

[54] **PACKAGING MATERIAL, PACKAGES AND METHOD OF MAKING SAME**

[75] Inventor: **John E. Snow**, Minneapolis, Minn.

[73] Assignee: **RAP Industries Inc.**, Minneapolis, Minn.

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[63] Continuation of Ser. No. 538,859, March 30, 1966, abandoned.

[52] U.S. Cl. **161/250**, 117/76, 117/138.8, 156/244, 206/59, 264/171

[51] Int. Cl. **B32b 27/10**, B32b 31/30, B29c 24/00, D21h 1/28, B29f 3/00

[58] Field of Search 117/76 P, 76 T, 232, 117/128, 138.8 E, 138.8 A, 138.8 UA, 155 UA; 161/232, 252, 270, 250; 156/244; 264/171; 220/83; 206/59 EF

[56]

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Primary Examiner—Philip Dier

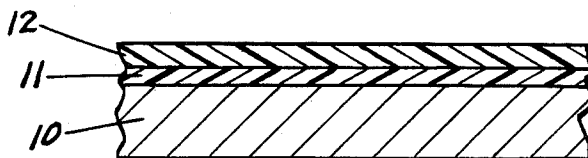
Attorney—Donald A. Gardiner et al.

[57]

ABSTRACT

This invention relates to a novel heat sealable packaging sheet material which is resistant to the transmission of oils and greases and to the strong durable packages made from such material.

5 Claims, 5 Drawing Figures



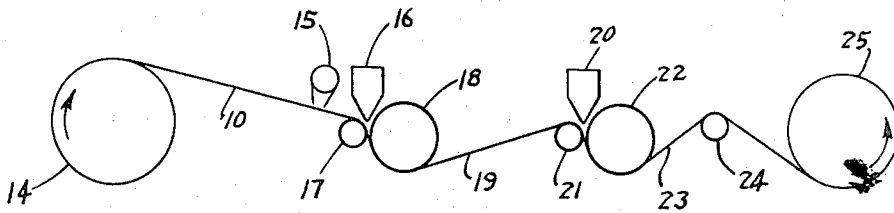


FIG. 3

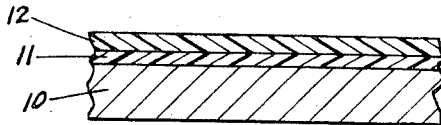


FIG. 1

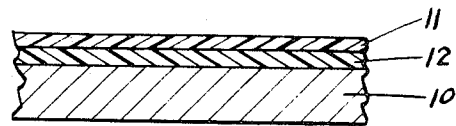


FIG. 2

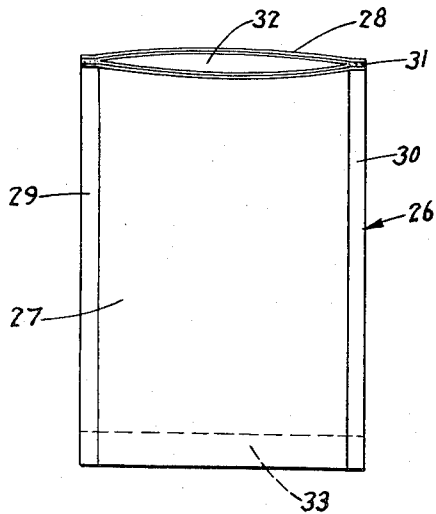


FIG. 4

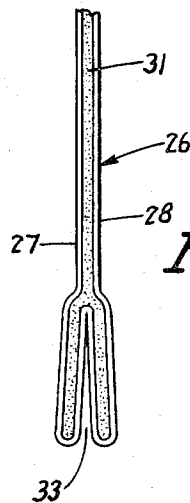


FIG. 5

INVENTOR.
JOHN E. SNOW
BY
Braddock & Burd
ATTORNEYS

PACKAGING MATERIAL, PACKAGES AND METHOD OF MAKING SAME

RELATED CASES

This is a continuation of copending case 538,859 filed Mar. 30, 1966 now abandoned.

SUMMARY AND BACKGROUND OF INVENTION

This invention relates to a novel heat sealable packaging sheet material which is resistant to the transmission of oils and greases and to the strong durable packages made from such material.

