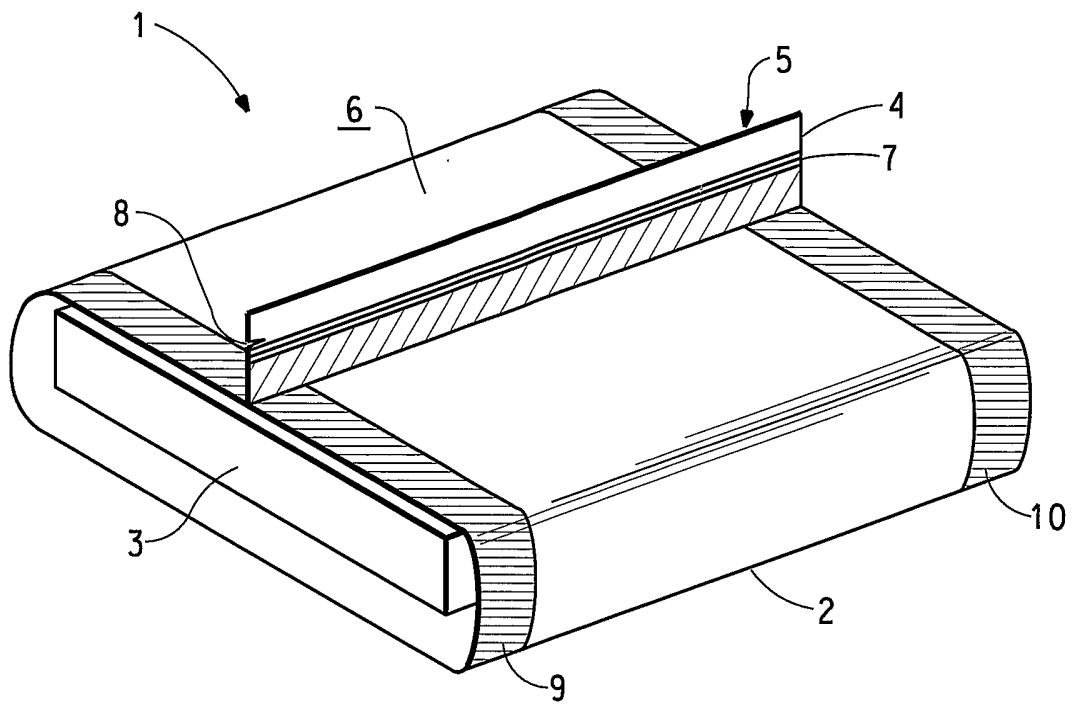


FIG. 1

