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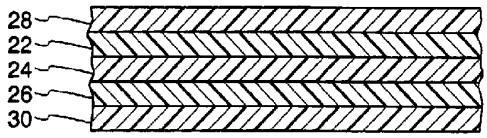
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(54) Title: HEAT SHRINKABLE BARRIER BAGS WITH ANTI BLOCK ADDITIVES



(57) Abstract: A multilayer polymeric film having five layers (28, 22, 24, 26, and 30), wherein an antiblock additive and a slip additive may optionally and independently present in the layers. The film comprises layers (22 and 28) which comprise a blend of two EVA polymers and LLDPE, layer (24) which comprise vinylidene chloride methyl acrylate copolymer, layer (26) which comprises EVA, and layer (30) which comprises a blend of LLDPE and LDPE.

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HEAT SHRINKABLE BARRIER BAGS

WITH ANTI BLOCK ADDITIVES

Field of the Invention

The present invention relates to a five layer heat shrinkable barrier bag wherein an antiblock additive may independently be present in layers 1, 2, 4 and 5. These heat shrinkable film structures are useful in packaging meats.

Background of the Invention

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Polymeric materials have many applications in packaging structures. They are used as films, sheets, lidstock, pouches, tubes and bags. These polymeric materials may be employed as a single layer or one or more layers in a structure. Unfortunately, there are countless polymeric materials available. Furthermore, resin suppliers frequently have a tendency to claim many more applications for a product than the product is actually suitable for. In addition, in view of the specialized applications and processing problems that are encountered despite the suppliers claims, one skilled in the art can not tell whether a particular resin will be suitable for an application unless tested. However, for various reasons there are frequently drawbacks to the use of many of these polymeric materials. For

example, ethylene vinyl alcohol is an excellent oxygen barrier material for use in packaging food products. However, this polymeric material can be affected by moisture that is present in the atmosphere or the packaged product. As a result, it is frequently found that some polymeric materials are better for certain applications than others.

One area where there is a need for suitable resins in film applications is in the area of heat shrinkable films. Heat shrinkable polymeric films are commonly used in packaging meats, particularly primal meat cuts and other large pieces of meat. While this description will detail the usage of films for packaging meat and meat by-products, it will be understood that these films are also suitable for packaging a myriad of other products, both including food products and non-food products.

Some of the films embodying the present invention are intended to be used by meat packers in the form of heat shrinkable bags with one opened end, which bags are closed and sealed after insertion of the meat. After the product is inserted, air is usually evacuated from the package and the open end of the bag is closed. Suitable methods of closing the bag include heat sealing, metal clips, adhesives etc. Heat is applied to the bag once sealing is completed to initiate shrinkage of the bag about the meat.

In subsequent processing of the meat, the bag may be opened and the meat removed for further cutting of the meat into user cuts, for example, for retail cuts or for institutional use.

Suitable shrink bags must satisfy a number of criteria. Many bag users seek a bag that is capable of surviving the physical process of filling, evacuating, sealing

and heat shrinking. For example, during the shrinking process great stress can be placed on the film by the sharp edges of bone in the meat. The bag must also have sufficient strength to survive the material handling involved in moving the large cuts of meat, which may weigh fifty pounds or more, along the distribution system.

Because many food products including meat deteriorate in the presence of oxygen and/or water, it is desirable that the bags have a barrier to prevent the infusion of deleterious gases and/or the loss or addition of moisture.

Conventional packaging for many products has frequently been made of multiple layer films having at least three layers. These multiple layer films are usually provided with at least one core layer of either an oxygen barrier material such as a vinylidene chloride copolymer, ethylene vinyl alcohol, a nylon or a metal foil preferably aluminum. Heat shrinkable meat bags, for example, have generally used vinylidene chloride copolymers. The copolymer of the vinylidene chloride may, for example, be a copolymer with vinyl chloride or methyl acrylate. Collapsible dispensing tubes have generally used one or more foil layers. The foil layers in addition to supplying an oxygen barrier also provide the dispensing tube with "deadfold", *i.e.*, the property of a collapsible dispensing tube when squeezed to remain in the squeezed position without bouncing back.

Outer layers of films used in packaging food products can be any suitable polymeric material such as linear low density polyethylene, low density polyethylene, ionomers including sodium and zinc ionomers, such as Surlyn®. In conventional shrink bags, the outer layers are generally linear low density polyethylene or blends thereof. Suitable outer layers for meat bags are taught by

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U.S. Patent No. 4,457,960 to Newsome, the disclosures of which are incorporated herein by reference.

United States Patent No. 4,894,107 to Tse *et al.* commonly assigned to American National Can discloses novel films and processes for making them. The films are characterized by having first and second layers whose compositions have a significant fraction of ethylene vinyl acetate (EVA). A third layer of vinylidene chloride copolymer (VDC-CP) is disposed between the first and second layers. The composition of at least one of the first and second layers is a blend of 10% by weight to 90% by weight linear low density polyethylene (LLDPE) and 90% to 10% EVA. These polymeric films are useful as heat shrinkable polymeric films. The film may be unoriented or oriented. Oriented films may be optionally cross-linked.

While conventional films have been suitable for many applications, it has been found that there is a need for films that are stronger and more easily processed than conventional films. In meat bags, there is a need for films and bags that have superior toughness and sealability and the ability to undergo cross-linking without undue deterioration.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

It is an object of a particularly preferred form of the present invention to provide relatively improved structures, including single and multi-layer films, sheets, lidstock, pouches, tubes and bags. In particular, structures for use in shrink bags wherein the shrink bags are capable of withstanding production stresses and the shrink process.

Summary of the Invention

According to a first aspect of the present invention there is provided a multiple layer polymer film, comprising:

a first layer, the composition of said first layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer and slip additive;

a second layer, the composition of said second layer comprising ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces;

a third layer, the composition of said third layer comprising vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer;

a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer;

a fifth layer, the composition of said fifth layer comprising a blend of linear low density polyethylene and low density polyethylene wherein said fifth layer is adhereed to said second layer on the surface opposite said third layer; and

wherein an antiblock additive and a slip additive are present in one or more layers 1, 2, 4 and 5.

According to a second aspect of the present invention there is provided a bag made from a multiple layer polymeric film according to the first aspect of the present invention, wherein said fourth layer further comprises an antiblock additive wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the layer; or wherein said antiblock additive is a blend of two or more antiblock additives.

According to a third aspect of the present invention there is provided a bag made from a multiple layer polymeric film according to the first aspect of the present invention, wherein said fourth layer further comprises an antiblock additive wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the layer; or wherein said antiblock additive is a blend of two or more antiblock additives; and wherein said multiple layer polymeric film is molecularly oriented.

