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(54) **PAPER-BASED COLLAPSIBLE TUBE**

(57) There is provided a collapsible tube comprising a wall composed of a paper-based material having a stretchability according to ISO 1924-3:2005 of at least 6% in the machine direction (MD) and at least 6% in the cross direction (CD).

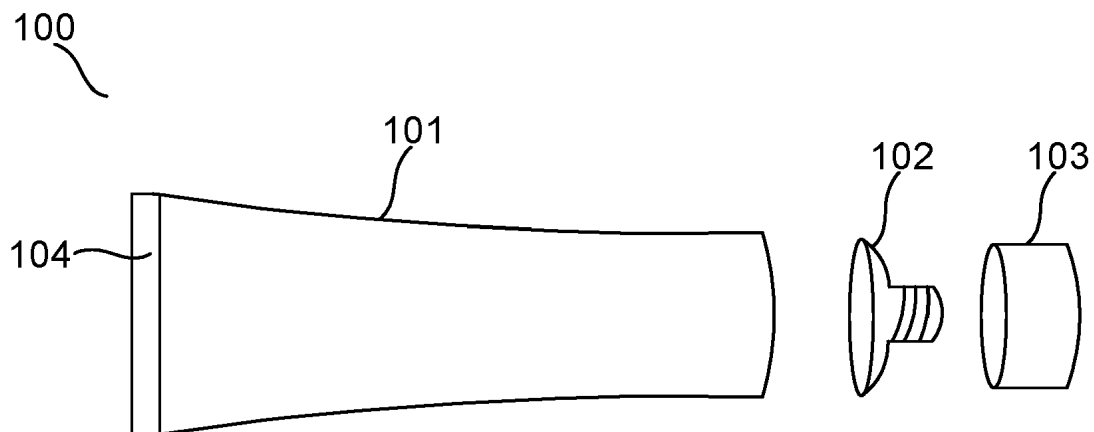


Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of collapsible tubes.

BACKGROUND

[0002] A collapsible tube, sometimes referred to as a squeeze tube, is a type of package that is used for viscous liquids such as toothpaste (and other types of paste), artist's paint, adhesives, caulk, ointments (e.g. cosmetic ointments) and hair care products. Collapsible tubes are also used for viscous foods. The body of a collapsible tube is normally formed from plastic or metallic sheet material. Paperboard-based materials, which are preferred from an environmental perspective, have also been used for the body of collapsible tubes, however in much smaller volumes. One reason for the limited success of the paperboard-based material in this application is that it often wrinkles and even breaks during use, i.e. when a user repeatedly squeezes the collapsible tube.

SUMMARY

[0003] An objective of the present disclosure is to provide a paper-based collapsible tube that break to a lesser extent than those of the prior art.

[0004] The present inventors have found that this objective can be met by using a highly stretchable paper-based material, which is surprising considering that the paper-based material is not stretched to any larger degree during use of the collapsible tubes.

[0005] There is thus provided a collapsible tube comprising a wall composed of a paper-based material having a stretchability according to ISO 1924-3:2005 of at least 6% in the machine direction (MD) and at least 6% in the cross direction (CD).

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Figure 1 is an exploded view of an embodiment of a collapsible tube 100 according to the present disclosure. The collapsible tube comprises a body portion 101, a shoulder portion 102 and a cap 103. The shoulder portion 102 is typically formed by injection moulding of a plastic material, such as polyethylene. In the embodiment of figure 1, the shoulder portion is threaded, which allows the cap 103 to be screwed on and off. Alternatively, the cap 103 may be hinged to the shoulder portion 102. The body portion 101 has a fin seal 104 that constitutes the rear end of the body portion 101. The fin seal 104 is typically formed by heat sealing. The wall material of the body portion 101 is a paper-based material having a stretchability

of at least 6% in the MD and the CD.

Figure 2 illustrates an embodiment of a stretchable paper-based material 200 according to the present disclosure. The stretchable paper-based material 200 is a laminate and comprises a first 201 and a second 202 paper layer, which are bound to each other by an adhesive 203. Both paper layers 201, 202 are highly stretchable FibreForm® paper marketed by BillerudKorsnäs. The top side of the first paper layer 201 is covered with a pigment coating layer 204, which in turn is printed. Alternatively, the pigment coating layer 204 is omitted for a more raw/natural look and feel. The print is intended to face the outside of the collapsible tube. The bottom side of the second paper layer 202 is covered by a barrier layer 205, which is in turn is optionally covered by a heat-sealable layer 206, such as a polyethylene (PE) layer.

