



(51) International Patent Classification:

*C08L 23/02* (2006.01) *A61K 8/891* (2006.01)  
*C08L 23/06* (2006.01) *C08G 77/455* (2006.01)  
*C08L 23/08* (2006.01) *C08K 5/20* (2006.01)  
*A61K 8/89* (2006.01)

(21) International Application Number:

PCT/US2011/025026

(22) International Filing Date:

16 February 2011 (16.02.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/304,898 16 February 2010 (16.02.2010) US

(71) Applicant (for all designated States except US): **THE PROCTER & GAMBLE COMPANY** [US/US]; One Procter & Gamble Plaza, Cincinnati, Ohio 45202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **TORO, Carlo** [IT/IT]; Via S. Aleramo, 7, I-65012 Cepagatti (Pescara) (IT). **BROYLES, Norman** [US/US]; 4781 Ouray Ct., Hamilton, Ohio 45011 (US). **POMPEI, Enzo** [IT/IT]; Via C. Ciglia, 50, I-65129 Pescara (IT). **SALONE, Fiorello** [IT/IT]; Via Malagrida, 53, I-65124 Pescara (IT).

**SIMONYAN, Arsen** [BG/IT]; Via Sele, 9, I-65015 Montesilvano (Pescara) (IT). **WNUK, Andrew, Julian** [US/US]; 450 Hidden Valley Lane, Wyoming, Ohio 45215 (US).

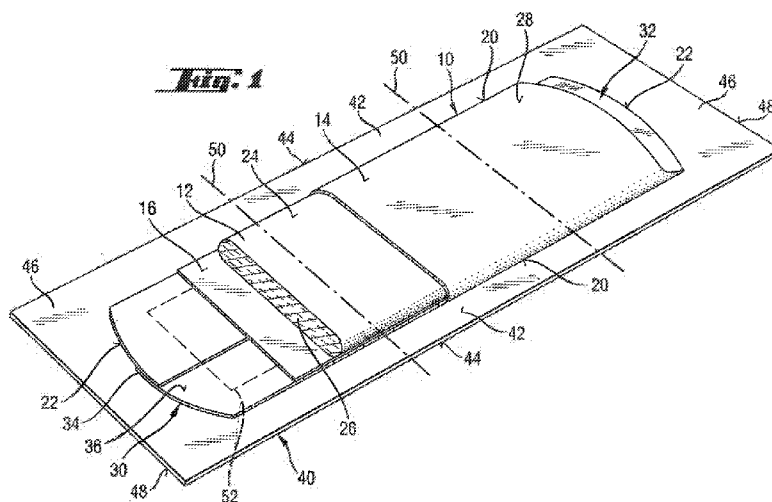
(74) Common Representative: **THE PROCTER & GAMBLE COMPANY**; c/o Eileen L. Hughett, Global Patent Services, 299 East Sixth Street, Sycamore Building, 4th Floor, Cincinnati, Ohio 45202 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,

[Continued on next page]

(54) Title: RELEASE SHEET MATERIAL



(57) Abstract: Release sheet materials for use as packaging material for individually packaged disposable absorbent articles, typically sanitary napkins and the like, and release compositions to be used in said release sheet materials.



LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,  
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments (Rule 48.2(h))*

**Published:**

— *with international search report (Art. 21(3))*

## RELEASE SHEET MATERIAL

## FIELD OF THE INVENTION

5 The present invention relates to improved release sheet materials for use for example in connection with disposable absorbent articles, for example sanitary napkins and the like, which are typically individually packaged prior to use, and to improved release compositions which can be used in such release sheet materials.

## BACKGROUND OF THE INVENTION

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Disposable absorbent articles of personal hygiene are known in the art. Typical examples include sanitary napkins, panty liners, adult incontinence articles, infant diapers, paper towels, bath tissue and facial tissue. Such articles are often used to absorb and retain bodily fluids and other exudates excreted by the human body. Many disposable absorbent articles have the same basic structure:  
15 an absorbent core encased between a liquid permeable, user contacting topsheet, which permits liquid to penetrate its thickness and contact the absorbent core where liquid is retained, and a backsheet, which may be liquid impermeable.

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While there are a great many variations in the specific structural features of disposable absorbent articles, they are typically presented to consumers in the same manner. Essentially, the disposable absorbent article, irrespective of the specific structural features used, is packaged in a box or bag from which the consumer withdraws the article, as needed. In order to protect the article from soiling or contamination from the time it is removed from the box or bag until the article is used, for example if a woman wanted to carry a sanitary napkin with her for use away from home, the  
25 articles may be individually packaged within the box or bag by means of a sheet of material which is wrapped around the individual article.

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A typical individual package for disposable absorbent articles is disclosed, for example, in US patent 4,556,146, which describes a disposable absorbent article, typically a sanitary napkin, associated with a wrapper which overlays one major surface of the sanitary napkin. The wrapper  
extends beyond the perimeter of the disposable absorbent article so that when the disposable absorbent article and the wrapper are folded as a unit, the longitudinal side flaps of the wrapper, which extend beyond the longitudinal sides of the article, may be frangibly sealed thereby

providing the disposable absorbent article with an individual package. It is also common to provide the disposable absorbent article with an adhesive element on the garment facing side of the backsheet which, in use, serves to affix the absorbent article to the wearer's undergarment thereby maintaining the absorbent article in place against the wearer's body. The adhesive  
5 element may take the form of a coating of adhesive which is for example in strips or other suitable pattern. For example, the garment facing side of the backsheet can be coated uniformly with a layer of pressure sensitive hot melt adhesive. The wrapper overlays the garment facing side of the backsheet with the longitudinal flap portions extending beyond the longitudinal perimeter segments of the absorbent article. The wrapper typically is not folded onto or otherwise brought  
10 into contact with the body facing side of the topsheet; in other words, the surface of the wrapper facing the garment facing side of the backsheet is in face to face relation substantially with said side only of the backsheet. The wrapper is typically releasably affixed to the disposable absorbent article, e.g. a sanitary napkin, by the aforementioned adhesive element. When an adhesive element is used in this manner, it is not necessary to provide the absorbent articles with a separate  
15 release sheet in order to protect the adhesive element before use, as this function is provided by the wrapper.

To individually package the absorbent article, the article and the affixed wrapper can be typically folded as a unit, as described for example in the above mentioned US 4,556,146. That is, they are  
20 folded together with the wrapper remaining in place with respect to the absorbent article. Typically, the absorbent article is folded lengthwise into thirds about two fold axes. The longitudinal side flaps or flap portions of the wrapper are frangibly sealed using any of the well known sealing techniques. For example, the longitudinal flap portions may be heat sealed, glued, ultrasonically bonded, or crimped.

25 In use, the individually packaged absorbent article is provided to a user. The user may then break the frangible seals, unfold the wrapper/absorbent article unit and separate the wrapper from the absorbent article, for example a sanitary napkin, exposing the adhesive element. The absorbent article may then be used as such devices normally are, typically being adhered by means of the  
30 adhesive element to the crotch portion of an undergarment, which is subsequently worn.