A particularly preferred form of the present invention provides a multiple layer polymeric film according to the first aspect of the present invention, wherein said fourth layer further comprises an antiblock additive wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the

layer, and/or wherein said antiblock additive is a blend of two or more antiblock additives, said polymeric film comprising:

a first layer, the composition of said first layer comprising a blend of 80% by weight of ethylene vinyl acetate copolymer; 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer and 0.35% by weight of slip additive;

a second layer, the composition of said second layer comprising 100% ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces;

a third layer, the composition of said third layer comprising 100% vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer;

a fourth layer, the composition of said fourth layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer; a slip additive; an antiblock additive and processing aids, wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and

a fifth layer, the composition of said fifth layer comprising a blend of 90% linear low density polyethylene and 10% by weight of low density polyethylene wherein said fifth layer is adhereed to said second layer on the surface opposite said third layer.

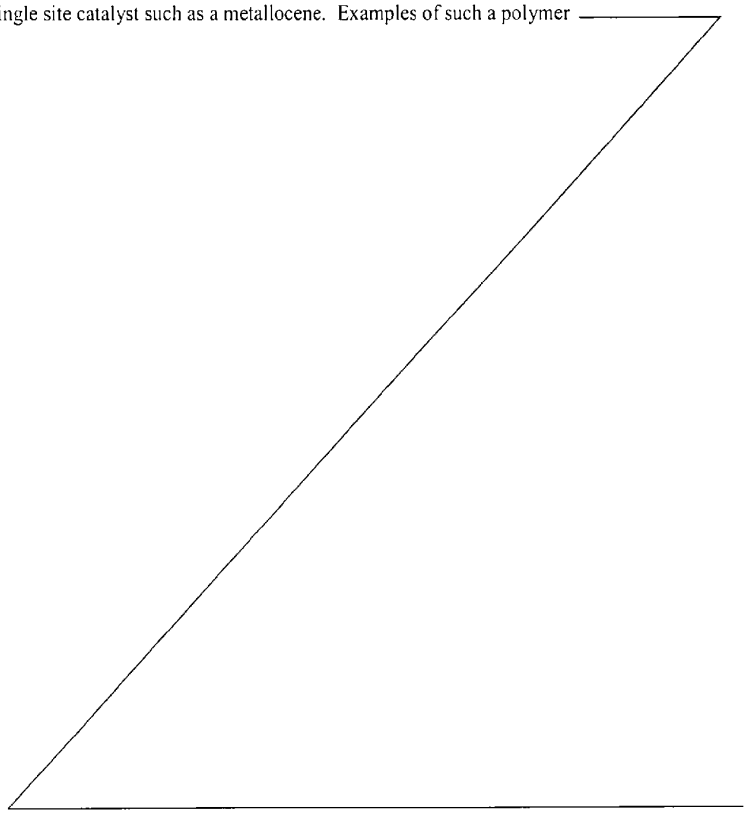
Broadly, the present invention provides a bag made from a multiple layer polymeric film according to the first aspect of the present invention, wherein said fourth layer further comprises an antiblock additive wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the layer; or wherein said antiblock additive is a blend of two or more antiblock additives; and wherein the composition of said first layer comprises a blend of 80% by weight of ethylene vinyl acetate copolymer, 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip additive;

the composition of said second layer comprises 100% ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces;

the composition of said third layer comprises 100% vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer;

the composition of said fifth layer comprises a blend of 90% linear low density polyethylene and 10% by weight of low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer; and wherein the composition of said fourth layer comprises 77.60% by weight of ethylene vinyl acetate copolymer, 9.7% by weight of linear low density polyethylene, 9.36% by weight of a second ethylene vinyl acetate copolymer, 0.34% by weight of slip additive, 1.0% by weight of an antiblock additive and 2% by weight of processing aids.

The structures of the present invention may be single or multilayer films, sheets, lidstock, pouches, containers, tubes and bags where at least one layer contains a polymer, usually a copolymer, formed by a polymerization reaction in the presence of a single site catalyst such as a metallocene. Examples of such a polymer



are ethylene and propylene polymers and copolymers thereof. One preferred copolymer is a copolymer of ethylene and an alpha olefin where such alpha olefin has a carbon chain length of from C_3-C_{20}. The structures of the present invention may also include blends of polymers and copolymers formed by a polymerization reaction with a single site catalyst or blends of a polymer and copolymer formed by a polymerization reaction with a single site catalyst and another polymeric material. Examples of suitable polymers for blending include: high and medium density polyethylene (HDPE, MDPE), linear low density polyethylene (LLDPE), low density polyethylene (LDPE), ethylene vinyl acetate (EVA), ultra low density polyethylene (ULDPE or very low density polyethylene VLDPE), and ionomers such as Surlyn®. Polymers made from single site catalyst, preferably metallocene catalysts, provide increased strength, particularly seal, burst, impact and puncture as well as improved optics and faster bag making/sealing speeds.

The present invention may also be a multilayer structure of at least three layers wherein the core layer is a barrier layer. In one embodiment of the present invention, there may be a first outer layer of an ethylene or propylene polymer or copolymer formed by a polymerization reaction in the presence of a single site catalyst, a barrier layer and a second outer layer of a polymeric material. The second outer layer may be an ethylene or propylene polymer or copolymer formed by a polymerization reaction in the presence of a single site catalyst or a layer of another polymeric material such as high density polyethylene, medium density polyethylene, linear low density polyethylene, ultra low density polyethylene, low density polyethylene, ethylene vinyl acetate, an ionomer or blends thereof. The first outer layer may also be a blend of the ethylene copolymer with another suitable

polymeric material such as described above. A preferred polymer formed by a single site catalyst is a copolymer of ethylene and an alpha olefin such as 1-octene. Additional layers such as adhesive layers or other polymeric layers may be interposed in the structure between one or both of the outer layers or on top of one or both of the outer layers. The structure of the present invention may be rendered oriented either uniaxially or biaxially and cross-linked by any suitable means, such as for example irradiation or chemical cross-linking.

Brief Description of the Drawings

Figure 1 is a side view of a three layer structure of the present invention.

Figure 2 is a side view of a five layer film of the present invention.

Figures 3-6 are examples of the structure of metallocene catalysts which could be used in the polymerization of the polymer used in the structures of the present invention.

Detailed Description of the Invention

The structures of the present invention include films, sheets, lidstock, pouches, containers, tubes and bags. These structures may be a single layer or multi-layer structure. The structures are comprised of polymers that have been polymerized in the presence of a single site catalyst, such as a metallocene. A metallocene is a complex organometallic molecule typically containing zirconium or titanium, with a pair of cyclic alkyl molecules. More specifically, metallocene catalysts are usually compounds with two cyclopentadiene rings fixed to the metal. These catalysts are frequently used with aluminoxanes as a cocatalyst or an activator, one suitable aluminozane is a methaluminoxane (MAO). Besides, titanium and zirconium, hafnium may also be used as the metal to which the

cyclopentadiene is bonded. Alternative metallocenes may include Group IVA, VA and VIA transition metals with two cyclopentadiene rings. Also mono-cyclopentadiene rings or silyl amides may alternatively be in the metallocene instead of two cyclopentadienes. Other metals to which the cyclopentadiene may be attached may include the metals in the lanthanide series. Figures 3, 4, 5 and 6 show representative metallocenes that are suitable single site catalysts.