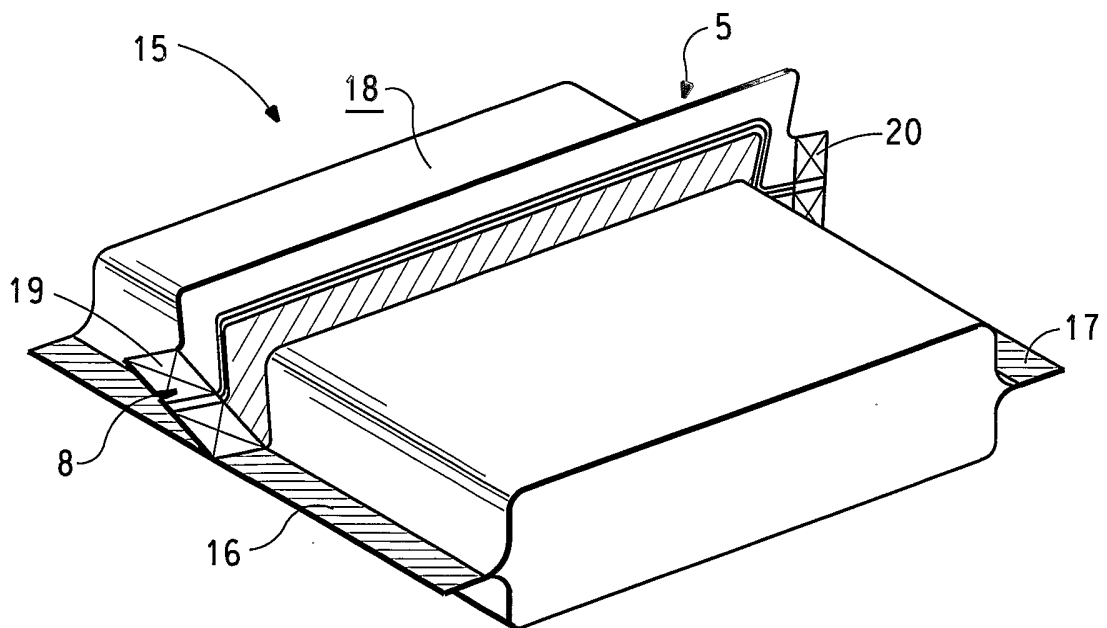
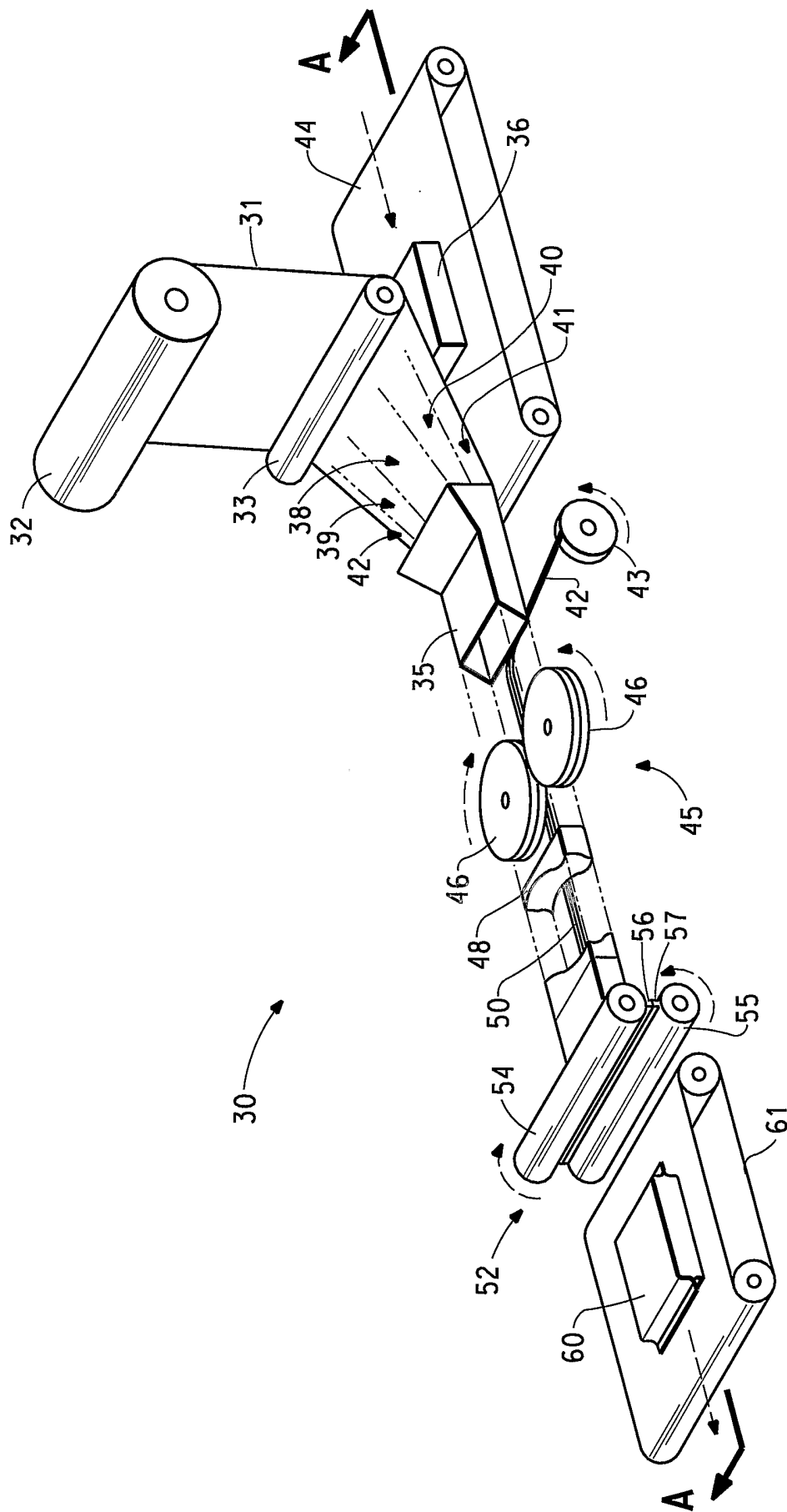