An advantage of an individually packaged disposable absorbent article, for example a sanitary napkin or a pant liner, is discreteness, as a user does not need to take with her an entire box or bag of products, but only a small number of individually packaged articles, as needed for subsequent use, for example when staying away from home. In a high speed production line the material of the wrapper can be typically provided in a continuous web; the adhesive element may be provided in selected areas directly onto the wrapper material continuous web, and then absorbent articles are provided onto each respective adhesive element, by adhering thereon the garment facing side of the backsheet. The wrapper material continuous web may be folded together with the applied absorbent article, and cut and sealed in order to form individually packaged articles. When the user, after unfolding the package and breaking the seals, separates the absorbent article from the wrapper material, at least some of the adhesive element, and typically substantially the entire adhesive element, remains on the garment facing surface of the backsheet since the respective surface of the wrapper element is typically provided with means having an inferior adhesion to the adhesive material. Said means can be typically a release composition provided to the wrapper material for example as a coating.

The wrapper material, e.g. a polyolefin film, can include a silicone composition which provides the wrapper material with the needed inferior adhesion to the adhesive material, i.e., namely with its adhesive release property. The silicone composition can be typically provided to the already formed sheet material as a coating, for example a known coating technique comprises applying to the sheet material used for the wrapper a layer of a silicone precursor composition, for example comprising a crosslinkable organosilicon prepolymer, which is then cured, namely crosslinked, and anchored to the sheet material surface. Curing/crosslinking can be typically performed by providing energy to the precursor composition in presence of a suitable catalyst or initiator, for example as UV radiation in the presence of a photoinitiator, or heat in the presence of a catalyst.

Other release coating compositions as those disclosed in US Patent 2,880,862 can for example comprise a solution in organic solvent of an oil-modified alkyd resin with an amino-aldehyde release agent which can be for example ethylene bis-stearamide. Said solutions can be typically provided as a coating to the sheet material, for example a synthetic film, and are subsequently cured by heating in an oven in presence of a catalyst.

Providing the release composition, for example a silicone composition, as a coating to a sheet material, for example the wrapper material as described above, constitutes a multi step process, involving the formation, or in any case the provision, of a finished sheet material which has to be then coated with the release composition, e.g. a silicone precursor composition, followed by the  
5 curing/crosslinking step. Also, this process is energy consuming, as curing/crosslinking is achieved by providing energy.

Alternative processes for the production of wrapper materials, e.g. typically polyolefin films, already comprising a release material, e.g. a silicone based composition, , have been developed in  
10 order to comprise a single manufacturing step, i.e. a film formation process, typically by extrusion, already including the release material.

A release sheet material, for example for a wrapper material, could in principle be obtained by directly extruding a layer from a masterbatch containing polyethylene and ethylene bis-stearamide  
15 as the release compound providing the release properties, or also by co-extruding such a layer together with at least another additional polyolefin layer, for example a polyethylene layer.

Said structures, however, are not satisfactory in terms of stability. In use, in fact, the ethylene bis-stearamide compound tends to at least partially migrate typically into the adhesive material in  
20 contact with it; for example the adhesive material of an absorbent article contacting it in the wrapped configuration as described above. This can spoil the adhesive properties of the adhesive material, which can hence show a lower adhesion capacity towards the fabric material of the undergarment. More in general, the ethylene bis-stearamide compounded with a polyolefin such as polyethylene has also a tendency to migrate into adjacent materials, e.g. other polyolefin  
25 co-extruded layers, possibly due to affinity with them, hence modifying the nature of said layers during time. This can in fact cause for example a decrease of the ethylene bis-stearamide content in the release sheet material, and ultimately a reduction of the release properties thereof.

It is therefore desirable to provide a flexible release sheet material for use for example as wrapper  
30 material for disposable absorbent articles, which comprises a single layer or a multi layer structure obtainable by means of extrusion or co-extrusion, and which is also more stable, i.e. less prone to the risk of material contamination, i.e. comprising a release material, typically a fatty

acid amide material, for example ethylene bis-stearamide, which has a reduced tendency to migrate into adjacent layers and/or in the adhesive material in contact thereto, for example when used as a wrapper material for an individually wrapped absorbent article in the packaged configuration.

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It is also desirable to provide a release composition which can be used for example in said flexible release sheet material.

A flexible release sheet material and, more in general, a release composition, can also find use in other applications different from wrapper materials for disposable absorbent articles, where release properties have to be shown towards adhesive or more in general sticky materials meant to come in contact therewith, for example as wrapper or lining material for adhesive tapes or sheets, or also rubber bales, food such as dried fruit, confections, baked goods and so on. Other uses for a release composition can be, but are not limited to, in three dimensional articles, for example injection moulded articles, where low surface energy on one or more surfaces is desirable. For example plastic bottles can be provided with an inner surface of low surface energy that would be non-wetted by the contained liquid (low contact angle of the liquid towards the bottle inner wall), with the purpose of avoiding left-over liquid difficult to pour or extract.

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#### SUMMARY OF THE INVENTION

The present invention addresses the above need by providing a release composition comprising a polyolefin or blend of polyolefins, from 1% to 5% by weight of a fatty acid amide or blend of fatty acid amides, and from 1% to 20% by weight of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane - polyamide copolymers. The present invention also provides a flexible release sheet material comprising an extruded or co-extruded film comprising at least a first layer which in turn comprises the release composition, and a process for making such a flexible release sheet material.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partially cut away perspective view of an absorbent article and its associated wrapper prior to being folded and sealed.

Figure 2 is a partially cut away perspective view of an absorbent article and its associated wrapper after they have been folded and sealed to form an individually packaged absorbent article.

5 Figure 3 is cross section of a flexible release sheet material according to an embodiment of the present invention.

Figure 4 is cross section of a flexible release sheet material according to another embodiment of the present invention.

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Figure 5 is a cross section of a flexible release sheet material according to a further alternative embodiment of the present invention.

Figure 6 is a schematic representation of an apparatus for the manufacturing of a flexible release  
15 sheet material according to the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a flexible release sheet material which may find use as a lining or wrapper material meant to come in contact with adhesive or sticky materials, and showing a  
20 reduced adhesion towards them. More in general, the present invention also relates to a release composition which can be used for example in such a release sheet material. As a non limiting example, the flexible release sheet material comprising the release composition of the present invention will be herein described in its use as a wrapper material for an individually packaged disposable absorbent article, wherein the article is adhered to the wrapper material through the  
25 adhesive which is meant, in use, for adhesion of the absorbent article to the user's undergarment, but can be extended to alternative executions where the adhesive in the absorbent article is for direct adhesion of the article itself to the user's body. More in general, the flexible release sheet material and the release composition of the present invention may also find use in other different applications, where for example the release properties have to be applied to adhesive or more in  
30 general sticky materials meant to come in contact with the release sheet itself, for example as wrapper or lining material for adhesive tapes or sheets, or also rubber bales, food such as dried fruit, confections, baked goods and so on, or also more in general for three dimensional articles



where low surface energy on one or more surfaces is desirable. For example, the release composition can be used as a lining for injection moulded articles such as for the inner surface of plastic bottles. Hence all respective teachings and features of the present invention as described herein are meant to apply to the release composition and to the flexible release sheet material as  
5 such independently of their intended use.