While the reaction mechanism is not completely understood, it is believed that the metallocene, single site catalyst confines the copolymerization reaction to a single site over the polymer thus controlling comonomer placement and side chain length and branching. The copolymers formed from metallocene single site catalysts are highly stereo regular products with narrow molecular weight distribution. The metallocenes can be used to polymerize ethylene, propylene, ethylenic and acetylenic monomers, dienes and carbon monoxide. Comonomers with ethylene and propylene include styrene, substituted styrene and 1,4-hexadiene. The metallocene single site catalysts are capable of producing isotactic polymers and syndiotactic polymers, *i.e.*, polymers in which the crystalline branches alternate regularly on both sides of the back bone of the polymer. There are two general types of single site catalyst reactions. The first are stereoselective catalysts reactions which have been developed by Exxon and Dow and which are used to make Exxon's Exact resins and Dow's constrained geometry catalyst technology (CGCT) resins. See Figs. 3 and 4. The second type of reactions are stereoselective catalysts developed by Hoechst and Fina for stereo specific polymerization particularly of polypropylene and other olefins such as 1-butene and 4-methyl-1-pentene. See, *e.g.*, Figures 5 and 6.

The ethylene alpha olefins polymerized by a single site catalyst can have low crystallinity and a density that ranges from 0.854 to 0.97 gm/cc. Although this density range is similar to conventional ethylene polymers, *i.e.*, LDPE, LLDPE and ULDPE, the polymers in the structures of the present invention have a narrow molecular weight distribution and homogeneous branching. The molecular weight distribution of the preferred polymers may be represented by the formula

$$MWD = M_w/M_n = <2.5$$

In addition, the melt processability of these polymers (I_{10}/I_2) has a range of about 5.5 to about 12 while conventional homogenous polymers are generally less than 6.5 at an MWD of 2. The melt tension of these polymers is in the range of about 1.5 to 3.5 grams.

The MWD of these polymers may be determined using a Water's 150 GPC at 140°C with linear columns (103_6 A-10_6 A_0) from Polymer Labs and a differential refractometer detector. Comparison of the MWD of a 1MI, 0.920 density CGCT polymer with that of 1MI, 0.920 density conventional LLDPE illustrates the very narrow MWD of the CGCT polymers which usually have a M_W/M_N of approximately 2 compared to 3 or greater for LLDPE.

A preferred ethylene copolymer is a copolymer of ethylene and a C_3 to C_{20} alpha olefin. A preferred copolymer is a low modulus ethylene octene copolymer sold by Dow. This copolymer is formed by Dow's constrained-geometry catalyst technology which uses a single site catalyst such as cyclo-pentadienyl titanium complexes. As best understood, Dow's constrained geometry catalysts are based on group IV transition metals that are covalently bonded to a monocyclopentadienyl group bridged with a heteroatom. The bond angle between the

monocyclopentadienyl group, the titanium center and the heteroatom is less than 115°. When the alpha olefin is present in the copolymer in the range of about 10 to 20% by weight these copolymers are referred to as plastomers. When the percent alpha olefin is greater than 20% these copolymers are called elastomers. The preferred ethylene octene copolymer has the octene comonomer present in an amount less than 25%. Examples of Dow ethylene octene copolymers have the following physical properties.

DENSITY g/cc	MOLECULAR WEIGHT DISTRIBUTION	MELT INDEX	MELT FLOW RATIO	MELT STRENGTH
0.920	1.97 1.89	1.0	9.5	
0.910	1.90 1.68	1.0	7.9	
0.902	2.10 1.68	1.0	7.6	

Molecular weight distribution is defined as the ratio of weight average molecular weight to number average molecular weight. The lower the figure, the narrower the molecular weight distribution. Melt flow ratio is defined as the ratio of melt index, as tested with a 10-kg load to the melt index with a 2.168-kg load. The higher the ratio, the more processable the material. Melt strength is defined as melt tension measured in grams. The higher the number the greater the melt strength. Other suitable resins are the Exact resins sold by Exxon, these resins have the following characteristics:

TYPICAL PROPERTIES OF EXACT
MEDICAL GRADE POLYETHYLENES

PROPERTY	VALUE BY GRADE 4028	4022	4021	4023	4024	4027
Melt index (D1238)*	10	6	22	35	3.8	4
Density, g./cc. (D-1505)	0.880	0.890	0.885	0.882	0.885	0.895
Hardness (D-2240)						
Shore A	78	84	84	80	83	89
Shore D	29	35	36	27	35	39
Tensile strength at break, p.s.i. (D-638)	2220	1700	3260	620	2840	2200
Tensile elongation at break, % (D-638)	>800	>800	>800	>800	>800	>800
Tensile impact, ft.-lb./sq. in. (D-1822)	145	130	350	280	300	340
Flexural modulus, p.s.i. (D-790)	5040	4930	3980	3100	4180	7230
Vicat softening point °F. (D-1525)	138	168	158	138	158	181

The structure of the present invention is comprised of an ethylene, propylene, or styrene polymer or copolymer formed by a polymerization reaction in the presence of a single site catalyst preferably a metallocene. Ethylene may be copolymerized with any suitable monomer such as C_3 - C_{20} alpha olefin including propylene butene-1, 4-methy-1-pentene, 1-hexene and 1-octene. A preferred comonomer is 1-octene. The preferred ethylene alpha olefin copolymer of the present invention has a density in the range of .880 gm/cc to about .920 gm/cc, a more preferred range of .890 gm/cc to about .915 gm/cc and a most preferred range of about .900 gm/cc to about .912 gm/cc.

Figure 1 shows a cross section of a three layer coextruded structure. Layer 14 is the core layer which may be a barrier layer that minimizes the transmission of oxygen through the structure. Preferred barrier materials are polyvinylidene chloride copolymers such as copolymers of vinylidene chloride and vinyl chloride or an alkyl acrylate such as methyl acrylate. Other preferred barrier materials include, ethylene vinyl alcohol, nylon or a metal foil such as aluminum. Layer 14 may also be a copolymer of ethylene and styrene formed using a single site catalyst in the polymerization reaction. In addition, layer 14 may also be a polystyrene formed by a polymerization reaction in the presence of a single site catalyst. One such polystyrene is the crystalline syndiotactic polystyrene sold by Idemitsu Petro-Chemical Co., Tokyo, Japan.