[0007] A typical coat weight of the pigment coating layer 204 is 15 g/m². The basis weight of the first 201 and the second 202 paper layer is typically 100 and 150 g/m², respectively. The adhesive 203 may be extruded polyethylene (PE) or a glue selected from polyurethane-based glues, polyacrylates and polyvinyl acetate copolymers. A typical amount of the adhesive 203 is 6-12 g/m². The coat weight of the barrier layer 205 may be about 60 g/m² in case of PE/EVOH/PE and about 42 g/m² in case of PET/AlOx/PE. In these cases where the outer sublayer of the barrier layer 205 is PE, no additional heat-sealable layer is needed. When a separate heat-sealable layer 206 is needed, it may have a coat weight of 30-40 g/m².

DETAILED DESCRIPTION

[0008] There present disclosure provides a collapsible tube comprising a wall composed of a paper-based material having a stretchability according to ISO 1924-3:2005 of at least 6% in the machine direction (MD) and at least 6% in the cross direction (CD). The wall typically forms a body portion of the collapsible tube. Another portion of the collapsible tube is typically a shoulder portion, which is sealed to the body portion. The shoulder portion typically defines an opening, through which the contents of the collapsible tube can be squeezed out. The collapsible tube typically further comprises a cap that can close the opening. The cap can be hingedly connected to the shoulder portion. Alternative, the cap can connect to the shoulder portion by thread means.

[0009] Preferably, the stretchability according to ISO 1924-3:2005 of a paper-based material having is at least 8% in the MD and at least 8% in the CD. More preferably, it is at least 9% in both MD and CD.

[0010] The paper of the paper-based material is preferably kraft paper, e.g. softwood kraft paper.

[0011] A suitable example of a highly stretchable softwood kraft paper is FibreForm® marketed by Billerud-

Korsnäs (Sweden).

[0012] For sufficient strength and robustness, the grammage of the paper-based material is typically at least 150 g/m², preferably at least 250 g/m² and more preferably at least 230 g/m². A suitable upper limit for this grammage is 500 g/m².

[0013] In the context of the present disclosure, grammage (also referred to as basis weight) is measured according to the standard ISO 536:2019.

[0014] The paper-based material is preferably a laminate comprising at least two paper layers, such as two or three paper layers. The grammage of each paper layer may be 80-200 g/m², preferably 100-200 g/m², more preferably 100-160 g/m².

[0015] The paper layers of the laminate may be bonded to each other by conventional technology known to the skilled person, e.g. by gluing or extrusion lamination.

[0016] The side of the paper-based material that faces the inside of the collapsible tube may comprise a barrier layer. In the barrier layer, an oxygen barrier sublayer may be sandwiched between sublayers of PE or PP. The coat weight of the barrier layer is for example 20-60 g/m². Examples of the oxygen barrier sublayer include an EVOH layer, a metallised layer, a SiO_x layer and an AlO_x layer.

[0017] The barrier layer may also be a water vapour barrier layer.

[0018] The barrier layer as such may be heat-sealable. Alternatively, a heat sealing layer may be provided on at least part of the barrier layer.

[0019] The side of the paper-based material that faces the outside of the collapsible tube may comprise a pigment coating layer. Suitable pigment coating layers are known to the skilled person and typically comprises a binder and calcium carbonate and/or clay. The coat weight of the pigment coating layer may be 10-30 g/m². The pigment coating layer is normally printed.

[0020] In an alternative embodiment, the paper-based material that faces the outside of the collapsible tube is not covered by a pigment coating layer. Thereby, a more raw/natural look and feel may be obtained. However, the uncoated paper surface may still be printed.

[0021] After filling, the rear end of the collapsible tube is sealed, typically by a fin seal. Such a seal may be formed by heat sealing.

[0022] The collapsible tube may be filled, e.g. by any one of the viscous products mentioned above in the background section.

2. The collapsible tube of claim 1, wherein the stretchability according to ISO 1924-3:2005 is at least 8% in the MD and at least 8% in the CD.

5 3. The collapsible tube of claim 2, wherein the stretchability according to ISO 1924-3:2005 is at least 9% in the MD and at least 9% in the CD.

10 4. The collapsible tube of any one of the preceding claims, wherein the grammage according to ISO 536:2019 of the paper-based material is in the range of 150 to 500 g/m², preferably 200 to 500 g/m², more preferably 230 to 500 g/m².

15 5. The collapsible tube of any one of the preceding claims, wherein the paper-based material is a laminate comprising at least two paper layers, such as two or three paper layers.

20 6. The collapsible tube of any one of the preceding claims, wherein the grammage according to ISO 536:2019 of each paper layer is 80-200 g/m², preferably 100-200 g/m².

25 7. The collapsible tube of any one of the preceding claims, wherein the side of the paper-based material that faces the inside of the collapsible tube comprises a barrier layer.

30 8. The collapsible tube of any one of the preceding claims, wherein the side of the paper-based material that faces the outside of the collapsible tube comprises a pigment coating layer.