Referring now to the drawings there is shown an individually packaged disposable absorbent article illustrating the teachings of the present invention in an exemplary, but non limiting embodiment. As used herein the term "absorbent article" refers to those articles intended to absorb and retain liquid and in particular to those articles which are placed against or in  
10 proximity to a wearer's body to absorb and contain the various liquids discharged from the body (e.g. blood, menses, urine). A "disposable absorbent article" is an absorbent article which is intended to be discarded after a single use (i.e., it is not intended to be laundered or otherwise restored and reused). Exemplary disposable absorbent articles according to the present invention can be absorbent articles for feminine hygiene such as sanitary napkins and panty liners,  
15 commonly referred to collectively as catamenial pads, light incontinence products, or the like.

Figure 1 is a partially cut away perspective view of a catamenial pad 10 and a wrapper 40 prior to being folded and sealed as set forth in greater detail herein below. A catamenial pad is a disposable absorbent article which is worn by females external to and in the proximity of the  
20 urogenital region and which is intended to absorb and contain menstrual fluids and other vaginal discharges. As used herein the term "catamenial pad" includes pantliners which are often worn by females external to the urogenital region between periods of heavy menstrual flow and which are intended to absorb light menstrual flow and nonmenstrual vaginal discharges. The primary difference between catamenial pads used during periods of heavy menstrual flow and catamenial  
25 pads used between periods of heavy menstrual flow (i.e., pantliners) is the absorbent capacity of the pad.

While the present invention will be described with reference to a catamenial pad, it should be understood that the present invention has application in the context of other disposable absorbent  
30 articles such as, for example, light incontinence products, as well as outside of the context of disposable absorbent articles. Further, the teachings of this invention have application to

catamenial pads manufactured according to the teachings of any of the multitudinous references in the catamenial pad art. A typical catamenial pad embodiment will now be described briefly.

As can be seen in Figure 1, the catamenial pad 10 basically can comprise an absorbent pad 12, an envelope sheet 14 and a barrier 16. The catamenial pad 10 has a perimeter generally comprising longitudinal perimeter segments, or longitudinal sides 20 and transverse perimeter segments, or transverse ends 22. The perimeter defines the outer boundary of the catamenial pad 10, while the longitudinal perimeter segments 20 and the transverse perimeter segments 22 define the outer boundary of the catamenial pad 10 along each longitudinal side and each transverse end respectively.

The absorbent pad 12 is generally compressible, conformable, and non-irritating to the user's skin and may be manufactured from a wide variety of absorbent materials which are capable of absorbing and retaining liquids. For example, a batt of absorbent fibres, a multiplicity of plies of creped cellulose wadding, or any equivalent material may be used. The absorbent capacity of the material used, however, should be sufficient to absorb and retain the expected liquid loading in the intended use of the absorbent article without undue bulk. An example of a suitable catamenial pad 10 intended to receive heavy menstrual discharges of approximately 40 millilitres, may include about 8 grams of comminuted wood pulp, generally referred to as airfelt.

The shape and dimensions of the absorbent pad 12 can be selected to permit the disposable absorbent article to conform to and fit about the portion of the body against which it will be placed. Often, as in the embodiment illustrated, the general shape and dimensions of the catamenial pad 10 can be determined by the shape and dimensions of the absorbent pad 12. In the embodiment illustrated in the figures, the shape and dimensions of the absorbent pad 12 were selected to permit the catamenial pad 10 to conform to the urogenital region of the wearer's body. While the shape and dimensions of the absorbent pad 12 may be varied, it has been found that a generally planar configuration having a first major surface, or body facing side, 24 and a second major surface, or garment facing side, 26 can be suitable. The first major surface 24 is that surface of the absorbent pad 12 facing toward the source of liquid (i.e. toward the wearer's body) and the second major surface 26 is that surface of the absorbent pad 12 facing away from the source of liquid. An example of a suitable catamenial pad 10 can have a generally rectangular,

planar shaped absorbent pad 12 having a length of about 9.0 inches (22.9 centimetres) and a width of about 2.5 inches (6.4 centimetres). It should be understood, however, that other shapes (e.g. elongated ovals, triangles, squares, etc.) and other dimensions may be used.

5 The catamenial pad 10 may include an envelope sheet 14 that encases the absorbent pad 12 and is preferably compliant, soft feeling, and non-irritating to the wearer's body. The envelope sheet 14 can help maintain the structural integrity of the absorbent pad 12 and has a first and a second end flap 30 and 32 respectively. The envelope sheet 14 may be wrapped about the absorbent pad 12 and may be affixed to itself along a seam 34 which is adjacent the second major surface 26 and  
10 which traverses the catamenial pad 10 longitudinally. The first and second flaps 30 and 32 respectively extend beyond the transverse ends of the absorbent pad 12 and are typically sealed so as to completely encase the absorbent pad 12 within the envelope sheet 14. The portion of the envelope sheet 14 overlaying the first major surface 24 is the topsheet portion 28 corresponding to the body facing side of the article, and the portion of the envelope sheet 14 overlaying the  
15 second major surface 26 is the backsheet portion 36 of the envelope sheet 14, corresponding to the garment facing side of the article. The topsheet portion 28 is liquid permeable. In use the topsheet portion 28 may contact the skin of the catamenial pad wearer and permit the transmission of liquid through its thickness to the absorbent pad 12 where the liquid may be retained.

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There are many suitable materials from which the envelope sheet 14 may be manufactured. The topsheet portion 28 may be manufactured from either hydrophobic or hydrophilic fibres and may, for example, be carded, spun bonded, melt blown, or air laid. Alternatively, the topsheet portion 28 may be a continuous film or sheet of, for example, thermoplastic material which is apertured.  
25 A suitable topsheet portion 28 is described in U.S. Pat. No. 4,324,246 which issued to Mullane et al on Apr. 13, 1982.

The topsheet portion 28 and the backsheet portion 36 may either be integral (i.e. the backsheet portion 36 and the topsheet portion 28 are separate elements affixed to each other) or unitary (i.e.  
30 the backsheet portion 36 and the topsheet portion 28 are formed from a continuous and undivided sheet of material) and may either have the same or different physical properties. The embodiment of Figure 1 shows the topsheet portion 28 and the backsheet portion 36 as being unitary.

To help prevent liquids absorbed by the absorbent pad 12 from penetrating through the backsheet portion 36, it may be advantageous to interpose a barrier 16 at the interface between the second major surface 26 of the absorbent pad 12 and the backsheet portion 36. The barrier 16 may be manufactured from any flexible, liquid impermeable material which is non-irritating to the  
5 wearer. In certain embodiments, the barrier 16 may be a sheet of polyethylene which is coincident with the backsheet portion 36.

Alternatively, the envelope sheet 14 may comprise a topsheet portion 28 and a backsheet portion 36 which are made integral with each other by affixing them together about their periphery. In  
10 such embodiments, the topsheet portion 28 may be at least partially liquid impervious and the backsheet portion 36 may be liquid pervious or wholly or partially liquid impervious.

It is common to provide the catamenial pad 10 with an adhesive element 52, partially shown in dotted line in Figure 1. The adhesive element 52 is positioned on the garment facing side of the  
15 article, namely on the backsheet portion 36 and, in use, serves to affix the catamenial pad 10 to the wearer's undergarments thereby maintaining the catamenial pad 10 in place against the wearer's body. The adhesive element 52 may take the form of a coating of adhesive which is in strips or any other suitable pattern. The backsheet portion 36 may be coated uniformly with a layer of a pressure sensitive hot melt adhesive such as, for example, NS34-2823 as manufactured  
20 by National Starch and Chemical of Bridgewater, N.J.