On opposite sides of the core layer 14 of Figure 1 are layers 12 and 16. At least one of these layers 12 is a polymer formed by a polymerization reaction in the presence of a single site catalyst. The remaining layer 16 may be any suitable polymeric material or blends of material such as a polyester, co-polyester, polyamide, polycarbonate, polypropylene, propylene-ethylene copolymer, ethylene-propylene copolymer, combinations of polypropylene and ethylene vinyl acetate copolymer, ultra low density polyethylene, low density polyethylene, medium density polyethylene, high density polyethylene, linear low density polyethylene copolymers, linear medium density polyethylene copolymer, linear high density polyethylene copolymer, ionomer, ethylene acrylic acid copolymer, ethylene ethyl acrylate copolymer, ethylene methyl acrylate copolymer, or ethylene methacrylic acid copolymer.

In an alternate embodiment, the layer 12 may be a blend of a polymer formed by a polymerization reaction in the presence of a single site catalyst and a suitable polymeric material such as is identified in connection with the description of layer 16 above.

As seen in Figure 2, the structure may also include embodiments which have a fourth layer 28 over the first layer 22 and a fifth polymeric layer 30 over the third layer 26. The composition of the fourth layer 28 may be selected from the same group of materials from which the composition of the first layer 12 or third layer 16 is selected, and the fifth layer 30 may also be the same composition as the first layer 22 or the third layer 26.

In an alternate embodiment of Figure 2, the five layer structure may have a first layer 28 similar in composition to layer 12 of Figure 1, *i.e.*, the film may have a first layer of a polymer formed by the polymerization reaction with a single site catalyst or blends thereof with another suitable polymeric material. One or both of the second 22 and fourth 26 layers may be an adhesive layer.

The composition of adhesive layers 22 and 26 is selected for its capability to bond the core or barrier layer 24 to the surface layers 28 and 30. A variety of the well known extrudable adhesive polymers adhere well to the core or barrier layer 24. Thus, if for example layer 30 is a polypropylene, an adhesive polymer based on polypropylene is desirably selected for layer 26. Examples of such adhesives are the extrudable polymers available under the trade designations Admer QF-500, QF550, of QF-551 from Mitsui Petrochemical Company, or Exxon 5610A2.

If the composition of layer 23 or 30 is an ethylene based polymer or copolymer, an adhesive polymer based on ethylene is preferably selected for layer

22, including ethylene homopolymer and copolymers. Such a preferred adhesive composition is an ethylene vinyl acetate copolymer (EVA) containing up to 25% to 30% by weight vinyl acetate. Other ethylene based homopolymer and copolymers, modified to enhance adhesion properties are well known under the trade names of, for example, Bynel and Plexar. Typical base polymers for these extrudable adhesives are the polyethylene LLDPE and the ethylene vinyl acetate copolymers. Such adhesive polymers, including the polypropylene-based polymers, are typically modified with carboxyl groups such as anhydride. Also acceptable as adhesives are ethylene methyl acrylate copolymers (EMA).

Additional layers may also be present in the structures of the present invention. For example, the present invention contemplates 4, 6, 7, 8, and higher numbers of layers in the film of the present invention and different combinations of layer structures may also be present. For example, there may be more than one barrier layer, *i.e.*, two layers of polyvinylidene chloride copolymers, two layers of foil or two layers of ethylene vinyl alcohol (EVOH) or nylon. Alternatively, this may be a layer of EVOH and a layer of a polyvinylidene chloride copolymer or a polyamide or a polystyrene and other combinations of the core materials. The additional layers of the present invention also encompass more than one polymer formed by the polymerization reaction in the presence of a single site catalyst. The polymers may be in a layer alone or in the form of a blend. Suitable polymers for blending with an ethylene polymer formed in a polymerization reaction with a single site catalyst include other ethylene polymers formed in a polymerization reaction with a single site catalyst, low density polyethylene (LDPE), linear low density polyethylene (LLDPE), ultra low density polyethylene (ULDPE), EVA, ionomers,

ethylene copolymers, ethylene methyl acrylate (EMA), ethylene acrylic acid (EAA), ethyl methyl acrylic acid (EMAA), polypropylene (PP), ethylene normal butyl acrylate (ENBA), ethylene propylene copolymers (PPE). Suitable polymers for blending with a propylene polymers formed in a polymerization reaction with a single site catalyst include ethylene propylene copolymers.

Preferred blends using EVA's are those having lower vinyl acetate (VA) content as they tend to yield EVA layers having better hot strength. EVA's having higher VA content tend to yield EVA layers having increased adhesion to for example, the vinylidene chloride copolymer layer. EVA's having virtually any amount of VA will have better adhesion to the vinylidene chloride copolymer layer than an ethylene homopolymer. However, good interlayer adhesion is considered desirable in the invention, and thus, steps are usually taken to enhance adhesion where no unacceptable negative effect is encountered. Thus, higher VA contents, in the range of 6% to 12% vinyl acetate are preferred, a melt index of less than 1 is also preferred. While blend amounts are shown herein in weight percent, VA contents are mole percent. Especially preferred EVA's have VA content of 7% to 9% and melt index of 0.2 to O.8. Blends of EVA's to make up the EVA component of layers 16 and 18 are acceptable.

Preferred structures of the invention are represented by a multiple layer polymeric film having five layers wherein one of the five layers is composed of vinylidene chloride methyl acrylate.

In a preferred embodiment of the invention, the multiple layer polymer film comprises a first layer, the composition of said first layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene

vinyl acetate copolymer; and slip additive; a second layer, the composition of said second layer comprising ethylene vinyl acetate and wherein each first and second layer having two surfaces; a third layer, the composition of said third layer comprising vinylidene chloride methyl acrylate and wherein said third layer is disposed between said first and second layer; a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and a fifth layer, the composition of said fifth layer comprising a blend of linear low density polyethylene and low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer.

In a further preferred embodiment of the invention, the first layer of the multiple layer polymeric film is a blend of 80% by weight of ethylene vinyl acetate copolymer; 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip.

The second layer of the multiple, five layer polymeric film is 100% by weight of ethylene vinyl acetate copolymer.

The third layer of the multiple polymeric film is 98.1% by weight of vinylidene chloride methyl acrylate and 1.9% by weight of additives.

The fourth layer of the multiple layer polymeric film is a blend of 80% by weight of ethylene vinyl acetate copolymer; 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip additive.

The fifth layer of the multiple, five layer polymeric film is a blend of 90% by weight of linear low density polyethylene and 10% by weight of low density polyethylene.

A preferred embodiment of the present invention, the multiple layer polymer film comprises a first layer, the composition of said first layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer and slip additive; a second layer, the composition of said second layer comprising ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces; a third layer, the composition of said third layer comprising vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer; a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and a fifth layer, the composition of said fifth layer comprising a blend of linear low density polyethylene and low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer and wherein an antiblock additive and an slip additive may optionally and independently be present in layers 1, 2, 4 and 5 and wherein said antiblock additive may be a blend of two or more antiblock additives and wherein both of said slip additive and said antiblock additives are present at about 0.1% - 10%, based on the total weight of the layer.

