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(72) Feltaláló(k):
Neumann, Andreas, 33790 Halle (DE)
Block, Joachim, 33790 Halle (DE)
Niepelt, Ralf, 48599 Gronau (DE)

(73) Jogosult(ak):
Mondi Halle GmbH, 33790 Halle (DE)

(74) Képviselő:
Erdély Péter, DANUBIA Szabadalmi és Jogi Iroda Kft., Budapest

(54) **Kompozit fólia fóliacsomagolásokhoz**

PACKING FILM COMPOSITE FOR FILM PACKAGING

DESCRIPTION

[0001] The invention relates to a composite film also called packing film composite in the following, for film packaging with an outer film, a core film and a hot-sealable inner film. For an angle of measurement of 60° the surface formed by the outer film comprises a gloss level of less than 40. The packing film composite is suitable for the manufacture of film packaging bags by folding and sealing, wherein there is no restriction regarding further development of the packaging bags. For example side-fold bags may be formed, which are initially open on one side and are empty while being manufactured and which are subsequently fed to a filling device, wherein the packaging bags, after filling, are then sealed, preferably by hot-sealing. In terms of the invention the packing film composite can also be used in a so-called "form, fill and seal process" (FFS), wherein the packaging bag is formed, filled and closed in immediate succession. Typical goods for filling are, without restriction, animal feed, foodstuffs, hygiene products, garden products such as earth and peat, detergents and cosmetic articles.

[0002] In practice, the packing film composites used for high-quality packaging normally comprise the features mentioned in the beginning, wherein typically the side of the outer film lying inside the composite comprises reverse-printing which is protected against abrasion by the material of the outer film. The outer films which can be printed on, frequently consist of bi-axially oriented polyethylene terephthalate (PET) or bi-axially oriented polypropylene (BOPP), which are cost-effective and lend themselves to being printed-on.

[0003] In order to encourage a potential buyer to form positive associations with the product properties of the packaged item, when he looks at the film packaging, and in order to give the packaging a high-quality appearance, a matt appearance and a soft-touch character are frequently desired. When a film comprises a matt appearance and at the same time is comparatively stiff, this is called paper-touch character. The soft-touch character is determined by the surface structure of the outer layer. Furthermore, such a design is suitable for forming a delineation in relation to competing products. A matt appearance is known to be achievable with PET and BOPP types, but they comprise a very smooth surface.

[0004] From the document US 2006/0093800 A1 a film packaging is known which comprises a matt surface and when in use, generates a low noise level. The film packaging is formed from a packing film composite with a multi-layer co-extruded barrier film from polypropylene and a hot-sealable film which preferably consists of polyethylene. To improve the matt properties, inorganic fillers or inks may be provided which however reduce the transparency of the barrier film.

[0005] An opaque matt polypropylene multi-layer film with a base layer, a top layer and an intermediate layer is known from the document EP 0 620 111 A1. The top layer may be formed of a polypropylene copolymer on the basis of polypropylene and polyethylene. Here the gloss level has been described to be less than 80, preferably 25 to 65. The film is suitable for manufacturing plastic labels for example. Due to its opacity however, the film is not suitable as an outer layer of a packing film composite with an imprint on the inside.

[0006] The invention is based on the requirement to propose a packing film composite for film packaging bags which comprises a high-quality appearance and a soft feel, is easy to process and comprises an imprint applied to the inside, which is visible through the outer film.

[0007] Based on a packing film composite with the above-described features the requirement is solved according to the invention in that on a surface of the packing film composite, the outer film comprises a layer, of which between 50 and 100 % by weight consists of a polypropylene copolymer, the rest consisting of polyolefin, in that the surface formed by the outer film, for an angle of measurement of 60°, comprises a gloss level of less than 40, preferably less than 20, especially preferably less than 10, and in that the outer film is unstretched. In order to achieve a soft and matt surface a soft, multi-phase polypropylene copolymer is preferably provided, which may be formed of propylene, ethylene and/or ethylene-α-olefins. A suitable polypropylene copolymer (suitable due to its properties) may be manufactured by post-polymerisation of polypropylene with a propylene-ethylene mixture. The low gloss-level gives to the packing film composite a velvety high-quality appearance, wherein an imprint arranged inside the packing film composite is distinctly and clearly visible through the outer layer due to its transparency. According to the invention the layer on the surface of the packing film composite consists, for its major part, of polypropylene copolymer and for the rest of polyolefin, wherein it may nevertheless be possible that this layer and the further layers of the packing film composite may comprise a small percentage of admixtures such as processing agents amounting to a maximum of 5 % and typically less than 2 %. Fillers such as chalk or talcum lending a matt appearance to the outer film may reduce transparency and are not normally envisaged for use in the invention.