For greater economy in packaging and shipping of many materials, notably foodstuffs, it is desirable that they be packaged in flexible pouches or bags instead of rigid boxes or cartons. For greater economy in the packaging operation and effectiveness of the seal it is desirable that such pouches or bags be heat sealable. While such packages have been available and have been used for many years, they have been susceptible to certain fundamental defects. Among these have been brittle seals and seams which have been subject to breakage and leakage in handling. Breakage of a package and spillage of its contents not only results in the loss of that package and its contents, but often results in damage of other packages shipped in the same case. Breakage of seals or opening of seams and consequent spillage, and possible spoilage of the contents, is destructive of good will whether it occurs in the normal distribution channels or in the hands of the ultimate consumer.

The problem becomes more acute in the case of some food products, such as cake mixes, pancake mixes, cookie mixes, particularly butter cookies, biscuit mixes, soup mixes, mixes for snack dips, and the like, which may contain an oily or greasy ingredient, such as shortening, butter, lard, margarine, hydrogenated oils and the like. Such materials are particularly difficult to package so as to prevent transmission of the oily or greasy ingredient through the package surfaces. The combination of grease resistance with good heat sealability to produce a strong durable package has been particularly difficult to achieve. Small breaks in the seals or openings in the seams can result in deterioration of the contents. Spillage of package contents having oily or greasy ingredients on adjacent packages can so deface those packages as to render them unsalable. It is to the solution of these problems that the present invention is directed.

It is the principal object of this invention to provide in sheet form a packaging material which is at the same time resistant to the transmission of oils or greases through the sheet and heat sealable to produce a strong durable pouch or bag.

Other objects of the invention will become apparent as the description proceeds.

The invention is illustrated by the drawings in which the same numerals refer to corresponding parts and in which:

FIG. 1 is a fragmentary section, greatly enlarged, showing the structure of one form of sheet packaging material according to the present invention;

FIG. 2 is a similar section showing another form of sheet packaging material;

FIG. 3 is a schematic representation of one process by which the packaging materials may be made;

FIG. 4 is a front view of a heat sealed pouch or bag formed from the sheet packaging material according to the present invention; and

FIG. 5 is an enlarged fragmentary edge view of the bottom portion of the bag or pouch of FIG. 4.

Broadly stated, the packaging sheet material according to the present invention is composed of a sandwich including a substrate and superimposed layers of an ionomer resin and polyethylene. As seen in FIG. 1, the substrate 10 is provided with a superimposed ionomer resin layer 11 upon which is deposited a polyethylene layer 12. In the structure as illustrated in FIG. 2, the substrate 10 is provided with a superimposed layer of polyethylene 12 upon which is superimposed a layer of ionomer resin 11. Both structures possess the required dominant characteristics of grease resistance and heat sealability.

The substrate 10 may be any one of a number of sheet materials commonly used in fabricating packages. Predominant among these is paper. However, other materials may be used such as metal foils; metal foil paper laminates; cellophane, coated or uncoated; and the like. The substrate functions primarily to impart strength to the completed package and to support the resinous layers. The outer exposed surface of the substrate should in most instances be printable to receive the usual labeling information identifying the contents of the completed package. The substrate may vary in basis weight between about 25 to 80 pounds per standard 3,000 square foot ream.

The ionomer layer 11 is composed of a material from a new family of thermoplastic resins characterized by outstanding toughness and transparency. Their toughness is not affected even by low temperatures and they have good resistance to oils and greases. They are characterized by the presence of covalent ionic bonds in their structure, which contains both organic and inorganic materials. In their simplest form they are copolymers of ethylene and a vinyl monomer with an acid group, such as methacrylic acid. The unique properties of the ionomer are to a great extent dependent on the presence in the polymer structure of strong interchain forces. The bonds involve positively (cationic) and negatively (anionic) charged groups which are disassociated from each other. The negatively charged groups hang from a hydrocarbon chain while the positively charged groups are located between chains. Sodium, potassium, calcium, magnesium or zinc ions are frequently used.