In accordance with the teachings of the exemplary embodiment of this invention, a wrapper 40 is associated with, and typically can have dimensions generally larger than those of the catamenial pad 10. Thus, the wrapper 40 has longitudinal flap portions 42 comprising that portion of the  
25 wrapper 40 between the longitudinal edge 44 of the wrapper and the longitudinal perimeter segment or longitudinal side 20 of the catamenial pad 10. In the embodiment illustrated in Figure 1, the wrapper 40 also has transverse flap portions 46 comprising that portion of the wrapper 40 between the transverse edges 48 of the wrapper 40 and the transverse perimeter segments or transverse ends 22 of the catamenial pad 10.

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The wrapper 40 is shown overlaying the garment facing side of the absorbent article, namely the backsheet portion 36, with the longitudinal flap portions 42 typically extending beyond the

longitudinal perimeter segments 20. In the absorbent shown in Figure 1, the wrapper 40 is not folded onto or otherwise brought into contact with the topsheet portion 28. In other words, the surface of the wrapper 40 facing the backsheet portion 36 is in face to face relation with the backsheet portion 36 only. The wrapper 40 is releasably affixed to the catamenial pad 10 by the  
5   aforementioned adhesive element 52, hence it is also defined as a releasable wrapper 40 according to the present invention. If an adhesive element is used in this manner, it is not necessary to provide the absorbent article with a separate release sheet as is commonly done in prior art devices, as the function of protecting the adhesive element from contamination prior to use is provided by the wrapper.

10   To individually package the catamenial pad 10, the catamenial pad 10 and the affixed wrapper 40 can be folded as a unit. That is, they can be folded together with the wrapper 40 remaining in place with respect to the catamenial pad 10. According to the exemplary embodiment of the present invention, the absorbent article and the wrapper can be folded as a unit about at least one  
15   fold-axis, e.g. a longitudinal or a transverse fold-axis, in order to define a packaged absorbent article. In certain embodiments, the catamenial pad 10 may be folded lengthwise into thirds about two transverse fold-axes 50, as shown in Figure 2, to define a package comprising the absorbent article. The longitudinal flap portions 42 can be frangibly sealed using any of the well-known sealing techniques. For example, the longitudinal flap portions 42 may be heat sealed, glued, or  
20   ultrasonically bonded.

In use, the individually packaged catamenial pad is provided to a user. The user may then break the seals, unfold the catamenial pad 10, and separate the wrapper 40 from the catamenial pad 10. The catamenial pad 10 may then be used as such devices normally are.

25   Means having a reduced adhesion to the adhesive material of the adhesive element 52 can be typically provided into the material of the wrapper 40, namely on the surface which is meant to contact, and be affixed to, the adhesive element 52 on the garment facing surface of the absorbent article in an individually packaged and wrapped absorbent article as illustrated in Figures 1 and 2.

30   According to the present invention, as illustrated in Figure 3, a flexible release sheet material is provided, typically for use as a releasable wrapper 40 for an individually packaged absorbent

article. The flexible release sheet material comprises the film 55, typically obtained by extrusion, which can be for example a single layer film. The flexible release sheet material comprises the release composition of the present invention in turn comprising a polyolefin or blend of polyolefins, from 1% to 5% by weight, or from 1.5% to 4% by weight, or also from 2% to 3% by weight of a fatty acid amide, or blend of fatty acid amides, and from 1% to 20% by weight, or from 2% to 15% by weight, or also from 4% to 13% by weight, of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane - polyamide copolymers, and mixtures thereof.

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The release composition of the present invention can typically comprise from 75% to 98% by weight, or from 81% to 96.5% by weight, or also from 84% to 94% by weight of the polyolefin or blend of polyolefins. In the release composition of the present invention the polyolefin or blend of polyolefins can comprise polyethylene, or polypropylene, or blends or copolymers thereof. Typically the polyolefin can be polyethylene, for example high density polyethylene (HDPE), or low density polyethylene (LDPE), or linear low density polyethylene (LLDPE), or a blend of LDPE and LLDPE, such as for example a blend of four parts LLDPE and one part LDPE.

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It is believed the adhesive release property in the release composition of the present invention, e.g. typically comprised in the flexible release sheet material, is provided by the presence in the composition itself of a fatty acid amide, or blend of fatty acid amides.

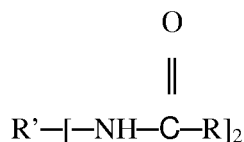
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Fatty acid amides can be selected among amides of a saturated or unsaturated carboxylic acid, for example a monocarboxylic acid, or alkylene bis-amides of a saturated or unsaturated monocarboxylic acid. The amides of a saturated or unsaturated carboxylic acid can be selected among primary amides of carboxylic acids having from 12 to 22 carbon atoms. Thus, for example, there may be used amides of lauric, myristic, palmitic and stearic acids as well as diamides of dicarboxylic acids such as oxalic and adipic acids and amides of unsaturated acids such as oleic and erucic acids. The fatty acid amides according to the present invention can also be selected among alkylene bis-amides which have the structure:

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5 wherein R' represents an alkylene group having from 1 to 5 carbon atoms and R represents an alkyl group of from 12 to 22 carbon atoms. For example, typical alkylene bis-amides can be selected among ethylene, methylene and propylene bis-amides, such as for example methylene bis-stearamide, ethylene bis-stearamide, ethylene bis-palmamide, propylene bis-stearamide, propylene bis-oleamide, and the like. For example, the fatty acid amide or blend of fatty acid  
 10 amides according to the present invention can be selected among methylene bis-stearamide, ethylene bis-stearamide, and propylene bis-stearamide. Typically, the fatty acid amide can be ethylene bis-stearamide.

According to the present invention, the compatibilizer compound can be typically selected among  
 15 ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane - polyamide copolymers, and mixtures thereof.

According to the present invention the compatibilizer compound can be for example an ethylene -  
 20 acrylic ester - maleic anhydride terpolymer. Typically, ethylene - acrylic ester - maleic anhydride terpolymers can have a relatively low maleic anhydride content, for example below 1% by weight, down to about 0.3% by weight, while the acrylic ester content can be from 10% to 30% by weight. The compatibilizer compound can be for example selected among the ethylene - acrylic ester - maleic anhydride terpolymers sold by Arkema under the trade name Lotader®  
 25 MAH, such as for example Lotader® 4403.

The compatibilizer compound can be also an ethylene - acrylic acid copolymer. Typically the content of acrylic acid can be for example from 1% to 25% by weight, or also from 5% to 15% by weight. An example can be the compound sold as Primacor® 3460 by Dow Chemical, from the  
 30 Primacor® family.

The compatibilizer compound can be also an ethylene - vinyl acetate copolymer. Typically the content of vinyl acetate can range for example from 9% to 25% by weight. An example can be a compound selected from the Elvax<sup>®</sup> resins sold by DuPont and having the preferred vinyl acetate content.

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The compatibilizer compound can be also selected among polyorganosiloxane-polyamide copolymers.

The polyorganosiloxane-polyamide copolymer of the release composition of the present invention can be preferably solid at room temperature (25°C.) and atmospheric pressure (760 mmHg).

10

For the purposes of the invention, the term “polymer” means a compound containing at least 2 repeating units, preferably at least 3 repeating units and better still 10 repeating units.