[0008] In terms of a preferred embodiment of the invention the above-described polypropylene copolymer, which is preferably multi-phase and comparatively soft, is present in the layer of the outer film forming the surface of the packing film composite in an amount of between 50 % and 90 % by weight. By mixing it with at least one further polymer component, a more irregular, distinctly rougher surface can be produced due to the different materials. With regard to one embodiment where the described layer of the outer film consists entirely of a soft, multi-phase polypropylene copolymer or merely contains admixtures of less than 10 % by weight, a distinct improvement in the soft-touch character is noticeable when touching the surface, which is desirable in terms of the invention.

[0009] According to the invention the outer film is unstretched. After forming the outer film therefore, no separate orientation is planned involving a stretching process. In terms of the invention the outer film may be formed by extrusion, preferably by blow film extrusion, by forming one or more layers. Apart from a certain orientation of the polymer chains during the extrusion process no further orientation is envisaged according to the invention. Stretched and unstretched films may have very different properties, wherein stretching of the film consists, in particular, in the alignment of the polymer chains. With the packing film composites known from practice, which comprise a smooth outer film of polypropylene, the desired properties can only be achieved by stretching and biaxial orientation. According to the invention no such additional process step is envisaged during manufacture of the outer film.

[0010] Determining the gloss level is effected using a reflectometer, wherein the values given as part of the invention for the gloss level refer to the DIN 67 530:1982-01 ("Reflectometer as an aid to assessing the gloss level on painted and plastic plane surfaces"). When taking measurements a light source and a receiver are arranged in an observation plane perpendicularly to the surface such that the angle of incidence is equal to the angle of reflection. The measured light current is then, in case of linear scaling, referenced to the reference value 100, which corresponds to the gloss level of a plane polished black glass plate.

[0011] According to the invention the polypropylene copolymer at room temperature comprises a hardness of less than 40 Shore D. Determination of the hardness is, in terms of the invention, effected in accordance with EN ISO 868:2003-10. A further measure for the mechanical properties of the polypropylene copolymer is the flexural modulus according to DIN EN ISO 178:2006-04. Under the present invention the flexural modulus of the polypropylene copolymer is preferably between 290 MPa and 370 MPa. For the properties cited the layer at the surface which comprises the polypropylene copolymer as its essential part, is comparatively soft and thus can contribute to a pleasant papery or fabric-like feel.

[0012] Preferably provision is made for the surface formed by the outer film to also comprise a high friction coefficient in order to improve processing of the packing film composite / the film packaging bag manufactured therefrom. In case of the matt PET and BOPP types used according to the state of the art there is the problem that these have a smooth surface so that during stacking of the filled bags or in the case of prefabricated bags which are held in readiness to be filled, the bags may start slipping off one another. Due to the design of the outer film according to the invention these disadvantages can be overcome, wherein, when the surfaces formed by the outer film of the packing film composite come to rest on top of each other, the dynamic friction coefficient is preferably greater than 0.35, especially preferably greater than 0.45. The values given as part of the invention of the dynamic friction coefficient refer to the DIN EN ISO 8295:2004-10, wherein determination is to be carried under the conditions defined in the standard with an appropriate testing device. When determining the dynamic friction coefficient, measuring is carried out film against film, wherein the surfaces of two film samples forming the outer film rest on top of each other, respectively. In principle it is known that for plastic films, the static and the dynamic friction coefficient may be dependent on the orientation of the samples relative to each other and in relation to the movement of direction. It is important, in terms of the invention, that the minimum values defined are achieved independent of the alignment of the films to be tested. Furthermore measurements are to be taken on film sections which must be free from impurities, and which have not been in storage for an extended period.

[0013] The thickness of the outer film lies typically between 10 µm and 50 µm, preferably between 20 µm and 40 µm. In terms of the invention the outer film may be a film co-extruded as a mono-film or a multi-layer film, wherein the outer film is formed by way of blow film extrusion or blow film co-extrusion and wherein, following extrusion, stretching of the film is not envisaged.