The ionic bonds are predominantly intermolecular, operating between the chains, and are purely electrostatic in nature, involving the actual transfer of an electron from one atomic shell to another. The ionic interchain links in the ionomers strengthen, stiffen and toughen the polymer without destroying its melt fabricability. The ionic linkages become diffuse as the temperature is raised permitting fabrication by conventional thermoplastic techniques. The residual ionic linkages impart outstanding melt strength.

Because of the bridging by inorganic materials in their structure, the ionomer melt process departs somewhat from conventional. The bonds between the metal radicals and the copolymer soften sufficiently under heat to allow very free flow, but return to their original toughness once back to room temperature. This makes it possible to extrude films virtually free from pin holes even in very light gauges.

Ionomers are commercially available from E.I. du Pont de Nemours & Co. (Inc.) under their trademark "Surlyn." "Surlyn" A 1602 is a commercial extrusion coating grade ionomer characterized by being a high molecular weight thermoplastic whose melt viscosity in terms of D-1238-62T is 1.2 decigrams/minute. It has a tensile strength in the range of 5,000 psi and a yield strength in the range of 1,800 psi. A film sample may be elongated about 450 percent before breaking. The polymer has a softening point of 72° C. (160° F.) and a melting point of 96° C. (205° F.). The major anion in this polymer is methacrylate and the major cation is sodium.

The polyethylene which is used may have a density range between about 0.915 to 0.935 and preferably has a density range between about 0.915 to 0.935 and preferably has a density range between about 0.915 to 0.925. Its melt index may range from about 1 to 15 and preferably between about 3 to 12.

Referring to FIG. 3 there is shown schematically one system by which packaging sheet material may be made by extrusion. The web of substrate 10 is fed from a supply roll 14. The substrate 10 is passed under a gas burner 15 whose flame just touches the surface of the substrate to warm the surface and to condition it for better adhesion of the ionomer resin. The heated substrate is then run through an extrusion coating machine. Ionomer resin from an extruder 16 is applied to the heated substrate and passed into the nip between rollers 17 and 18. The ionomer resin may be applied in amounts ranging from about 5 to 22 pounds per standard ream of 3,000 square feet of substrate. The coated substrate is passed around roller 18 with the ionomer layer in contact with the roller surface, which may be cooled to accelerate setting of the resin.

The web of ionomer coated substrate 19 is then passed through an extrusion coating machine. Polyethylene is extruded from an extruder 20 on top of the ionomer layer and then passed into the nip between rollers 21 and 22. The flame treatment is normally omitted from the second coating pass. The polyethylene coating is in contact with the surface of roller 22 as the coated substrate passes around that roller, which may be cooled to accelerate setting of the coating. Polyethylene may be applied in amounts ranging from about 5 to 30 pounds per standard ream of substrate. The web of finished packaging sheet material 23 is then passed over an idler 24 and rewound on a finished product roll 25.

Where desired, the ionomer coated substrate may be rewound and coated with polyethylene at a different time or different place instead of applying both resin layers successively, as illustrated. Where thicker layers may be tolerated, either or both the ionomer resin and polyethylene may be applied as preformed films, both by adhesive lamination, or one layer may be extruded as a coating also functioning as adhesive for the other applied as a film. The order of application of the ionomer resin and polyethylene may be reversed to produce the product as illustrated in FIG. 2. Bags or pouches are made from the finished packaging sheet material in the usual manner on conventional equipment and heat sealed after filling.

As seen in FIGS. 4 and 5, the pouch 26 as formed on a Bartelt machine comprises a front 27 and a back 28 formed from the sheet material folded with the resinous layers innermost. The abutting resin surfaces are heat

sealed by fusing along the opposite side edge margins 29 and 30 to produce tight but flexible seams. The individual resin layers lose their separate identities and merge into a coalesced bonding layer 31 between the front and back substrate panels. After the bag is filled through the top opening 32 the top edge is similarly sealed. The bag shown is formed with an optional bottom gusset 33. Alternatively, the bag may be shaped in tubular form by folding the sheet material longitudinally and heating to form a narrow fin seal between the abutting edge surfaces. Such a tube may be cut into appropriate lengths and sealed top and bottom, as is well known, with the fin seal folded against one of the bag surfaces.

The invention is illustrated by the following examples.