FIG. 2



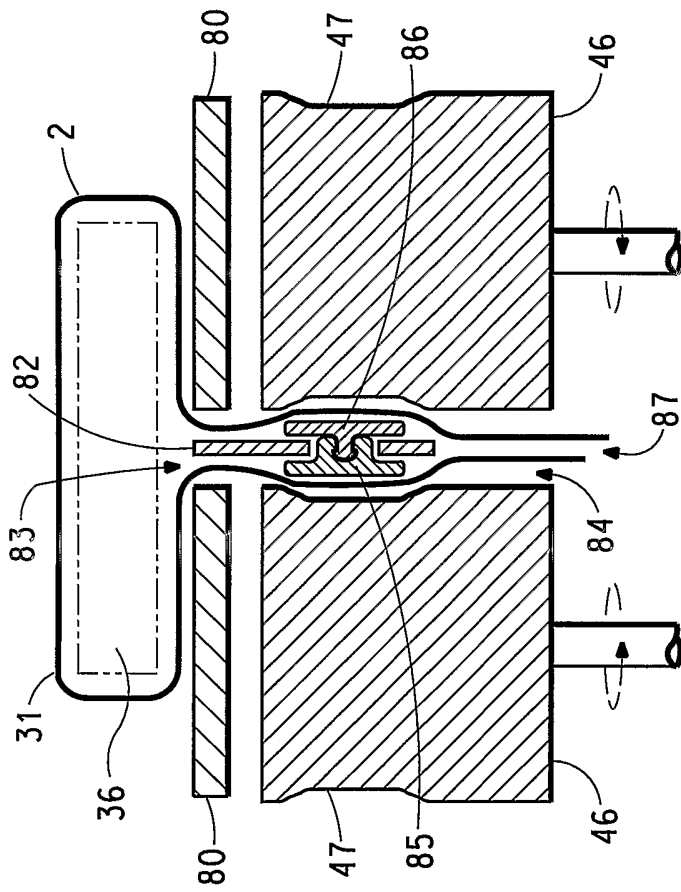


FIG. 5

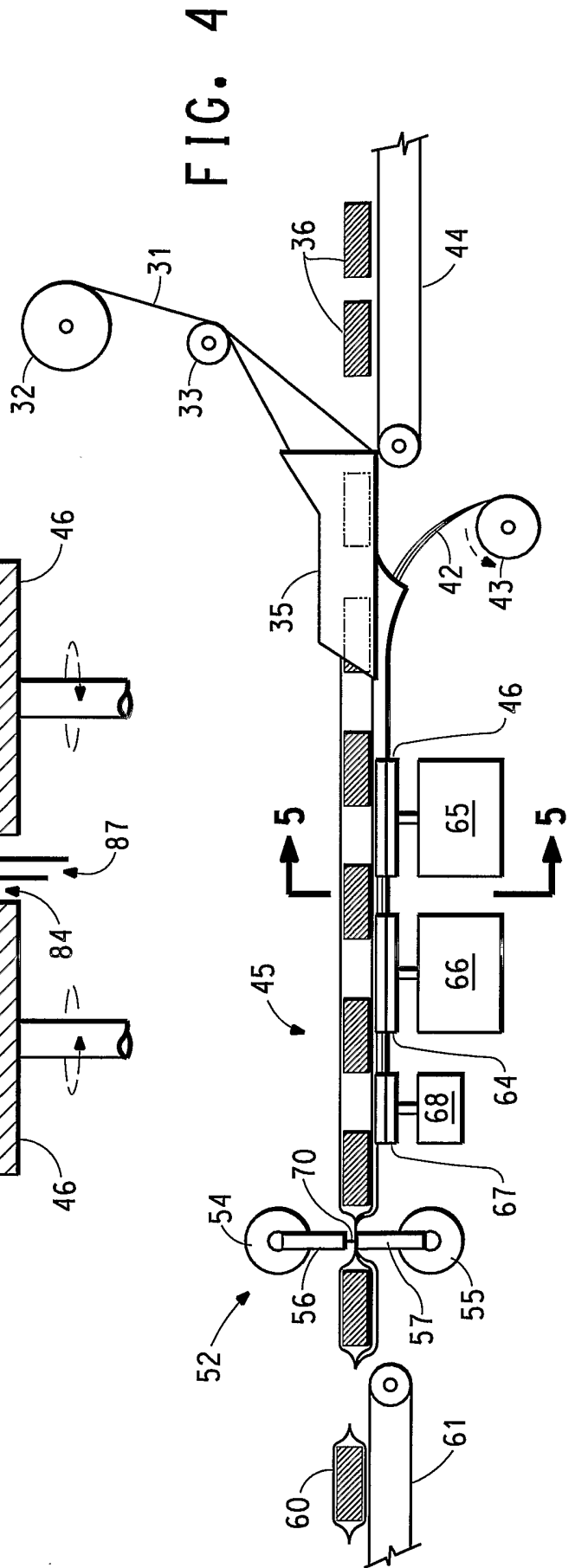


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/006468

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D33/25 B65B61/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D B65B

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

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

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	page 6, line 6 - page 9, line 2; figure 2	7
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Y	paragraph '0027! - paragraph '0034!; figures 3,4	7,9
Y	US 4 874 257 A (INAGAKI HIROMICHI) 17 October 1989 (1989-10-17) cited in the application column 3, line 58 - column 4, line 26; figures 14,16	9

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

9 July 2004

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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