[0014] With one design of the outer film as mono-film, this preferably consists of a multi-phase polypropylene copolymer in an amount of 50 – 100 % by weight, the rest consisting of polypropylene from the group of oriented polypropylene homo-polymers, polypropylene block copolymers, polypropylene random copolymers or mixtures of these polypropylene types.

[0015] With one design of the outer film as a co-extruded film, this is designed in three layers consisting of an outer layer, a core layer and a laminated layer. According to a preferred further development provision is made for the outer film to be symmetrically constructed, wherein the laminated layer and the outer layer consist of multi-phase polypropylene copolymer in an amount of 50 – 100 % by weight, the rest consisting of polypropylene from the group of oriented polypropylene homo-polymers, polypropylene block copolymers, polypropylene random copolymers or mixtures of these polypropylene types. The core layer, the thickness of which is normally greater than 1/3 of the overall thickness of the symmetrically constructed outer film, preferably comprises between 50 and 100 % by weight of the polypropylene copolymer, which also forms the

essential part of the outer layer and the laminated layer. A further part may be formed by a polyolefin, for example a metallocene-catalysed linear low-density polyethylene (mLLDPE), which ensures good compatibility with the remaining polymers.

[0016] In terms of the arrangement according to the invention provision is made for the packing film composite to be formed of three films in total, wherein a core layer is provided between the outer film and the inner film. The packing film composite may be formed by preferably using an adhesive for gluing the films together. The overall thickness of the packing film composite lies typically between 70 µm and 200 µm, preferably between 100 µm and 180 µm.

[0017] The invention will now be explained with reference to the single figure. The single figure shows how the packing film composite is constructed.

[0018] The packing film composite shown in the single figure is formed from an outer film 1, a core film 2 and a hot-sealable inner film 3, which are glued together with a solvent-free 2-component PUR adhesive system. For reasons of clarity the outer film 1, the core film 2 and the inner film 3 are shown at a distance from each other in the single figure, wherein the adhesive is not shown. The outer film 1, which is free from fillers such as chalk or talcum, is provided on its inside, when viewed in the packing film composite, with an imprint 4, which is clearly visible due to the transparency of the outer film 1, and which has been applied by reverse printing to the outer film 1 prior to applying adhesive to the films to produce the lamination.

[0019] The unstretched outer film 1 is formed by blow film co-extrusion and comprises a symmetrical three-layer construction with an outer layer 5, a core layer 6 and a laminated layer 7, wherein the outer layer 5 forms the surface of the packing film composite. The outer layer 5 and the laminated layer 7 have a thickness of 8 µm and consist of a multi-phase soft polypropylene copolymer (PP-CO) in an amount of 70 % by weight. The rest consists of polypropylene block copolymers (PP-BC). By mixing the multi-phase soft polypropylene copolymer with a further polymer component, a particularly irregular, less smooth surface is achieved. Due the increased roughness the desired soft-tough character is improved. The core layer 6 with a thickness of 14 µm consists of the multi-phase soft polypropylene copolymer in an amount of 50 % by weight, and this forms the main part of the outer layer 5 and the laminated layer 7. Further polymer components of the core layer 6 are mLLDPE and LDPE. These raw materials are low-cost, improve processing and exhibit good compatibility with polypropylene copolymers.

[0020] The multi-phase soft polypropylene copolymer is manufactured by a post-polymerisation of the polypropylene with an ethylene-propylene-mixture and is characterised by its softness and optical properties, which give a matt appearance and soft-touch effect to the surface of the packing film composite. The polypropylene copolymer at room temperature may, for example, comprise a hardness of 36 Shore D and a flexural modulus of 330 MPa (Megapascal). The pleasant feel, which matches the matt appearance of the surface, is further due to a high friction coefficient.

[0021] The core film 2 is a mono-film made of PET and has a thickness of 12 µm. The 100 µm thick inner film 3 consists of polyethylene and can be easily sealed. The total thickness of the packing film composite including the adhesive is approx. 146 µm. The easily sealable inner film 3 may preferably contain high-density polyethylene (HDPE) or may be formed of HDPE. HDPE may also be provided as an admixture in a layer of the outer film 1 and/or in the core film 2. HDPE helps to increase the stiffness of the packing film composite or to adjust it in such a way that it is possible to achieve not only the soft-touch effect but also a paper-touch

character. A paper-touch character is understood to mean that the film, despite its thin thickness, comprises a comparatively high stiffness and is matt.

