PCT WORLD INTELLECTI Inte

INTERNATIONAL APPLICATION PUBLISHEL

WO 9605051A1

(51) International Patent Classification 6 :
B32B 1/08, 27/08, 27/32, B29C 55/12

A1

(43) International Publication Date: 22 February 1996 (22.02.96)

(21) International Application Number: PCT/US95/10113

(22) International Filing Date: 9 August 1995 (09.08.95)

(30) Priority Data:
9416183.3 10 August 1994 (10.08.94) GB

(71) Applicant *(for all designated States except US)*: MOBIL PLASTICS EUROPE, INC. [US/US]; Suite L-100, 32 Loockerman Square, Dover, DE 76466-3889 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: BOSCH, François-Philippe [FR/FR]; 8, rue Damille-Barthélémy, B-6762 Saint-Mard (BE).

(74) Agents: SANTINI, Dennis, P. et al.; Mobil Oil Corporation, 3225 Gallows Road, Fairfax, VA 22037 (US).

(81) Designated States: CA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: ORIENTED HDPE LAMINATES FOR EASY DIRECTIONAL OPENING

(57) Abstract

This invention provides oriented plastics film packaging which has easy directional control of opening and is reclosable. One aspect of the invention is a laminate which comprises: (i) a film of high density polyethylene laminated to (ii) an oriented web wherein (i) is biaxially oriented such that the ratio of the deformation ratio in the transverse direction to the deformation ratio in the machine direction is greater than 1.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgystan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

"ORIENTED HDPE LAMINATES FOR EASY DIRECTIONAL OPENING"

This invention relates to oriented high density polyethylene (HDPE) laminates; more particularly, the present invention relates to such laminates used to fabricate bags which possess both easy directional opening and reclosability.

Oriented plastics films currently enjoy a substantial share of the packaging market, especially of perishable goods such as comestibles. However, bags made with such films on vertical form, fill and seal (VFFS) and horizontal form, fill and seal (HFFS) packaging machines have hermetic seals; and these seals often present the consumer with difficulty of access to the product. Attempts to overcome this difficulty include precut systems at the top transverse direction (TD) seal which allow the consumer to initiate a tear in the package; but often with biaxially oriented film, the propagation of the tear is uncontrolled and results in destruction of the bag; jettison of product; and consumer dissatisfaction. Other attempts include tear tape systems which can give a measure of directional control to the propagation of the tear but still result in bag destruction; furthermore, it is often the consumer's experience that the tape itself ruptures.

This invention seeks to provide oriented plastics film packaging which not only provides the consumer with easy directional control of opening but also is reclosable.

Accordingly, therefore, to one aspect of the present invention there is provided a laminate which comprises:

(i) a film of high density polyethylene laminated to

(ii) an oriented web

wherein (i) is biaxially oriented such that the ratio of the deformation ratio in the transverse direction (DRTD)

to the deformation ratio in the machine direction (DRMD) is greater than 1.

In accordance with a further aspect of this invention, there is also provided the use of a film of high density polyethylene which is biaxially oriented such that the ratio of the deformation ratio in the transverse direction (DRTD) to the deformation ratio in the machine direction (DRMD) is greater than 1, laminated to an oriented web, to provide propagation control along the transverse direction of the high density polyethylene.

The biaxially oriented high density polyethylene films used in the laminates of this invention are prepared using high density polyethylene (HDPE) having a density of at least 0.94, preferably at least 0.96 g/cm^3. The film can be composed exclusively of a single HDPE resin, a mixture of HDPE resins, or of HDPE containing up to 10 weight percent microcrystalline wax. The mixture of HDPE resins gives better processing characteristics in the extruder by reducing extruder torque. Films made with either a blend of HDPE resins or with microcrystalline wax reduce splittiness of the film which manifests itself as the tendency of the film to break in the TD during operation on VFFS machinery.

