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(54) Title: LAMINATE

(57) Abstract: A laminate comprising inner and outer layers, the outer layer comprising a layer of polypropylene disposed between layers of polyethylene and making up from 40 to 90% of the thickness of the outer layer.

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LAMINATE

The present invention relates to a laminate suitable for forming tubes and other packages. The invention also relates to an oral care composition packaged in a laminate tube.

EP-B2-0 164 232 (America Can) discloses a multiple-layer sheet structure for use in a paperless heat sealed package, having a heat sealable surface layer, an oriented polymer layer and optionally an intervening adhesive layer, wherein the oriented polymer layer is selected from polypropylene, polyethylene, high density polyethylene, ethylene copolymers, polypropylene-polyethylene blends, nylons and polyesters.

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EP-B1-0 121 336 (America Can) discloses a multiple-layer sheet structure for packaging including a heat sealable layer forming an exterior surface of the structure, a polypropylene layer and a intervening adhesive layer, wherein the polypropylene layer at least is uniaxially oriented at a stretch ratio of 3/1 to 4/1 and this layer is disposed with its surface in contact with the adhesive layer being within 1.5 mil (0.038 mm) of the said exterior surface.

25

EP 0 539 026 B1 (Mobil) discloses a metallized oriented film combination comprising a propylene homopolymer or copolymer substrate (B) having a high density polyethylene skin layer (A) on at least one side thereof, said polyethylene having a thin metal layer deposited therein.

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In a first aspect the present invention provides a laminate comprising inner and outer layers, the outer layer comprising a layer of polypropylene disposed between layers of polyethylene and making up from 40 to 90% of the  
5 thickness of the outer layer.

Preferably, the polypropylene makes up from 50 to 80% of the thickness of the outer layer and more preferably from 60 to 70%. The most advantageous thickness ratio is 1:3:1  
10 polyethylene:polypropylene:polyethylene. An advantage in this type of laminate structure is that it is more easily processed by high speed machines such as those becoming increasingly common. Preferably the thickness of the outermost polyethylene layer ranges from 5 to 40  $\mu\text{m}$ , more  
15 preferably from 10 to 30  $\mu\text{m}$  and most preferably around 20  $\mu\text{m}$ . This thickness provides the optimum balance between providing enough polyethylene to function as an adhesive when it is welded to another polyethylene surface for sealing thereto, and yet not so much so as to detract from  
20 the overall structural integrity should too much polyethylene be melted during such welding. Further, the use of such a polypropylene spine within the polyethylene layer provides a useful support for the outer layer during  
welding.

25

Preferably, the inner layer also includes a polyethylene. Preferably, the polyethylene is low density polyethylene, more preferably, linear low density polyethylene (LLDPE).

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Preferably, the ratio of thickness of the outer and inner layers ranges from 1:1 to 4:1, more preferably, from 1.5:1 to 2.5:1 and most preferably around 2:1.

5 Preferably, the inner layer comprises a layer of polypropylene. Preferably, this layer of polypropylene is disposed between layers of at least one lower polyolefin such as polyethylene, more preferably, linear low density polyethylene. Alternatively, the inner layer comprises a  
10 further layer of polyethylene disposed between layers of one or more further polyethylenes of a difference density. Preferably, the at least one further polyethylene is of a lower density than the first polyethylene. More preferably, at least one of the further polyethylenes is linear low  
15 density polyethylene.

Where the inner layer comprises a polypropylene layer it is preferred that the polypropylene makes up from 50 to 80% of the thickness of the inner layer and more preferably from 60  
20 to 70%.

Where the inner layer comprises a further layer of polyethylene disposed between layers of one or more further polyethylenes of a difference density it is preferred that  
25 the further layer of polyethylene makes up from 50 to 80% of the thickness of the inner layer and more preferably from 60 to 70%.

More preferably, the ratio between the outermost  
30 polyethylene layers of the inner and outer layers range from

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1:1 to 4:1, more preferably, from 1.5:1 to 2.5:1 and most preferably around 2:1.

A most preferred embodiment of the invention is a laminate  
5 comprising inner and outer layers disposed either side of a  
core layer, the inner layer comprising a medium density  
polyethylene layer between two linear low density  
polyethylene layers, the medium density layer making up from  
50 to 70% by thickness of the inner layer, the outer layer  
10 comprising a polypropylene layer between two linear low  
density polyethylene layers, the polypropylene layer making  
up from 50 to 80% by thickness of the outer layer.

Preferably, the core layer comprises a metallized layer  
15 comprising a metal such as aluminium. The metallized layer  
provides a barrier to gases and if required, a metallic  
lustre for decorative purposes. The metallized layer is  
adhered to the rest of the laminate with suitable adhesives  
such as ethylene acrylic acid copolymer (EAA).

20

The laminate according to the invention is made by standard  
processes as are exemplified in "Plastic Films" by Osborn  
and Jenkins and published by Technomic Publishing Company  
(1992). Preferably, the polyolefin layers are biaxially  
25 drawn.