A still further preferred embodiment of the present invention, the multiple layer polymer film comprises a first layer, the composition of said first layer comprising a blend of 80% by weight ethylene vinyl acetate copolymer, 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene

vinyl acetate copolymer; and 0.35% by weight of slip additive. a second layer, the composition of said second layer comprising 100% ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces; a third layer, the composition of said third layer comprising 100% vinylidene chloride methyl acrylate copolymer (96.5% by weight of vinylidene chloride methyl acrylate and 3.5% by weight of processing aids) and wherein said third layer is disposed between said first and second layer; a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and wherein said fourth layer further comprises an antiblock additive wherein said antiblock additive may be a blend of two or more antiblock additives and wherein both of said slip additive and said antiblock additives are present at about 0.1%-10%, based on the total weight of the layer; and a fifth layer, the composition of said fifth layer comprising a blend of 90% linear low density polyethylene and 10% by weight of low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer.

In the preferred embodiments of the present invention the anti-block additive is selected from Ampacet 7012124 or Ampacet 10579 which are products of Ampacet Corporation, Mount Vernon, New York. The anti-block additives may be present in the film structure as a single anti-block additive or as a blend of anti-block additives.

In the preferred embodiments of the present invention, the composition of said fourth layer comprises 77.60% by weight of ethylene vinyl acetate copolymer; 9.7% by weight of linear low density polyethylene, 9.36% by weight of a second

ethylene vinyl acetate copolymer, 0.34% by weight of slip additive, 1.0% by weight of an antiblock additive and 2% by weight of processing aids. Ethylene vinyl acetate resins suitable for the practice of this invention are exemplified by ESCORENE® (LD-318) and ESCORENE® (LD-712) from Exxon Chemical.

EXCORENE® LD-318 is a 9.0% vinyl acetate copolymer film resin. This resin has the following properties:

Resin Properties	ASTM Method	Units (SI)	Typical Value[2]
Melt Index	Exxon Method	g/10 min.	2.0
Density	Exxon Method	g/cm^3	0.930
Vinyl Acetate	Exxon Method	% by wt.	9.0
Melting Point	Exxon Method	°F(°C)	210 (99)

ESCORENE® LD-712 is a 10.0% vinyl acetate copolymer film resin. This resin has the following properties:

Resin Properties	ASTM Method	Units (SI)	Typical Value[3]
Melt Index	Exxon Method	g/10 min.	0.35
Density	Exxon Method	g/cm^3	0.931
Vinyl Acetate	Exxon Method	% by wt.	10
Melting Point	Exxon Method	°F(°C)	207 (97)

ESCORENE® LD-318 is suitable for the 9.65% of EVA of layers one and four and ESCORENE® LD-712 is suitable for the remaining ethylene vinyl acetate of layers one, two and four.

Linear low density polyethylene resin suitable for the practice of this invention is exemplified by DOWLEX® 2267A and DOWLEX® 2247A from Dow Chemical Company.

DOWLEX® 2267A has the following properties:

Physical Properties	ASTM Method	Values[1]:English (SI)
Resin Properties		
Melt Index, gm/10 min	D 1238	0.85
Density, gm/cc	D 792	0.917
Vicat Softening Point, °F (°C)	D 1525	208 (98)

DOWLEX® 2247A has the following properties:

Physical Properties	ASTM Method	Values[1]:English (SI)
Resin Properties		
Melt Index, gm/10 min	D 1238	2.3
Density, gm/cc	D 792	0.917
Vicat Softening Point, °F (°C)	D 1525	210 (99)

Alternatively, Exxon's EXCEED® 363C32 linear low density polyethylene resin may also be used in the structure of the present invention. EXCEED® 363C32 has the following properties:

Resin Properties[1]	Units (SI)	Typical Value[3]
Melt Index	g/10 min.	2.5
Density	g/cm^3	0.917
Melting Point	°F (°C)	239 (115)

In the preferred embodiment of the present invention, the low density polyethylene resin suitable for the practice of this invention is exemplified by PETROTHENE® NA204-000 from Equistar Chemicals, L.P. PETROTHENE® has the following properties:

	Value	Units	ASTM Test Method
Density	0.918	g/cm^3	D1505
Melt Index	7.0	g/10 min.	D 1238
Melt Point	106.5	°C	

The polyvinylidene chloride methyl acrylate copolymer polymer of the present invention contains between 3 mole percent and 20 mole percent of methyl acrylate. These more preferred copolymers have 6 to 12 mole percent methyl acrylate. Additives typically used with vinylidene chloride copolymers may be used in conventional amounts which would be known to one skilled in the art. Said additives are exemplified by ethylene vinyl acetate, dibutylsebacate, magnesium oxide, stearamide, and epoxidized soy bean oil.

Slip is a coefficient of friction additive which is selected from erucamide and other fatty acid amides.

The structure of the present invention may be formed by any conventional process. Such processes include extrusion, coextrusion, extrusion coating, extrusion lamination, adhesive lamination and the like, and combinations of processes. The specific process or processes for making a given film which is neither oriented nor cross-linked can be selected with average skill, once the desired structure and compositions have been determined.

When the structure of the present invention is a film, the film may also be oriented either uniaxially or biaxially. Orientation can also be done by any conventional process for forming multiple layer films. A preferred process includes the steps of coextrusion of the layers to be oriented, followed by orientation in one of the conventional processes such as blown tubular orientation or stretch orientation

in the form of a continuous sheet; both being molecular orientation processes. The double bubble technique disclosure in Pahlke, U.S. Patent No. 3,456,044 is suitable for use in producing the film of this invention. The films may also be formed by a tubular water quench process. In this process the film may be extruded downwardly as a tube formed by an annular die, and carried into a water quench tank, generally with a cascade of water on the outside surface providing initial cooling. The flattened tape is withdrawn from the quench bath, is reheated (normally in a second water bath) to its orientation temperature, is stretched in the machine direction between two sets of rolls that are so rotated as to establish a linear rate differential therebetween, and is simultaneously oriented in the transverse, or cross-machine, direction as an inflated bubble trapped between the nips of the rolls. In accordance with conventional practice, the film will usually be cooled by air in the orientation zone.

The film of the present invention may also be oriented and/or cross-linked. The first step is the formation of a multiple layer film. The formation of the multiple layer film, is usually most easily accomplished by coextrusion of the desired layers. Other formation processes are acceptable so long as the resulting oriented film at the conclusion of fabrication processing is a unitary structure.

The second step is orienting the multiple layer film. One method for accomplishing orientation is by heating the film to a temperature appropriate to molecular orientation and molecularly orienting it. The film may then be optionally heat set by holding it at an elevated temperature while its dimensions are maintained. The orientation step is preferentially carried out in line with the first step, which is the film formation step of the process.

The third step is subjecting the formed and oriented multiple layer film, to electron beam irradiation.