The blends of HDPE polymers can comprise two or more polymers all of which preferably have densities of at least 0.96. Blends of HDPE polymers advantageously comprise a major proportion of HDPE having a melt index of 0.6 to 1.2 and one or more polymers having a different melt index. Terblends have been found particularly desirable. Suitable terblends generally comprise 50 to 98 weight percent, preferably 84 to 96 weight percent, of HDPE having a density of 0.96 g/cm^3 or higher and a melt index of greater than 0.5 to 2.0; 1 to 25 weight percent, preferably 3 to 8 weight percent, of HDPE having a density of 0.96 g/cm^3 or greater and a melt index of 0.1 to 0.5; and 1 to 25 weight percent, preferably 3 to 8 weight

percent, of HDPE having a density of 0.96 g/cm^3 or higher and a melt index of greater than 2 to 8. Preferably, the second and third HDPE polymers (which are minor components) are present in about equal amounts.

It is highly desirable that the biaxially oriented HDPE films used in the laminates of this invention be provided with a heat seal layer. The heat seal layer can be applied in the known manner to the HDPE, for example by coating or coextrusion before orientation or by coating the HDPE after one or both of the biaxial orientation operations.

The heat seal layer can be any of the conventional material used for this purpose in conjunction with polyolefin films particularly polyethylene films. For example ethylene-vinyl acetate copolymers or ethylene-methacrylic acid salt ionomers (available from DuPont as "Surlyn") can be used. Films in which the heat seal layer is an ethylene-methacrylic acid salt ionomer have been found to be particularly useful in preparing films which are suitable for VFFS applications. The heat seal layer can comprise the heat seal resin as such or can include small amounts of other materials. For example, the relatively costly Surlyn ionomer can be mixed with small amounts of less costly materials such as low density polyethylene.

The HDPE films of this invention can include other polymer layers in addition to or instead of the heat seal layer, for example polymers having desirable barrier properties for gases such as oxygen. Examples include polymers of vinylidene chloride.

The degree of orientation of the HDPE films is an important aspect of this invention inasmuch as the proper degree of orientation provides desirable physical properties, good water vapor transmission (WVTR) characteristics and dead-fold. For example, it has been determined that the films of this invention having a

thickness of 1.0 to 1.2 mils will have acceptable WVTR of less than 0.28 g-mil/100 in^2/24 hr/1 atm (less than 4.34 x 10^{-4} g-mil/cm^2/24 hr/1 atm).

In the usual manner the film is heated to its orientation temperature and first subjected to MD orientation between two sets of nip rolls, the second rotating at a greater speed than the first in an amount equal to the desired draw ratio. Then the film is TD oriented by heating and subjected it to transverse stretching in a tenter frame. Typically, MD orientation is conducted at 60° to 120°C and TD orientation at 100° to 145°C. The preferred deformation ratios are from 1.1 to 2, suitably from 1.18 to 1.25 in the MD and from 6 to 12 in the TD.

The oriented web (ii) may comprise an oriented plastics film or paper, preferably a biaxially oriented plastics film. The film may suitably comprise an olefin polymer, especially polypropylene.

The web may be formed and laminated to the biaxially oriented film (ii) in any known manner. The laminate may then be formed with a bag with conventional VFFS or HFFS machinery.

It is found that when utilizing a laminate in accordance with this invention in the fabrication of bags then, whatever the present system used, the propagation of the tear is always in the TD. This provides not only control of opening but also enables the consumer to utilize the lower tear edge as a pouring lip. Furthermore, the dead-fold of the oriented HDPE enables, simply by twisting or folding, the bag to be reclosed. None of these advantages is present unless the HDPE is laminated in accordance with this invention.