15

The polyorganosiloxane-polyamide copolymers of the release composition of the invention may be polymers as those described in documents U.S. Pat. No. 5,874,069, U.S. Pat. No. 5,919,441, U.S. Pat. No. 6,051,216 and U.S. Pat. No. 5,981,680. According to the invention, the polyorganosiloxane-polyamide copolymers may belong to the following two families:

20

- (1) polyorganosiloxane-polyamide copolymers comprising at least two amide groups, these two groups being located in the polymer chain, and/or
- (2) polyorganosiloxane-polyamide copolymers comprising at least two amide groups, these two groups being located on grafts or branches.

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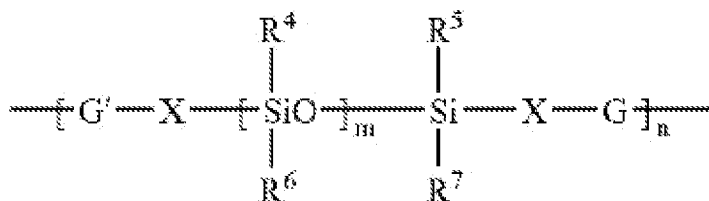
According to a first variant, the polyorganosiloxane-polyamide copolymers are copolymers as defined above under (1) in which the amide units are located in the polymer chain.

The polyorganosiloxane-polyamide copolymers may be more particularly polymers comprising at least one unit corresponding to the general formula (I)

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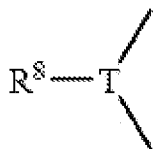
(I)



in which:

- 5      ○ 1) G' represents C(O) when G represents —C(O)—NH—Y—NH—, and G' represents —NH— when G represents —NH—C(O)—Y—C(O)—,
- 2) R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup> and R<sup>7</sup>, which may be identical or different, represent a group chosen from:
  - 10      ▪ linear, branched or cyclic, saturated or unsaturated, C<sub>1</sub>-C<sub>40</sub> hydrocarbon-based groups, possibly containing in their chain one or more oxygen, sulfur and/or nitrogen atoms, and possibly being partially or totally substituted with fluorine atoms,
  - C<sub>6</sub>-C<sub>10</sub> aryl groups, optionally substituted with one or more C<sub>1</sub>-C<sub>4</sub> alkyl groups,
  - 15      ▪ polyorganosiloxane chains possibly containing one or more oxygen, sulfur and/or nitrogen atoms;
- 3) the groups X, which may be identical or different, represent a linear or branched C<sub>1</sub>-C<sub>30</sub> alkylenediyl group, possibly containing in its chain one or more oxygen and/or nitrogen atoms;
- 20      ○ 4) Y is a saturated or unsaturated, C<sub>1</sub>-C<sub>50</sub> linear or branched divalent alkylene, arylene, cycloalkylene, alkylarylene or arylalkylene group, possibly comprising one or more oxygen, sulfur and/or nitrogen atoms, and/or bearing as substituent one of the following atoms or groups of atoms: fluorine, hydroxyl, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, C<sub>1</sub>-C<sub>40</sub> alkyl, C<sub>5</sub>-C<sub>10</sub> aryl, phenyl optionally substituted with 1 to 3 C<sub>1</sub>-C<sub>3</sub> alkyl, C<sub>1</sub>-C<sub>3</sub> hydroxyalkyl and C<sub>1</sub>-C<sub>6</sub> aminoalkyl groups; or
- 25

- 5) Y represents a group corresponding to the formula:



in which

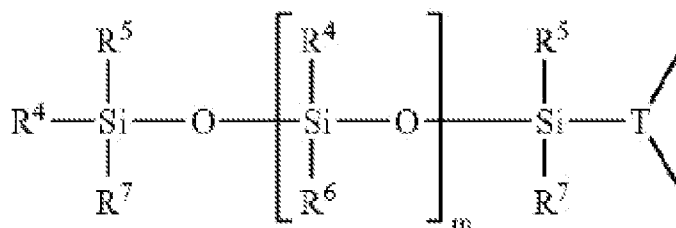
- T represents a linear or branched, saturated or unsaturated, C<sub>3</sub>-C<sub>24</sub> trivalent or tetravalent hydrocarbon-based group optionally substituted with a polyorganosiloxane chain, and possibly containing one or more atoms chosen from O, N and S, or T represents a trivalent atom chosen from N, P and Al, and
  - R<sup>8</sup> represents a linear or branched C<sub>1</sub>-C<sub>50</sub> alkyl group or a polyorganosiloxane chain, possibly comprising one or more ester, amide, urethane, thiocarbamate, urea, thiourea and/or sulfonamide groups, which may possibly be linked to another chain of the polymer;
- 6) n is an integer ranging from 2 to 500 and preferably from 2 to 200, and m is an integer ranging from 50 to 1000, preferably from 50 to 700 and better still from 50 to 200.

It will be noted that “m” corresponds to the mean degree of polymerization of the silicone portion of the polyorganosiloxane-polyamide copolymer.

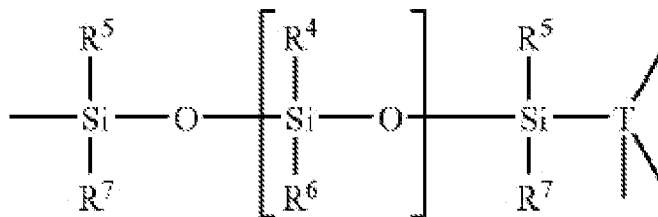
- 20 According to the invention, 80% of the groups R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup> and R<sup>7</sup> of the polymer are preferably chosen from methyl, ethyl, phenyl and 3,3,3-trifluoropropyl groups. According to another embodiment, 80% of the groups R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup> and R<sup>7</sup> of the polymer are methyl groups.

- 25 According to the invention, Y can represent various divalent groups, furthermore optionally comprising one or two free valencies to establish bonds with other units of the polymer or copolymer. Preferably, Y represents a group chosen from:

- a) linear C<sub>1</sub> to C<sub>20</sub> and preferably C<sub>1</sub> to C<sub>10</sub> alkylene groups,
- b) C<sub>30</sub> to C<sub>56</sub> branched alkylene groups possibly comprising rings and unconjugated unsaturations,
- c) C<sub>5</sub>-C<sub>6</sub> cycloalkylene groups,
- 5    ○ d) phenylene groups optionally substituted with one or more C<sub>1</sub> to C<sub>40</sub> alkyl groups,
- e) C<sub>1</sub> to C<sub>20</sub> alkylene groups comprising from 1 to 5 amide groups,
- f) C<sub>1</sub> to C<sub>20</sub> alkylene groups comprising one or more substituents chosen from hydroxyl, C<sub>3</sub> to C<sub>8</sub> cycloalkane, C<sub>1</sub> to C<sub>3</sub> hydroxyalkyl and C<sub>1</sub> to C<sub>6</sub> alkylamine groups,
- 10    ○ g) polyorganosiloxane chains of formula:



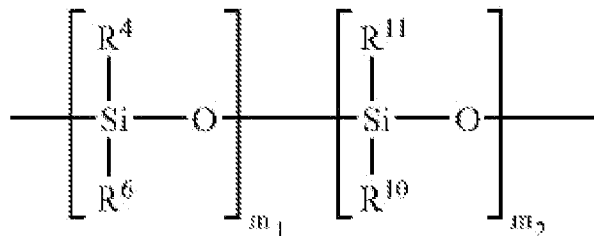
or



15    in which R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, T and m are as defined above.