The amount of electron beam irradiation is adjusted, depending on the make-up of the specific film to be treated and the end use requirement. While virtually any amount of irradiation will induce some cross-linking, a minimum level of at least 1.0 megarads is usually preferred in order to achieve desired levels of enhancement of the hot strength of the film and to expand the range of temperature at which satisfactory heat seals may be formed. While treatment up to about 50 megarads can be tolerated, there is usually no need to use more than 10 megarads, so this is a preferred upper level of treatment the most preferred dosage being 2 to 5 megarads.

The third step of subjecting the film to electron beam irradiation is performed only after the multiple layer film has been formed, and after molecular orientation, in those embodiments where the film is molecularly oriented. It should be noted that, in the irradiation step, all of the layers in the film are exposed simultaneously to the irradiation sources, such that irradiation of all the layers of the film takes place simultaneously.

In one embodiment of the process, the second step of orientation may be omitted and the unoriented multiple layer film may be cross-linked by irradiation treatment to produce a cross-linked, unoriented, multiple layer film.

Multilayer heat shrinkage films of the present invention may also contain an optical brightner. The films which contain an optical brightner counteract the effects of yellowing in the oxygen barrier material of the multilayer heat shrinkable films.

In a still preferred embodiment of the heat shrinkable films, the multiple layer polymer film comprises a first layer, the composition of said first layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer; and slip; a second layer, the composition of said second layer comprising ethylene vinyl acetate and wherein each first and second layer having two surfaces; a third layer, the composition of said third layer comprising vinylidene chloride methyl acrylate wherein a violet pigment is incorporated into the vinylidene chloride methyl acrylate copolymer layer and wherein said third layer is disposed between said first and second layer; a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and a fifth layer, the composition of said fifth layer comprising a blend of linear low density polyethylene and low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer and wherein an antiblock additive and an slip additive may optionally and independently be present in layers 1, 2, 4 and 5 and wherein said antiblock additive may be a blend of two or more antiblock additives and wherein both of said slip additive and said antiblock additives are present at about 0.1% - 10%, based on the total weight of the layer..

As used herein, "violet tint" means a color within the visible light spectrum which is characterized by a wavelength range of from about 380 to about 440 nanometers.

The multilayer heat shrinkable films which contain a colored pigment, specifically a violet pigment, are manufactured by incorporation of the violet

pigment into the barrier layer of the film. In a preferred embodiment, the violet pigment is incorporated into vinylidene-chloride-methyl acrylate copolymer layer.

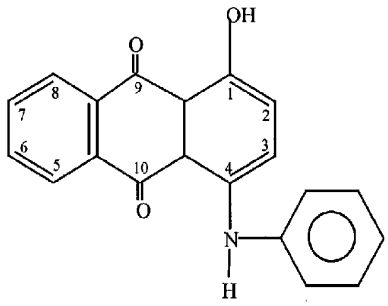
For ease in manufacturing the pigmented layer of film, the pigment is used dispersed in a polymeric material. These polymeric concentrates may be prepared by using any suitable method for dispersing solid materials in polymers. Extrusion and milling are examples of such methods. Generally, the polymeric material which is selected for the disbursement of the pigment is compatible with the polymeric material which is selected for the film layer. Therefore, the polymeric material which functions as the dispersing agent must be dispersible into the film layer into which it is incorporated.

For the purpose of this invention, a polymeric concentrate may contain pigment in an amount of 300 ppm to 800 ppm, based on the total weight of the pigment and polymeric material combined.

Pigment may be incorporated into a film by combining the polymeric concentrate which contains the pigment with the feed material of one or more film layers by any suitable mixing methods. The amount of polymeric concentrate incorporated into a given film layer will depend on many factors. These factors include but are not limited to: the number of layers into which the pigment will be incorporated, the polyvinylidene chloride copolymer content of the film, and the degree of thermal and/or radiation exposure said polyvinylidene chloride copolymer is subjected to. A film should contain sufficient pigment to provide a film which despite exposure of the polyvinylidene chloride copolymer layer to radiation levels from 2.0 megarad to 6.0 megarads, retains an acceptable violet tint.

In a preferred embodiment, the vinylidene chloride methyl acrylate copolymer layer contains a substituted anthraquinone in an amount of 5 to 15 ppm based on the total weight of the vinylidene chloride methyl acrylate copolymer present.

A substituted anthraquinone suitable for use is 1-hydroxy-4-anilino-9,10-anthraquinone having the following structural formula:



EXAMPLES

Multilayer films may be prepared according to the present invention. Biaxially stretched three layer films may be prepared by a "double bubble" process similar to that disclosed in U.S. Patent No. 3,456,044 by coextruding the following compositions through a multilayer die, biaxially stretching the coextruded primary tube. The films may also be irradiated if desired.

EXAMPLE 1

Layer 1 - Copolymer of ethylene and an alpha olefin such as 1-Hexene or 1-Octene formed by the polymerization reaction in the presence of a single site catalyst or metallocene (hereinafter CEO)

Layer 2 - Vinylidene chloride - methyl acrylate (VDC-MA) copolymer

Layer 3 - Polyolefin. This film may be biaxally stretched and if necessary irradiated.

	EXAMPLE 2	EXAMPLE 3	EXAMPLE 4
Layer 1	CEO	CEO	CEO-EVA blend
Layer 2	VDC-MA	VDC-MA	VDC-MA
Layer 3	ULDPE-EVA blend	CEO	CEO-EVA blend

	EXAMPLE 5	EXAMPLE 6	EXAMPLE 7
LAYER 1	CEO	CEO	CEO-EVA blend
LAYER 2	Nylon	Nylon	Nylon
LAYER 3	CEO	ULDPE-EVA	CEO-EVA blend

	EXAMPLE 8	EXAMPLE 9
LAYER 1	Polyolefin	Polyolefin
LAYER 2	Styrene copolymer formed by the polymerization reaction with a single site catalyst	Propylene copolymer formed by the Polymerization reaction with a single site catalyst
LAYER 3	Polyolefin	Polyolefin

	EXAMPLE 10	EXAMPLE 11	EXAMPLE 12
LAYER 1	CEO	CEO	CEO-EVA Blend
LAYER 2	CEO	EVOH	EVOH
LAYER 3	CEO	ULDPE-EVA Blend	CEO-EVA Blend

	EXAMPLE 13	EXAMPLE 14	EXAMPLE 15
LAYER 1	CEO	CEO	CEO-EVA Blend
LAYER 2	Tie	Tie	Tie
LAYER 3	PVDC Copolymer or EVOH	PVDC Copolymer or EVOH	PVDC Copolymer or EVOH
LAYER 4	Tie	Tie	Tie
LAYER 5	ULDPE-EVA Blend	CEO	CEO-EVA Blend

EXAMPLE 16

LAYER 1	EVA-ULDPE
LAYER 2	ULDPE or CEO
LAYER 3	PVDC Copolymer or EVOH
LAYER 4	EVA
LAYER 5	CEO or blend of CEO and EVA

The following examples may also be prepared in accordance with the present invention:

EXAMPLE 17

Meat Film – Forming Web

Formed by TWQ Process

(Tubular Water Quench Process)

LAYER 1	Nylon
LAYER 2	Tie
LAYER 3	EVOH
LAYER 4	Tie
LAYER 5	CEH or CEO

CEH is a copolymer of ethylene and 1-Hexene formed by the polymerization reaction in the presence of a single site catalyst or a metallocene. Other alpha olefins can be polymerized with the ethylene also.