In a second aspect the invention provides an oral  
composition packaged in a deformable tube. The tube  
comprising a laminate according to the first aspect of the  
30 invention and containing an extrudable toothpaste  
composition.

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The laminate according to the first aspect provides the further advantage of making it easier for the user to extrude all the toothpaste from a toothpaste tube since it is more rigid than that in the prior art yet without the expected reduction in flexibility.

Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material ought to be understood as modified by the word 'about'.

The term 'comprising' is meant not to be limiting to any subsequently stated elements but rather to encompass non-specified elements of major or minor functional importance. In other words the listed steps, elements or options need not be exhaustive. Whenever the words 'including' or 'having' are used, these terms are meant to be equivalent to 'comprising' as defined above.

Embodiments according to the invention shall now be discussed with reference to the following non-limiting examples.

**EXAMPLE**

The first laminate is a comparative example and has, from the outermost layer towards the innermost layer:

-33.3  $\mu\text{m}$  polyethylene  
-33.3  $\mu\text{m}$  polypropylene  
-33.3  $\mu\text{m}$  polyethylene

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-25  $\mu\text{m}$  EAA adhesive  
-10  $\mu\text{m}$  aluminium foil  
-25  $\mu\text{m}$  EAA adhesive  
-50  $\mu\text{m}$  polyethylene

5

In contrast the following is an embodiment according to the invention and having, again from the outermost layer towards the innermost layer:

10        -20  $\mu\text{m}$  polyethylene  
          -60  $\mu\text{m}$  polypropylene  
          -20  $\mu\text{m}$  polyethylene  
          -25  $\mu\text{m}$  EAA adhesive  
          -10  $\mu\text{m}$  aluminium foil  
15        -25  $\mu\text{m}$  EAA adhesive  
          -10  $\mu\text{m}$  polyethylene  
          -30  $\mu\text{m}$  medium density polyethylene  
          -10  $\mu\text{m}$  polyethylene

20        In contrast to the comparative example, the embodiment according to the invention is much more easily processed by the high speed machinery becoming more common in processing laminate films.

CLAIMS

1. A laminate comprising inner and outer layers, the outer layer comprising a layer of polypropylene disposed  
5 between layers of polyethylene and making up from 40 to 90% of the thickness of the outer layer.
2. A laminate according to claim 1, wherein the polyethylene is linear low density polyethylene.  
10
3. A laminate according to claim 1 or 2, wherein the inner layer comprises polyethylene.
4. A laminate according to any preceding claim, wherein the  
15 inner layer comprises a linear low density polyethylene.
5. A laminate according to any preceding claim, wherein the ratio of thickness of the outer and inner layers ranges from 1:1 to 4:1.  
20
6. A laminate according to any preceding claim, wherein the inner layer comprises a layer of polypropylene.
7. A laminate according to any preceding claim, wherein the  
25 inner layer comprises a layer of polypropylene disposed between layers of polyethylene.
8. A laminate according to any of claims 1-6, wherein the  
30 inner layer comprises a layer of medium or high density polyethylene disposed between layers of polyethylene of



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a different density.

9. A laminate according to any preceding claim, wherein the inner and outer layers are disposed on either side of a core layer, the core layer comprising a metallized layer.
- 5
10. A laminate comprising inner and outer layers disposed either side of a core layer, the inner layer comprising a medium density polyethylene layer between two linear low density polyethylene layers, the medium density layer making up from 50 to 70% by thickness of the inner layer, the outer layer comprising a polypropylene layer between two linear low density polyethylene layers, the polypropylene layer making up from 50 to 80% by thickness of the outer layer.
- 10
- 15
11. An oral care composition packaged in a deformable tube which comprised a laminate according to any preceding claim.
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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP2005/006705

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B32B27/32 B65D35/02

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B32B B65D

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

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

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/148132 A1 (SCHWINN GEORG) 7 August 2003 (2003-08-07) claims 1,3,5-7,12 paragraphs '0005!', '0006!', '0018!', '0020!', '0034!', '0035!', '0041! -----	1-4,6,9
X	DE 101 47 538 A (RENOLIT WERKE GMBH) 17 April 2003 (2003-04-17) claims 1,2,4,5 -----	1-4,6,9
Y	DATABASE WPI Section Ch, Week 199624 Derwent Publications Ltd., London, GB; Class A17, AN 1996-234733 XP002304312 & JP 08 090738 A (OKURA IND CO LTD) 9 April 1996 (1996-04-09) abstract ----- -/--	11

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

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- \*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

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- \*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
- \*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.
- \*&\* document member of the same patent family

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International Application No  
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 168 338 A (CROWN ZELLERBACH CORP) 15 January 1986 (1986-01-15) claims 1,4,5 page 1, line 35 - page 3, line 13 page 7, line 1 - line 11	11
A	US 2001/055692 A1 (KEUNG JAY K ET AL) 27 December 2001 (2001-12-27) claims 1-3 paragraph '0037!; example 1	1-11

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