The following Examples illustrate the invention. Laminates were made, both in accordance with the present invention and by way of comparison, on a pilot coater. Bags were then produced on a VFFS machine to evaluate the

directional tear and reclosability. The results are shown in the following Table. The following ranking was used:

E : excellent
G : good
M : medium
F : fair
B : bad

TABLE

Laminates	Directional Tear	Reclosability Twist	Reclosability Folding
12 PET/30 HDPE*	E	G	M
12 Pet/30 LLDPE	F	F	B
20 PP/30 HDPE*	E	G	M
20 PP/30 LLDPE	B	B	B
30 PP/30 HDPE*	M	M	F
30 PP/30 LLDPE	B	B	B
12 PA/30 HDPE*	E	G	M
12 PA/30 LLDPE	M	B	B
40 g Paper/30 HDPE*	E	E	G
40 g Paper/30 LLDPE	B	G	M
30 PP/ 30 PP	B	B	B
40 PP	B	B	B

where:

PET represents polyethylene terephthalate
HDPE represents biaxially oriented HDPE
PP represents biaxially oriented polypropylene
LLDPE represents linear low density polyethylene
PA represents oriented nylon
40g Paper represents paper having a weight of 40 g per sq. metre

* DRTD = 8.0 and DRMD = 1.18

Claims

1. A laminate which comprises:

(i) a film of high density polyethylene laminated to

(ii) an oriented web

wherein (i) is biaxially oriented such that the ratio of the deformation ratio in the transverse direction to the deformation ratio in the machine direction is greater than 1.

2. A laminate according to claim 1 wherein the deformation ratio in the transverse direction is from 6 to 12 while the deformation ratio in the machine direction is from 1.1 to 2.

3. A laminate according to claim 1 wherein the high density polyethylene has a density of at least 0.94 g/cm^3.

4. A laminate according to claim 1 wherein the high density polyethylene has a melt index from greater than 0.5 to 2.0.

5. A laminate according to claim 1 wherein (ii) comprises a biaxially oriented plastic film.

6. A laminate according to claim 5 wherein the oriented plastic film of (ii) comprises an olefin polymer.

7. A laminate according to claim 6 wherein the olefin polymer is polypropylene.

8. A laminate according to claim 1 which is fabricated into a bag.

9. Method for manufacturing a laminate film comprising high density polyethylene film which comprises biaxially orienting said high density polyethylene film such that the ratio of the deformation ratio in the transverse direction to the deformation ratio in the machine direction is greater than 1, and laminating said biaxially oriented high density polyethylene film to an oriented web.

10. The method of claim 9 wherein the deformation ratio in the transverse direction is from 6 to 12 while the deformation ratio in the machine direction is from 1.1 to 2.

11. The method of claim 9 wherein the high density polyethylene has a density of at least 0.94 g/cm^3.

12. The method of claim 9 wherein the high density polyethylene has a melt index from greater than 0.5 to 2.0.

13. The method of claim 9 wherein the oriented web comprises a biaxially oriented plastic film.

14. The method of claim 13 wherein the oriented plastic film of the oriented web comprises an olefin polymer.

15. The method of claim 14 wherein the olefin polymer of the oriented web is polypropylene.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/10113

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B32B 1/08, 27/08, 27/32; B29C 55/12
US CL :428/35.2, 515, 516, 523; 264/288.4, 290.2
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)

U.S. : 428/35.2, 515, 516, 523, 910; 264/288.4, 290.2

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 practicable, search terms used)

APS: polyethylene, orientation, tearable.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,006,378 (ITABA ET AL) 09 April 1991, see column 2, lines 30-44; column 3, lines 22-68; column 6, lines 48-52.	1, 3-9, 11-15
Y	US, A, 5,045,620 (ITABA ET AL) 03 September 1991, see column 2, lines 35-68; column 3, line 32 to column 4, line 3;	1-4, 8-12
A	US, A, 5,250,334 (LUTTEROTTI) 05 October 1993, see column 2, lines 22-42.	1-15
A, P	US, A, 5,348,794 (TAKAHASHI ET AL) 20 September 1994, see column 1, line 62 to column 2, line 15.	1-15
A	US, A, 4,565,738 (PURDY) 21 January 1986, see column 1, line 54 to column 2, line 15.	1-15

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

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
26 OCTOBER 1995	13 NOV 1995
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer VIVIAN CHEN Telephone No. (703) 308-2351

Form PCT/ISA/210 (second sheet)(July 1992)*