EXAMPLES 18-20

Innerliner Films - These films can be formed either on a blown film line or by using a tubular water quench.

LAYER 1 HDPE

LAYER 2 Blend of CEH or CEO and EVA and polybutylene

LAYER 1 HDPE

LAYER 2 CEH or CEO and polybutylene

LAYER 1 HDPE

LAYER 2 CEH or CEO

EXAMPLES 21 and 22

Meat - Non Forming Top Web film

LAYER 1 PVDC coated PET

LAYER 2 Adhesive (lamination)

LAYER 3 CEO or CEH

This film may be formed by adhesive laminating a film formed of a copolymer of ethylene and an alpha olefin with the PVDC coated PET film.

LAYER 1 PVDC coated PET

LAYER 2 LDPE - extrusion laminated

LAYER 3 LDPE/CEH or CEO coextrusion

This film can be formed by extrusion laminating a film of PVDC coated PET or LDPE.

EXAMPLE 23

Layer 1 – Blend of two or more copolymers of ethylene and an alpha olefin polymerized in the presence of a single site catalyst or metallocene such as CEO with either CEH or CEB. CEB is a copolymer of

ethylene and butene-1 formed by a polymerization reaction in the presence of a single site catalyst or a metallocene.

EXAMPLE 24

Layer 1 - Blend of a copolymer of ethylene and an alpha olefin formed by a polymerization reaction in the presence of a single site catalyst or a metallocene with Polyethylene or other polyolefin such as EVA, EMA, FAA, EMAA, ionomers, ENBA, PP or PPE.

The films of example 23 and 24 can either be single layer films or multi layer films where additional layers are present on layer 1.

EXAMPLE 25

A four layer film was coextruded at a total caliper of 2.1, 2.3, 2.5 or 3.0 mil. depending upon the end use requirements. The outer two layers of the film are the same and a blend of EVA, LLDPE, and slip. The 80% EVA was Exxon LD 712.06, the 9.65% EVA Exxon LD 318.92, the 10% LLDPE Dow 2267A-1 and the 0.35% slip Reed Spectrum 1080823 U slip. The core layer was 0.20 mil which was positioned between the two outer layers and the two inner layers was vinylidene chloride-methyl acrylate copolymer blended with the appropriate plasticizers, stabilizers and lubricants. The one inner layer positioned next to the core layer was 100% Exxon EVA LD 712.06. The inner most layer (sealant layer) was 90% Dow LLDPE 2247A-1 and 10% Equistar LDPE NA 204-000. The thus coextruded film was heated to orientation temperature via a hot water bath (98°C) and biaxially oriented at a stretch ratio of 3.8 X 2.7/1. After orientation, the film was treated with 4.6 megarads of electron beam irradiation and fabricated into bags for the use in packaging various cuts of fresh and processed meat products. The bags were heat

sealed on commercial 8300 and 8600 rotary evacuator-sealer equipment available from the Cryovac division of W.R. Grace and Company.

EXAMPLE 26

A five layer film was coextruded at a total caliper of 2.25 mil. The first layer of the film was a blend of ethylene vinyl acetate copolymer, linear low density polyethylene, a second ethylene vinyl acetate and slip additive. The 80.0% ethylene vinyl acetate copolymer was Exxon LD712.06, the 10.0% linear low density polyethylene was Dow 2267A-1, the 9.65% second ethylene vinyl acetate copolymer was Exxon LD318.92 and the 0.35% slip additive was Reed Spectrum 1080823. The second layer was ethylene vinyl acetate copolymer. The 100.00% ethylene vinyl acetate copolymer was Exxon LD712-06. The third layer was vinylidene chloride methyl acrylate copolymer. The 100.00% vinylidene chloride methyl acrylate copolymer was Dow XU32019.19. The fourth layer was a blend of ethylene vinyl acetate copolymer, linear low density polyethylene, a second ethylene vinyl acetate, slip additive and an anti block additive. The 77.60% ethylene vinyl acetate copolymer was Exxon LD712-06, the 9.70% linear low density polyethylene was Dow 2267A-1, the 9.36% second ethylene vinyl acetate copolymer was Exxon LD 318.92, the 0.34% slip additive was Reed Spectrum 1080823, the anti block additive was 1.00% of Ampacet 10579 and 2% processing aids; the fifth layer was a blend of linear low density polyethylene and low density polyethylene. The 90.0% of linear low density polyethylene was Dow 2247A-1 and the 10.0% of low density polyethylene was Millennium NA204-00. The thus coextruded film was heated to orientation temperature via a hot water bath (98°C) and biaxially oriented at a stretch ratio of 3.8 X 2.7/1. After orientation, the film was treated with 4.6

megarads of electron beam irradiation and fabricated into bags for the use in packaging various cuts of fresh and processed meat products. The bags were heat sealed on commercial 8300 and 8600 rotary evacuator-sealer equipment available from the Cryovac division of W. R. Grace and Company.

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise", "comprising", and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

Although the invention has been described with reference to specific examples it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A multiple layer polymer film, comprising:

a first layer, the composition of said first layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer and slip additive;

a second layer, the composition of said second layer comprising ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces;

a third layer, the composition of said third layer comprising vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer;

a fourth layer, the composition of said fourth layer being the same as said first layer wherein said fourth layer is adhered to said first layer on the surface opposite said third layer;

a fifth layer, the composition of said fifth layer comprising a blend of linear low density polyethylene and low density polyethylene wherein said fifth layer is adhereed to said second layer on the surface opposite said third layer; and

wherein an antiblock additive and a slip additive are present in one or more layers 1, 2, 4 and 5.

2. A muliple layer polymer film according to claim 1, wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the layer.

3. A multiple layer polymer film according to claim 2, wherein said antiblock additive is a blend of two or more antiblock additives.

4. A multiple layer polymer film, according to claim 1 wherein said fourth layer further comprises an antiblock additive wherein both of said slip additive and said antiblock additive are present at about 0.1% - 10%, based on the total weight of the layer.

5. A multiple layer polymer film according to claim 4, wherein said antiblock additive is a blend of two or more antiblock additives.

6. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the composition of said first layer is a blend of 80% by weight of ethylene vinyl acetate copolymer, 10% by weight of linear low density polyethylene, 9.65% of ethylene vinyl acetate copolymer and 0.35% of slip additive.

7. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the composition of said second layer is 100% by weight of ethylene vinyl acetate copolymer.

8. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the composition of said third layer is 98.1% by weight of vinylidene chloride methyl acrylate copolymer and 1.9% by weight of additives..