EXAMPLE I

A roll of 40 pound (per 3,000 square foot ream) basis weight paper is passed through an extrusion coating machine and coated with 7½ pounds per 3,000 square foot ream of an ionomer resin (Surlyn A duPont). Just prior to entering the extrusion coating machine the paper is passed under a gas burner whose flame just touches the surface of the paper to warm it and to condition it for better adhesion of the ionomer resin to the paper. The ionomer coating has a thickness of approximately ½ mil. The extrusion machine has a die opening of 0.020 inch and the paper is passed through at a rate of about 200 feet per minute. The ionomer coated paper is then run through an extrusion coating machine and an additional coating of conventional polyethylene is applied at the 10 pounds per 3,000 square foot ream to produce a coating of approximately two-thirds mil thickness. Gusseted pouches made by heat sealing the resulting finished product were filled and subjected to handling tests in simulation of actual handling but of greater severity. Impact resistance is tested by throwing the filled pouches against a hard surface and by dropping against a hard surface from a fixed height. These pouches showed much improved impact and shipping durability as compared with the conventionally used 40 pound paper/7½ pound polyethylene/7½ pound polyvinylidene chloride structure. These latter produce far more brittle seals and open at the seams more readily on impact and shipping tests.

EXAMPLE II

A similar structure is made following the general procedure of Example I. A roll of 40 pound basis weight paper is passed through an extrusion coating machine and coated with 10 pounds of polyethylene and then coated with 7 pounds of ionomer resin (Surlyn A). This resulting sheet material also seals well and when made into pouches possesses the same improved impact resistance noted in Example I.

EXAMPLE III

A laminated packaging sheet material was made by extruding 7 pounds of ionomer resin (Surlyn A) on a web of 35 pound paper in an extrusion coating machine and then immediately laminating a 1 mil film of polyethylene to the extruded ionomer resin layer using the molten ionomer layer as adhesive for the polyethylene film. This material when made into bags showed the same good heat sealability and resistance to damage in handling tests.

Other structures have been made varying the weight of the paper between 25 and 80 pounds, varying the weight of the ionomer resin between 5 and 22 pounds, varying the weight of the polyethylene between 5 and 30 pounds and varying the order of application of the ionomer resin and polyethylene. Each of the structures has possessed the desired qualities of good heat sealability resulting in strong and tight but flexible seams and strong, tight, non-brittle end seals. The material has exhibited excellent resistance to passage of oil and grease when used to package materials containing oily or greasy ingredients.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

I claim:

1. A three layer flexible packaging sheet material characterized by strength, durability, good heat sealability, and oil resistance consisting essentially of paper substrate having at least 25 pounds per 3,000 square feet basis weight, an extruded thin layer of thermoplastic ionomer resin present in the amount of at least 6 pounds, and an extruded layer of polyethylene, said ionomer resin and polyethylene layers being immediately adjacent and extending substantially continuously over one side of said substrate.
2. A packaging material according to claim 1 further characterized by being comprised of a hollow pouch-like container for enclosing an oil or grease containing product, said pouch-like container form having at least

a front wall and a rear wall to enclose opposite sides of the product, the substrate surface of said packaging material being outermost, said envelope form being effected by joining together portions of said material with at least one heat welded longitudinal seam and at least one transverse heat welded end seam.

3. A method of making a three layer flexible packaging sheet material characterized by strength, durability, heat sealability and oil resistance, comprising the steps of extruding onto at least one surface of paper substrate having a basis weight of at least 25 pounds per 3,000 square feet ream,

a thin layer of thermoplastic ionomer resin in the amount of at least 6 pounds per 3,000 square feet, and

a layer of polyethylene, said ionomer and polyethylene layers being immediately adjacent and extending substantially continuously over at least said one surface of said paper substrate.

4. A method of making a packaging material according to claim 3 by forming a hollow pouch-like container from the product of claim 1, said container having at least a front wall and a rear wall to enclose opposite sides of a product to be enclosed therein, the substrate surfaces of said packaging material being outermost on said container, said container being formed by joining together portions of the material into at least one heat-welded longitudinal seam and at least one transverse heat-welded end seam.

5. A method of making a material according to claim 3 further characterized in that the polyethylene is extruded between the ionomer and substrate.

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