[0022] A sample of the above described packing film composite (sample 1) has been subjected to a test according to DIN EN ISO 8295 in order to determine the dynamic friction coefficient μ_D and subjected to a test according to DIN 67530 in order to determine the gloss level at 60°. The results of the measurements are shown in table 1. Comparison sample 1 consists of a packing film composite with an inner film from polyethylene and an outer film from a matt clouded polyethylene terephthalate. Comparison sample 2 consists of a packing film composite with an inner film from polyethylene and a multi-layer outer film, in which the film layer on the surface of the packing film composite is formed from a matt polyethylene terephthalate. The packing film composite of comparison sample 3 essentially corresponds to comparison sample 2, wherein the two outer layers of the outer film are formed from a matt polyethylene terephthalate. A packing film composite with an inner film from polyethylene and outer film from bi-axially oriented polypropylene is used as comparison sample 4. Comparison sample 5 finally relates to a packing film composite with an inner film from polyethylene and an outer film which comprises a glossy polyethylene terephthalate with anti-slip properties.

	μ_D (EN ISO 8295)	Gloss level 60° (DIN 67 530)
Sample 1	0.57	6
comparison sample	0.26	19
comparison sample	0.32	46
comparison sample	0.25	33
comparison sample	0.18	9
comparison sample	0.75	117

[0023] Comparison samples 1 – 4 comprise a comparatively small dynamic friction coefficient μ_D. When film bags manufactured from these packing film composites are stacked there is the increased danger during processing and storing that they slip. Furthermore the gloss-level in particular with comparison sample 2 is undesirably high.

[0024] Apart from the described three-layer design of the outer film 1 the outer film 1 may be designed as a mono-film, wherein this then consists of the polypropylene copolymer in an amount of at least 50 % per weight.

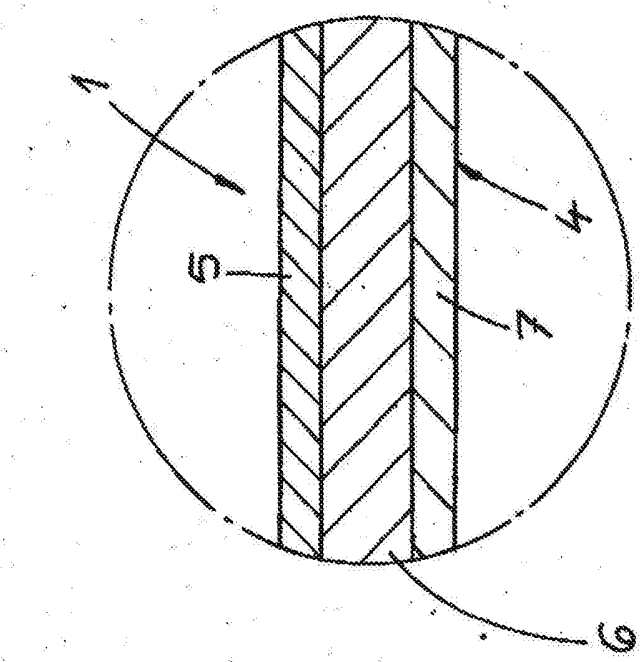
Kompozit fólia fóliacsomagolásokhoz

SZABADALMI IGÉNYPONTOK

1. Kompozit fólia fóliacsomagolásokhoz, külső fóliával (1), magfóliával (2) egy hővel lezárható belső fóliával (3), ahol a külső fólia (1) felületének felületi fénye 60 fokos mérési szögnél 40-nél kisebb érték, **azzal jellemezve, hogy** a külső fólia (1) egy vagy több rétegű, töltőanyag nélküli, transzparens, nyújtás nélküli fúvott film, aminek a magfólia (2) felőli belső oldala reverz nyomtatással van ellátva, és a külső felületet képező legalább egyik külső réteg (5) tartalmaz egy poliolefinből és egy legalább

50%-ban egy lágy, többfázisú polipropilén kopolimerből álló polimer vegyület, ahol a kopolimer szobahőmérsékleten 40 shore-D keménységnél kisebb keménységű.