9. A multiple layer polymeric film according to claim 4 or claim 5, wherein the ethylene vinyl acetate copolymer which comprises 80% by weight of said first layer has a vinyl acetate content of 10%, a melt index of 0.35 g/10min and a density of 0.931 g/cm^3.

10. A multiple layer polymeric film according to claim 4 or claim 5, wherein the ethylene vinyl acetate copolymer which comprises 9.65% by weight of said first layer has a vinyl acetate content of 9.0%, a melt index of 2.0 g/10min and a density of 0.930 g/cm^3.

11. A multiple layer polymeric film according to claim 6, wherein the composition of said second layer is 100% by weight of ethylene vinyl acetate copolymer and said ethylene vinyl acetate copolymer has a vinyl acetate content of 10%, a melt index of 0.35 g/10min and a density of 0.931 g/cm^3.

12. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the composition of said fourth layer is a blend of 77.60% by weight of ethylene vinyl

acetate copolymer; 9.70% by weight of linear low density polyethylene; 9.36% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip additive, 1% by weight of antiblock additive and 2% by weight of processing aids.

13. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the composition of said fifth layer is a blend of 90% by weight of linear low density polyethylene and 10% by weight of low density polyethylene.

14. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the antiblock additive is Ampacet 10579.

15. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the antiblock additive is Ampacet 7012124.

16. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the antiblock additive is a blend of Ampacet 7012124 and Ampacet 10579.

17. A multiple layer polymeric film according to any one of claims 1 to 3, wherein the antiblock additive blend is present up to 3% of the total weight of the fourth layer.

18. A multiple layer polymeric film according to claim 4 or claim 5, wherein said multiple layer polymeric film is molecularly oriented.

19. A multiple layer polymeric film according to claim 18, wherein the composition of said first layer is a blend of 80% by weight of ethylene vinyl acetate copolymer; 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip additive.

20. A multiple layer polymeric film according to claim 18, wherein the composition of said second layer is 100% by weight of ethylene vinyl acetate copolymer.

21. A multiple layer polymeric film according to claim 18, wherein the composition of said third layer is 98.1% by weight of vinylidene chloride methyl acrylate copolymer and 1.9% by weight of additive.

22. A multiple layer polymeric film according to claim 18, wherein the ethylene vinyl acetate copolymer which comprises 80% by weight of said first layer has a vinyl acetate content of 10%, a melt index of 0.35 and a density of 0.931 g/cm^3.

23. A multiple layer polymeric film according to claim 18, wherein the ethylene vinyl acetate copolymer which comprises 9.65% by weight of said first layer has a vinyl acetate content of 9.0%, a melt index of 2.0 and a density of 0.931 g/cm^3.

24. A multiple layer polymeric film according to claim 18, wherein the composition of said second layer is 100% by weight of vinyl acetate copolymer and said ethylene vinyl acetate has a vinyl acetate content of 10%, a melt index of 0.35 g/10min and a density of 0.931 g/cm^3.

25. A multiple layer polymeric film according to claim 18, wherein the composition of said fourth layer is a blend of 77.6% by weight of ethylene vinyl acetate copolymer; 9.70% by weight of linear low density polyethylene; 9.36% by weight of a second ethylene vinyl acetate copolymer; and 0.35% by weight of slip additive, 1% by weight of an antiblock agent and 2% by weight of processing aids.

26. A multiple layer polymeric film according to claim 13, wherein the composition of said fifth layer is a blend of 90% by weight of linear low density polyethylene and 10% by weight of low density polyethylene.

27. A bag made from a multiple layer polymeric film according to claim 4 or claim 5.

28. A bag made from a multiple layer polymeric film according to claim 18.

29. A multiple layer polymeric film according to claim 4 or 5, comprising:

a first layer, the composition of said first layer comprising a blend of 80% by weight of ethylene vinyl acetate copolymer; 10% by weight of linear low density polyethylene; 9.65% by weight of a second ethylene vinyl acetate copolymer and 0.35% by weight of slip additive;

a second layer, the composition of said second layer comprising 100% ethylene vinyl acetate copolymer and wherein each first and second layer having two surfaces;

a third layer, the composition of said third layer comprising 100% vinylidene chloride methyl acrylate copolymer and wherein said third layer is disposed between said first and second layer;

a fourth layer, the composition of said fourth layer comprising a blend of an ethylene vinyl acetate copolymer; linear low density polyethylene; a second ethylene vinyl acetate copolymer; a slip additive; an antiblock additive and processing aids, wherein said fourth layer is adhered to said first layer on the surface opposite said third layer; and

a fifth layer, the composition of said fifth layer comprising a blend of 90% linear low density polyethylene and 10% by weight of low density polyethylene wherein said fifth layer is adhered to said second layer on the surface opposite said third layer.

30. A multiple layer polymeric film according to claim 29, wherein the composition of said fourth layer comprises 77.60% by weight of ethylene vinyl acetate copolymer, 9.7% by weight of linear low density polyethylene, 9.36% by weight of a second ethylene vinyl acetate copolymer, 0.34% by weight of slip additive, 1.0% by weight of an antiblock additive and 2% by weight of processing aids.

31. A multiple layer polymeric film according to claim 29, which can be molecularly oriented.

32. A bag made from a multiple layer polymeric film according to claim 30.

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33. A multiple layer polymer film substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

34. A bag substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

Dated this 30th day of April 2007
Shelston IP
Attorneys for: Pechiney Emballage Flexible Europe

Fig. 1

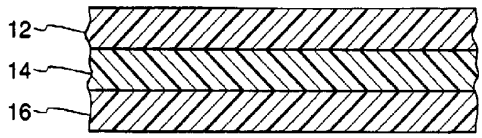


Fig. 2

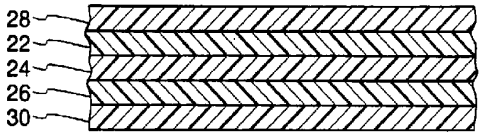


Fig. 3

NON-STEREOSELECTIVE

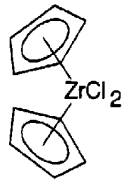


Fig. 4

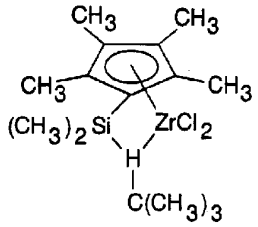
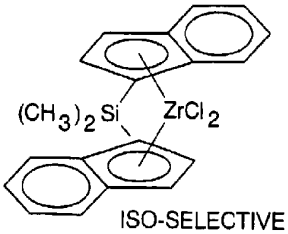


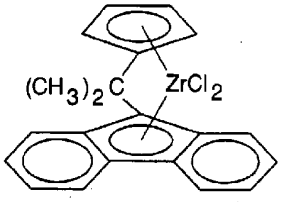
Fig. 5

STEREOSELECTIVE



ISO-SELECTIVE

Fig. 6



SYNDIO-SELECTIVE