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(54) **Recyclable laminate for packaging a photographic or radiographic product.**

(57) The invention concerns a laminate for packaging photographic or radiographic films.
The packaging comprises a heat-sealable component associated with a polyester film covered with a deposit of silicon dioxide.
This packaging is completely recyclable and has characteristics suitable for packaging silver halide photographic or radiographic films.

This invention concerns the packaging of photographic and radiographic products.

Various composite materials, hereinafter referred to as laminates, have been proposed for packaging photographic or radiographic products. One of these types of packaging is a complex made of polyethylene covered with a film of metallised polyester. In particular such packaging enables radiographic products with an incorporated screen to be vacuum packed by heat sealing. The characteristics which a laminate for packaging photographic or radiographic products must have are imperviousness (to light and moisture in particular), suitability for heat sealing, strength (mechanical resistance to tearing) and, of course, the absence of interaction with the photographic or radiographic product packaged using this laminate. The imperviousness of laminates based on metallised polyester is sometimes uncertain, as a result of variations in the quality of the polyester and/or of the metallic coating on the polyester. Generally speaking, the characteristics listed above represent so many constraints on the choice and the production of the packaging laminate. In addition to these, there has for some time now been a further constraint, resulting from concerns associated with environmental protection. Packaging now has to be recyclable without excessive difficulty. However, a laminate containing metallised polyester as a component poses a problem in this respect because of the presence of a metal.

It is therefore desirable that recyclable packaging should be available for photographic and radiographic products, without for all that sacrificing the characteristics which are necessary in other respects, such as imperviousness, strength or dimensional stability.

The object of the present invention is to resolve this problem by proposing a recyclable laminate which can be used for packaging a photographic or radiographic product and which comprises successively, starting from the inside face, (a) a polymeric component suitable for heat sealing, (b) a barrier layer comprising an inorganic pigment obtained by vapor disposition and, (c) a polyester-based component. The word "inside face" refers to the face of the packaging which, after folding and heat sealing, will be in contact with the photographic film. An intermediate layer comprising a bonding agent may be disposed between the polyester component and the heat-sealable component. At least one of these components is opaque, so as to prevent actinic radiation acting on the photographic product. According to one embodiment, the intermediate bonding layer between the heat-sealable component and the polyester component comprises an adhesive. According to one embodiment, an opaque material such as carbon black, titanium or zinc oxides, barium sulphate, or organic pigments such as aniline black or polyazo dyes, is incorporated in the heat-sealable polymeric component. In addition, the antistatic properties can be improved if desired by using a conductive carbon black. The heat-sealable component consists of a polymer having an appropriate melting temperature which allows heat sealing. For this purpose, α -olefin polymers or copolymers are used, in particular linear copolymers of ethylene and a higher α -olefin having for example between 3 and about 10 carbon atoms. This α -olefin polymer or copolymer may be oriented. The layer of α -olefin polymer or copolymer may itself consist of two or more superimposed sheets, each having been differently oriented by stretching. Each of the sheets may be separated from the adjacent sheet by an intermediate layer comprising a bonding agent or an adhesive. The total thickness of the heat-sealable component is generally between about 20 and about 300 μm and advantageously between 100 and 200 μm . Such laminates are for example marketed by VAN LEER under the name VALERON®.

The barrier layer containing the inorganic pigment is a layer of silicon oxide SiO_x , where x is between 0 and 2, obtained by deposition or atomisation under vacuum so as to obtain a deposit with a thickness of between about 0.01 and about 1.0 μm and advantageously between 0.04 and 0.10 μm . The total thickness of the component (C) is between about 5 and about 50 μm and advantageously between 10 and 25 μm . The assembly of the different layers or components of the laminate is carried out in a conventional manner by heat sealing, coextrusion, ultrasonic welding, the use of hot-melt self-adhesive compositions, etc. The packaging of photographic or radiographic products according to the invention is also carried out in a conventional manner according to the techniques of heat sealing, welding or high-frequency welding, and/or using hot-melt glues. The laminate is particularly suitable for packaging photographic products under vacuum, or radiographic products with an incorporated screen, particularly those which are exposed to a source of X-rays through their individual packaging.

EXAMPLE

A packaging laminate is produced using the following components: a base made from ESTAR® transparent polyethylene terephthalate, 12 μm thick and bearing a 1000 Å deposit obtained by vaporising silicon oxide under vacuum, of the SILAMINATE® type, marketed by the company 4P VERPACKUNGEN GmbH, Ronsberg, Germany. This polyester coated with silicon oxide will form the outer part of the packaging laminate. The polyester coated in silicon oxide is then bonded with a VALERON® linear low-density polyethylene having a thickness of 180 μm and pigmented black, marketed by VAN LEER, Essen, Belgium, the silica-coated face being

applied to the polyethylene laminate. To achieve this bonding, a one or two- component polyurethane-based glue, with or without solvents (Multiflex®, sold by CECA), is used as an adhesive. The VALERON® laminate consists of 4 crossed layers of low-density polyethylene each separated by a coating of adhesive. This laminate will constitute the inner part of the packaging laminate.

5 A control packaging laminate is produced which is identical except that the polyester with the silicon oxide deposit on the polyester is replaced by a polyester with an aluminium deposit obtained by vacuum metallising.