2. Az 1. igénypont szerinti kompozit fólia, **azzal jellemezve, hogy** a külső réteg (5) polimer vegyülete a lágy, többfázisú polipropilén kopolimer 50 – 90 súly% -át tartalmazza.
3. Az 1. vagy 2. igénypont szerinti kompozit fólia, **azzal jellemezve, hogy** a többfázisú polipropilén kopolimer hajlítási modulusa szobahőmérsékleten 290 és 370 MPa között van.
4. Az 1 – 3. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a külső fólia (1) monofóliaként van kialakítva, ami 50 – 90 súly%-ban lágy, többfázisú polipropilén kopolimer, ami szobahőmérsékleten 40 shore-D keménységnél kisebb keménységű, a maradék pedig polipropilén az orientált polipropilén-homopolimerekből, polipropilén- blokk-kopolimerekből, polipropilén- random-kopolimerekből vagy ezek keverékéből álló csoportból.
5. Az 1 – 3. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a külső fólia (1) három részes, szimmetrikus rétegfelépítésű fóliaként van kiextrudálva, és tartalmaz egy külső réteget (5), egy közbülső réteget (6) és egy, a magréteg felé néző fedőréteget (7), ahol a fedőréteg (7) és a külső réteg (5) 50 – 90 súly%-ban lágy, többfázisú polipropilén kopolimer, ami szobahőmérsékleten 40 shore-D keménységnél kisebb keménységű, a maradék pedig polipropilén az orientált polipropilén-homopolimerekből, polipropilén- blokk-kopolimerekből, polipropilén- random-kopolimerekből vagy ezek keverékéből álló csoportból.
6. Az 1 – 5. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a magfólia egy polietilénterftalátból (PET) van.
7. Az 1 – 6. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a teljes vastagsága 70 µm és 200 µm, előnyösen 100 µm és 180 µm között van.
8. Az 1 – 7. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a külső fólia (1) vastagsága 10 µm és 50 µm, előnyösen 20 µm és 40 µm között van.
9. Az 1 – 8. igénypontok bármelyike szerinti kompozit fólia, **azzal jellemezve, hogy** a DIN EN ISO 8295:2004-10 szabvány szerinti dinamikus súrlódási koefficiens értéke, ha a kompozit fólia külső fóliája (1) által alkotott felület önmagára van felfektetve, nagyobb, mint 0,35, előnyösen nagyobb, mint 0,45.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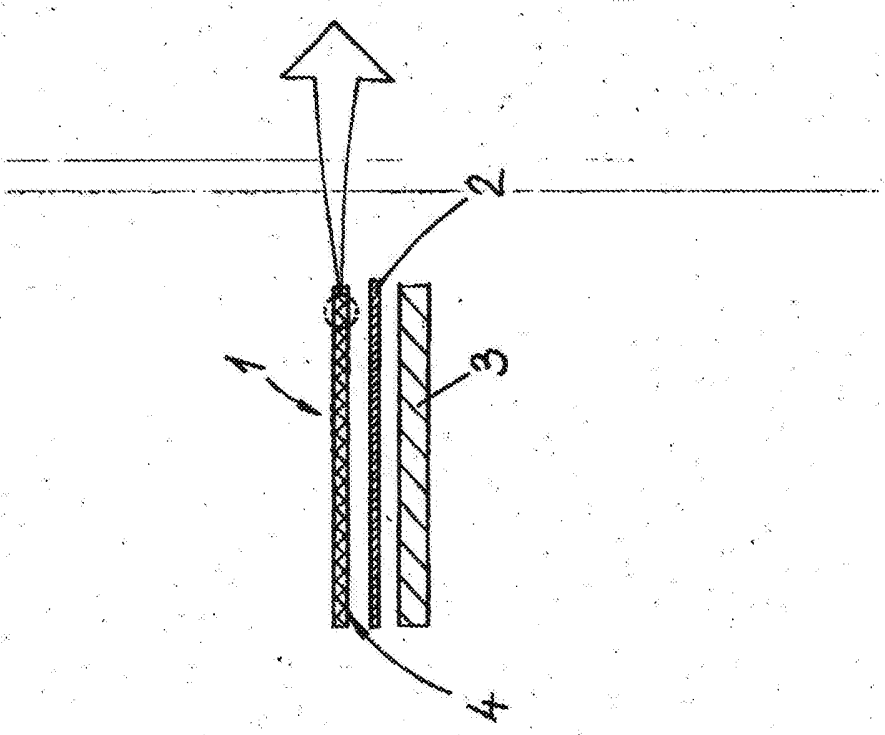
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