According to a second variant, the polyorganosiloxane-polyamide copolymers may be copolymers as defined above under (2) in which the amide units are located on grafts or branches, and comprise at least one unit corresponding to formula:

(II)



5

in which

- $\text{R}^4$  and  $\text{R}^6$ , which may be identical or different, are as defined above for formula (I),
- $\text{R}^{10}$  represents a group as defined above for  $\text{R}^4$  and  $\text{R}^6$ , or represents a group of formula  $\text{---X-G''---R}^{12}$  in which X is as defined above for formula (I) and  $\text{R}^{12}$  represents a hydrogen atom or a linear, branched or cyclic, saturated or unsaturated,  $\text{C}_1\text{--C}_{50}$  hydrocarbon-based group optionally comprising in its chain one or more atoms chosen from O, S and N, optionally substituted with one or more fluorine atoms and/or one or more hydroxyl groups, or a phenyl group optionally substituted with one or more  $\text{C}_1\text{--C}_4$  alkyl groups,
- and  $\text{G''}$  represents  $\text{---C(O)NH---}$  and  $\text{---HN---C(O)---}$ ,
- $\text{R}^{11}$  represents a group of formula  $\text{---X-G''---R}^{12}$  in which X,  $\text{G''}$  and  $\text{R}^{12}$  are as defined above,
- $m_1$  is an integer ranging from 1 to 998, and
- $m_2$  is an integer ranging from 2 to 500.

20

It will be noted that “ $m_1$ ” corresponds to the mean degree of polymerization of the silicone portion of the polyorganosiloxane-polyamide copolymer.

According to the invention, the polyorganosiloxane part of the copolymer may be a homopolymer, that is to say a polymer comprising several identical units, in particular units of formula (I) or of formula (II).

- 5 According to the invention, it is also possible that the polyorganosiloxane part of the copolymer may be in turn a copolymer comprising several different units of formula (I), that is to say a polymer in which at least one of the groups  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ , X, G, Y, m and n is different in one of the units. The copolymer may also be formed from several units of formula (II), in which at least one of the groups  $R^4$ ,  $R^6$ ,  $R^{10}$ ,  $R^{11}$ ,  $m_1$  and  $m_2$  is different in at least one of the units.

10

It is also possible to use a polyorganosiloxane-polyamide copolymer comprising at least one unit of formula (I) and at least one unit of formula (II), the units of formula (I) and the units of formula (II) possibly being identical to or different from each other.

- 15 According to one variant of the invention, it is also possible to use a polyorganosiloxane-polyamide copolymer furthermore comprising at least one hydrocarbon-based unit comprising two amide groups, chosen from ester, amide, sulfonamide, carbamate, thiocarbamate, urea, urethane, thiourea, oxamido, guanidino and biguanidino groups, and combinations thereof. These copolymers may be block polymers or grafted polymers.

20

In formulae (I) and (II), the alkylene group representing X or Y can optionally contain in its alkylene part at least one of the following components:

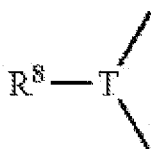
- 1) one to five amide, urea, urethane or carbamate groups,
- 25 ○ 2) a  $C_5$  or  $C_6$  cycloalkyl group, and
- 3) a phenylene group optionally substituted with 1 to 3 identical or different  $C_1$ - $C_3$  alkyl groups.

- In formulae (I) and (II), the alkylene groups may also be substituted with at least one component  
30 chosen from the group consisting of:

20

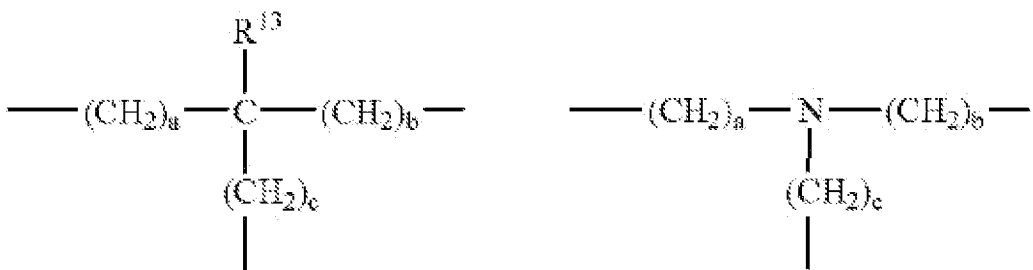
- a hydroxyl group,
- a C<sub>3</sub>-C<sub>8</sub> cycloalkyl group,
- one to three C<sub>1</sub>-C<sub>40</sub> alkyl groups,
- a phenyl group optionally substituted with one to three C<sub>1</sub>-C<sub>3</sub> alkyl groups,
- 5   ○ a C<sub>1</sub>-C<sub>3</sub> hydroxyalkyl group, and
- a C<sub>1</sub>-C<sub>6</sub> aminoalkyl group.

In these formulae (I) and (II), Y may also represent:



10

in which R<sup>8</sup> represents a polyorganosiloxane chain and T represents a group of formula:



or

15

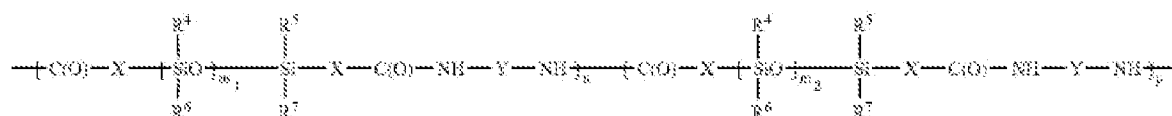
in which a, b and c are, independently, integers ranging from 1 to 10, and R<sup>13</sup> is a hydrogen atom or a group such as those defined for R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup> and R<sup>7</sup>.

In formulae (I) and (II), R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup> and R<sup>7</sup> preferably represent, independently, a linear or  
 20   branched C<sub>1</sub> to C<sub>40</sub> alkyl group, preferably a CH<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>, n-C<sub>3</sub>H<sub>7</sub> or isopropyl group, a  
 polyorganosiloxane chain or a phenyl group optionally substituted with one to three methyl or  
 ethyl groups.

As has been seen previously, the polyorganosiloxane-polyamide copolymer may comprise identical or different units of formula (I) or (II).

Thus, the polyorganosiloxane-polyamide copolymer may comprise a polyamide containing several units of formula (I) or (II) of different lengths, i.e. a polyamide corresponding to formula (III):

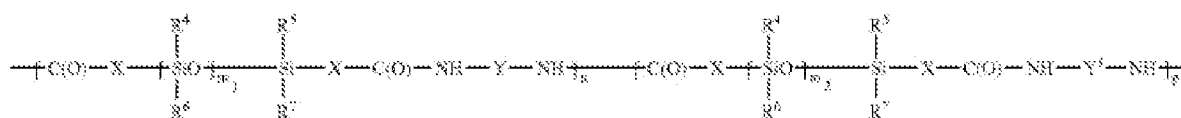
(III)



in which X, Y, n and R<sup>4</sup> to R<sup>7</sup> have the meanings given above, m<sub>1</sub> and m<sub>2</sub>, which are different, are chosen in the range from 1 to 1000, and p is an integer ranging from 2 to 300.