35 9. The collapsible tube of claim 8, wherein the pigment coating layer is printed.

40 10. The collapsible tube of any one of the preceding claims, wherein the rear end of the collapsible tube is sealed by a fin seal.

11. The collapsible tube of claim 10, wherein the fin seal is formed by heat sealing.

45 12. The collapsible tube of any one of the preceding claims, wherein the fin seal is formed by heat sealing.

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Claims

1. A collapsible tube comprising a wall composed of a paper-based material having a stretchability according to ISO 1924-3:2005 of at least 6% in the machine direction (MD) and at least 6% in the cross direction (CD).

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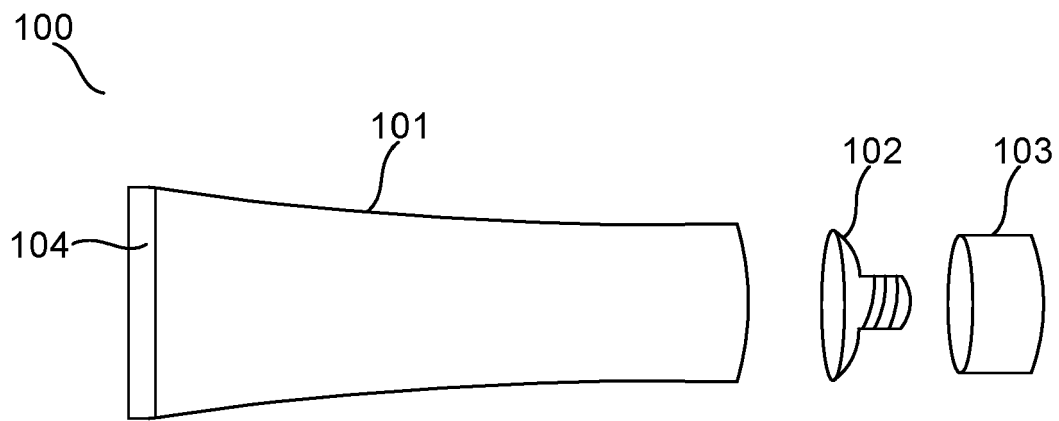


Fig. 1

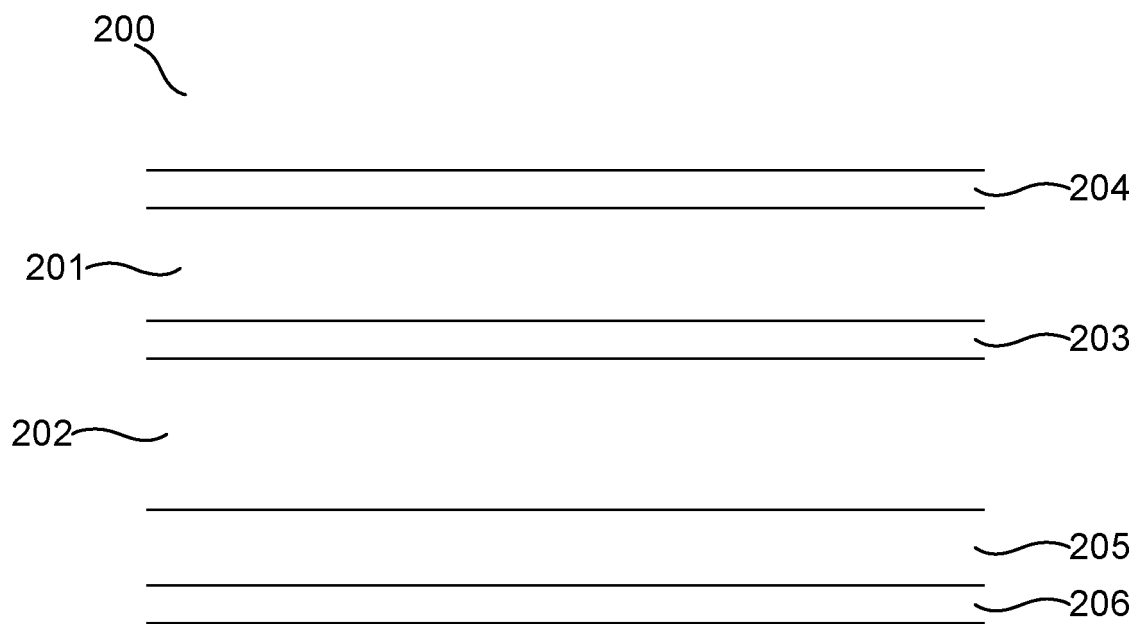


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 6182

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* paragraphs [0005], [0034]; claims 1,4,5,7,14 *	1	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			D21H B65D
Place of search		Date of completion of the search	Examiner
Munich		17 June 2021	Ponsaud, Philippe
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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17-06-2021

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82