The two packaging laminates are then subjected to a series of tests to evaluate their characteristics with regard to imperviousness to light, moisture and air, resistance to separation and tear strength. The tests used are defined or described below. The results obtained are set out in the following table.

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TABLE

5			<u>Metallised polyester</u> <u>(reference)</u>	<u>Silica coated polyester</u>
		<u>Units</u>		
10	Bonding of the VALERON ^R laminate to the polyester	daN/15 mm		
	Lengthwise (direction of rotation)		0.270-0.330	0.627 (1)
	Across		0.220-0.410	0.610 (1)
15	Elmendorf tear strength; ASTM D-1922			
20	Lengthwise	cN	1240-2480	1972
	Across		1510-2360	1453
25	Tear strength	daN		
	TSA-108 DIN 53363			
	Lengthwise		12	11.2
30	Across		9.7	11.1
	Nail tear strength	mm		
35	ASTM D-2582			
	Lengthwise		30.2	35
	Across		33.1	38
40	Puncture strength	N/m	8.4	5.4
	AFNOR Q-03-034			
45	Permeability to moisture 38° - 50% RH (AFNOR H-00-44)	g/m ² /24 h	0.3-0.8	0.84
50	Resistance to welding 150°C - 0.5 s - 2000 hPa	daN/15 mm	15.6-21.6	20

55 These results show in particular that with the laminate comprising the polyester coated with silicon oxide, excellent adhesion is obtained between the polyester and the polyethylene (1), and in addition all the other properties necessary for the use of the laminate for packaging photographic and radiographic products are retained.

In addition, the use of the laminate with polyester covered with silicon oxide to package a standard medical X-ray product shows that permeability to light is zero; the fogging level remains below 0.15 and variations in sensitivity remain below 15%. According to the invention, a laminate has therefore been produced which complies with the requirements for packaging photographic or radiographic products and is in addition easy to recycle.

The tests used are as follows:

Adhesion: test pieces of 100 x 15 mm are cut out in each direction (lengthwise and across). On all the test pieces, at one end the separation of the heat-sealable component from the polyester component is initiated over a length of 20 mm. The free ends of the test piece are fixed in the jaws of a dynamometer. The force necessary to separate the two components is measured over a range from 0 to 2 daN and at a speed of separation of the jaws of the dynamometer of 100 mm per minute. The resistance must be not less than 0.225 daN/15 mm.

Permeability: the test is carried out on a folded sample (AFNOR H00-044); the permeability must be less than 1.0 g/m²/24 h.

Claims

1. Packaging laminate for photographic or radiographic product, the said packaging consisting, starting from the inside face in contact with the photographic or radiographic product, of (a) a component comprising a polymer or α -olefin polymer which can be heat sealed, (b) a barrier layer and (c) a sheet of polyester, at least one of components (a), (b) or (c) being opaque, characterised in that, the barrier layer (b) comprises an inorganic pigment obtained by vapor deposition.
2. The packaging for photographic or radiographic product of Claim 1, wherein the mineral pigment is a silicon oxide SiO_x wherein x is in the range of 0 to 2.
3. The packaging for photographic or radiographic product of Claim 1 or 2, wherein the layer of mineral pigment has a thickness in the range of from about 0.01 μ m to about 1 μ m.
4. The packaging for photographic or radiographic product of any of Claims 1-3, wherein component (a) comprising a α -olefin polymer or copolymer, comprises at least two separate layers or sheets, oriented differently and separated by a bonding layer.
5. The packaging for photographic or radiographic product of any of Claims 1-4, wherein component (a) comprises a low-density polymer or copolymer of ethylene.
6. The packaging for photographic or radiographic product of any of Claims 1-5, wherein component (a) contains a black pigment.
7. The packaging for photographic or radiographic product of any of Claims 1-6, wherein component (a) has a thickness in the range of from about 50 μ m to about 300 μ m.
8. The packaging for photographic or radiographic product of any of Claims 1-7, wherein component (c) is a sheet of polyethylene terephthalate.
9. The packaging for photographic or radiographic product of any of Claims 1-8, wherein component (c) has a thickness in the range of from about 5 to about 25 μ m.
10. The packaging for photographic or radiographic product of any of Claims 1-9, wherein the bonding component (b) comprises an adhesive.



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EUROPEAN SEARCH REPORT

Application Number
EP 94 42 0145

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y X	GB-A-1 086 482 (E. I. DUPONT DE NEMOURS) * claims; figure 1; example 1 * ---	1-10 1-3,7-9	G03C3/00
Y	GB-A-2 117 536 (FUJI PHOTO FILM) * page 2, line 4 - line 34 * * page 5, line 52 - line 56 * * page 2, line 4 - line 9 * * page 6, line 33 - line 36; figures 8,9 * ---	1-10	
Y	EP-A-0 408 013 (FUJI PHOTO FILM) * page 11, line 9 - line 27 * ---	1-10	
A	EP-A-0 385 054 (TETRA PAK HOLDINGS & FINANCE) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			G03C
Place of search THE HAGUE		Date of completion of the search 18 August 1994	Examiner Philosoph, L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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