In this formula, the units may be structured to form either a block copolymer, or a random copolymer or an alternating copolymer. In this copolymer, the units may be not only of different lengths, but also of different chemical structures, for example containing different groups Y. In this case, the polymer may correspond to formula IV:

(IV)



in which R<sup>4</sup> to R<sup>7</sup>, X, Y, m<sub>1</sub>, m<sub>2</sub>, n and p have the meanings given above and Y<sup>1</sup> is different from Y but chosen from the groups defined for Y. As previously, the various units may be structured to form either a block copolymer, or a random copolymer or an alternating copolymer.

In an embodiment of the invention, the polyorganosiloxane-polyamide copolymer may also consist of a grafted copolymer. Thus, the polyamide containing polyorganosiloxane units may be grafted and optionally crosslinked with polyorganosiloxane chains containing amide groups. Such polymers may be synthesized with trifunctional amines.

According to the invention, as has been seen previously, the siloxane units may be in the main chain or backbone of the polyorganosiloxane-polyamide copolymer, but they may also be present in grafted or pendent chains. In the main chain, the siloxane units may be in the form of segments as described above. In the pendent or grafted chains, the siloxane units may appear individually or in segments.

According to another embodiment of the invention, a copolymer of polyorganosiloxane-polyamide copolymer and of hydrocarbon-based polyamide, or a copolymer comprising units of formula (I) or (II) and hydrocarbon-based polyamide units, may be used. In this case, the polyorganosiloxane-polyamide units may be located at the ends of the hydrocarbon-based polyamide.

Typically, polyorganosiloxane-polyamide copolymers as described above, and in particular a polyorganosiloxane-polyamide copolymer of formula (I), can have a weight-average molecular mass ranging from 10,000 to 500,000 Dalton, or from 20,000 to 250,000 Dalton, or also from 40,000 to 120,000 Dalton.

Typically, X and Y in the context of a polyorganosiloxane-polyamide copolymer of formula (I) independently represent a group chosen from linear  $C_1$ - $C_{20}$  and preferably  $C_1$ - $C_{10}$  alkylene groups.

According to the invention the polyorganosiloxane-polyamide copolymer as the compatibilizer compound in the release composition can be selected among polydialkylsiloxane-polyamide copolymers, wherein alkyl may be preferably any hydrocarbon group of size  $C_1$  to  $C_{12}$ , or more preferably  $C_1$  to  $C_4$ . Polydimethylsiloxane-polyamide or polydiethylsiloxane-polyamide copolymers can be selected as the compatibilizer compound in the release composition of the present invention. Polydimethylsiloxane-polyamide (PDMS-PA) copolymers are particularly preferred as a compatibilizer compound in the release composition of the present invention.

Typically, the release composition of the present invention can comprise as a compatibilizer compound at least one polydimethylsiloxane-polyamide copolymer, particularly a polymer of general formula (I) with an index m of 50 to 500, preferably of 75 to 300 and more preferably of 100 to 200.



As examples of polyorganosiloxane-polyamide copolymers that may be selected as a compatibilizer compound in the release composition of the present invention, mention may be made of the polydimethylsiloxane-polyamide copolymers obtained in accordance with U.S. Pat. No. 5,981,680, in particular for example the compounds of Examples 1 to 3. For example a  
5 commercially available polydimethylsiloxane-polyamide copolymer can be the product sold under the reference DC 2-8179 by Dow Corning.

In general, the polyorganosiloxane-polyamide copolymers in the release composition of the present invention can typically have a complex melt viscosity of 0.1 Pa·s to 200 Pa·s, preferably  
10 of 5 Pa·s to 100 Pa·s, more preferably of 10 Pa·s to 50 Pa·s as measured at 190°C, 10 Hz frequency, and 1% strain. Those skilled in the art will be able to use appropriate rheological equipment to determine the complex viscosity in accordance with the above specification. For information purposes, the specific method followed is as follows. The equipment used to obtain measurements is a Rheometrics stress controlled rotational viscometer, model SR5000, operating  
15 in dynamic oscillatory mode and utilizing a 25 mm parallel plate fixture. 2 g of the copolymer or mixture of copolymers is placed between the preheated parallel plates at a 10 mm gap. The sample is allowed to melt for approximately 1 min. The upper plate is slowly lowered until the gap is 1 mm. Excess sample outside the boundary of the parallel plate fixture is removed with a brass tool. Once temperature has fully equilibrated at 190°C, the sample is continuously sheared  
20 at 50 Pa for a period of 2 minutes to remove any air bubbles and to remove previously thermo-mechanical history. The device is then stopped for a period of 30 seconds. A frequency sweep measurement is then completed from 0.1 to 100 Hz in five point per decade increments at 1% strain. The data at 10 Hz is then reported.

25 The polyorganosiloxane-polyamide copolymers can also have a melting point between 80°C and 200°C, preferably between 120°C to 160°C, where, as it is known for polymers, the melting point is the DSC (Differential Scanning Calorimetry) melting point, which is the temperature identified as that corresponding to the DSC peak, or corresponding to the highest DSC peak in case of a mixture of polymers showing more than one peak.

30

Typically, the polyorganosiloxane-polyamide copolymers as a compatibilizer compound in the release composition of the present invention, and particularly the

polydimethylsiloxane-polyamide copolymers, can be selected in order to have one or more of the characteristics described above. Without being bound to any theory, it is believed polyorganosiloxane-polyamide copolymers, and particularly polydimethylsiloxane-polyamide copolymers, are particularly suitable as compatibilizer compounds towards fatty acid amides in the release composition of the present invention, based on their respective chemistry, since both compounds comprise amide groups in the molecule. It has also been found that particularly the polydimethylsiloxane-polyamide copolymers selected as a compatibilizer compound in the release composition of the present invention, when comprised for example in the flexible release sheet material can have the further advantage of providing a sheet material producing a reduced noise upon separation of the adhesive material therefrom; for example, in the exemplary embodiment illustrated in Figure 1, when the absorbent article is detached from the release sheet material of the wrapper the noise is low, thus making the article more discreet in its current use.

A flexible release sheet material according to the present invention can also comprise a co-extruded multilayer film comprising at least two layers, wherein at least one first layer consists of a film comprising the release composition of the present invention in turn comprising a polyolefin or blend of polyolefins, a fatty acid amide or blend of fatty acid amides and a compatibilizer compound, with the components selected as described above. The co-extruded multilayer film also comprises a second layer comprising a polyolefin or blend of polyolefins, for example the second layer can actually consist of a polyolefin or blend of polyolefins. This provides for example a flexible release sheet material of the desired thickness, which comprises a thicker layer made of a cheaper material, e.g. typically a polyolefin, as the second layer described above, and only having at least one external relatively thin layer of the composition meant to provide the release properties on at least one side of the multilayer film structure, actually the first layer described above.

Such a multilayer film can be typically made by means of co-extrusion, which refers to the extrusion of multiple layers of material simultaneously. This type of extrusion can typically utilize two or more extruders to melt and deliver a steady volumetric throughput of different viscous thermoplastic materials to a single extrusion head (die) which will extrude the materials in the desired form, i.e., as a multilayer film. This technology can be used on any of the processes for film forming, such as sheet/film extrusion or blown film extrusion. The respective layer

thicknesses can be controlled according to known means, i.e. typically by the relative speeds and sizes of the individual extruders delivering the materials to the single extrusion die. Co-extrusion can have the advantage that a multiple layer film structure can be manufactured in a single and relatively simple process step, with no need of post processing. For example a composite film can be produced having a layer or layers providing mechanical characteristics such as flexibility, resilience, strength, and a layer or layers providing desired surface finishing, such as for example an adhesive release surface.

According to the present invention, a flexible release sheet material comprising a co-extruded multilayer film, i.e. a multilayer film obtainable by means of co-extrusion, can hence be provided which has both mechanical and chemical stability, for example for use in a releasable wrapper for an individually packaged absorbent article. A releasable wrapper made of this release sheet material, and an absorbent article individually packaged in a releasable wrapper made of this flexible release sheet material are also within the scope of the present invention. The flexible release sheet material, as e.g. a co-extruded multilayer film, can be obtained by means of a careful selection of the components of the different layers.

As schematically illustrated in Figure 4, the flexible release sheet material according to this embodiment of the present invention comprises the co-extruded multilayer film 54, which can typically include at least two layers, respectively at least a first layer 58 comprising a polyolefin or blend of polyolefins, from 1% to 5% by weight, or from 1.5% to 4% by weight, or also from 2% to 3% by weight of a fatty acid amide or blend of fatty acid amides, and from 1% to 20% by weight, or from 2% to 15% by weight, or also from 4% to 13% by weight, of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane - polyamide copolymers, or mixtures thereof, and a second layer 56 comprising a polyolefin or blend of polyolefins. The composition and the components of the first layer 58 can be typically selected as described above with reference to the single layer film 55 of Figure 3, and can typically correspond thereto. Typically, the second layer 56 can actually consist of a polyolefin or blend of polyolefins, selected as mentioned above, i.e. comprising polyethylene, or polypropylene, or blends of copolymers thereof. Typically the polyolefin can be polyethylene, for

example low density polyethylene (LDPE), or linear low density polyethylene (LLDPE), or a blend of the two, such as for example a blend of four parts LLDPE and one part LDPE.

According to another embodiment of the present invention, a flexible release sheet material can  
5 comprise a co-extruded multilayer film 154 as illustrated in Figure 5, comprising a first layer 158 and a second layer 156 typically having the same compositions as corresponding first and second layers 58 and 56 described above with reference to Figure 4; the second layer 156 can further comprise a polyamide or polyethylene terephthalate. Typically, the second layer 156 can consist of a polyolefin or blend of polyolefins, for example of polyethylene, selected as mentioned above  
10 with respect to the second layer 56. The coextruded multilayer film 154 further comprises a third layer 157 between the first layer 158 and the second layer 156. The third layer 157 can be typically constituted of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and mixtures thereof. Typically the compatibilizer compound of the third layer 157 can be  
15 selected in order to correspond to the compatibilizer compound comprised in the first layer 158, unless the compatibilizer compound of the first layer 158 is a polyorganosiloxane-polyamide copolymer, as it has been discovered that a polyorganosiloxane-polyamide copolymer is not suitable as an intermediate third layer 157 in a coextruded multilayer film 154 as illustrated in Figure 5. An intermediate third layer 157 constituted by the compatibilizer compound selected as  
20 said above, and interposed between the first and the second layers 158, 156, can further improve the bonding between the second layer 156 comprising the polyolefin or blend of polyolefins, and the first layer 158 providing the release properties.

According to an embodiment of the present invention the flexible release sheet material can be  
25 actually constituted by a co-extruded multilayer film as described above with reference to Figures 4 and 5.

The multilayer construction of the co-extruded flexible release sheet materials 54, 154 of the present invention, as represented for example by the embodiments of Figures 4 and 5, generally at  
30 least comprises a second layer 56, 156 typically constituted by a polyolefin, or a blend of polyolefins, and typically providing the multilayer release sheet material 154 with the desired mechanical properties, and at least a first layer 58, 158 typically comprising a polyolefin or blend

of polyolefins, a fatty acid amide or blend of fatty acid amides, and a compatibilizer compound, selected as described above, which instead can be typically meant to provide the release properties. This provides the advantage of having a multilayer release sheet material mostly comprising inexpensive but mechanically resistant polyolefin or polyolefins, and at least only a  
5 thin layer made of the release composition of the present invention which provides the release properties.

Without being bound to any theory, it is believed the presence of the selected compatibilizer compound in the release composition comprising the polyolefin or polyolefins and the selected  
10 fatty acid amide or blend of fatty acid amides, either constituting the single layer flexible release sheet material 55, illustrated for example in Figure 3, or a first layer 58, 158 in a multilayer flexible release sheet material, such as sheet materials 54 and 154 illustrated in Figures 4 and 5 respectively, chemically stabilizes the fatty acid amide or amides within the polyolefin, and makes it less prone to migrate in other materials which contact the sheet material itself, such as  
15 for example an adhesive, when the release sheet material is typically used as a release material intended to releasably contact an adhesive, for example in the context of a release wrapper material for an individually packaged absorbent article, as illustrated in Figures 1 and 2. The improved stability of the fatty acid amide or amides within the polyolefin can be also beneficial in the context of a multilayer release sheet material, such as in the embodiment illustrated in  
20 Figure 4, where possible migration of the fatty acid amide from the first layer 58 towards the second layer 56 is prevented. This effect is further reinforced in the embodiment illustrated in Figure 5, where the second layer 156 is separated from the first layer 158 containing the fatty acid amide or amides by a further intermediate layer 157 typically constituted by the compatibilizer compound only, which acts as a sort of “barrier” layer.

25

According to the present invention, a flexible release sheet material can be formed, as a single layer or as a multilayer film, as exemplified for example in the embodiments of Figures 3, 4 and 5 respectively, in the desired thickness by extruding the above composition in conventional extrusion or co-extrusion apparatuses, typically as sheet/film or blown film extrusion or  
30 co-extrusion. Typical thicknesses for the flexible release sheet material of the present invention may vary according to the final use of the material itself, and can range from 8  $\mu\text{m}$  to 80  $\mu\text{m}$ , or even up to 100  $\mu\text{m}$ , or from 10  $\mu\text{m}$  to 40  $\mu\text{m}$ , or also from 15  $\mu\text{m}$  to 30  $\mu\text{m}$ . These ranges may be

typical for use of the flexible release sheet material as a wrapper material for an individually packaged disposable absorbent article.

In release sheet materials having multilayer film structures, such as those illustrated in Figures 4 and 5, the thickness of the second layer 56, 156 comprising the polyolefin or blend of polyolefins, can be from 5  $\mu\text{m}$  to 30  $\mu\text{m}$ , or from 8  $\mu\text{m}$  to 20  $\mu\text{m}$ , or also from 10  $\mu\text{m}$  to 15  $\mu\text{m}$ . The thickness of the first layer 58, 158, comprising the polyolefin or blend of polyolefins, the fatty acid amide or blend of fatty acid amides, and the compatibilizer compound, can be from 0.5  $\mu\text{m}$  to 5  $\mu\text{m}$ , or from 1  $\mu\text{m}$  to 3  $\mu\text{m}$ . The thickness of the third intermediate layer 157, when present, as shown in Figure 5, between the first layer 158 and the second layer 156, and consisting of a compatibilizer compound, can be from 1  $\mu\text{m}$  to 10  $\mu\text{m}$ , or from 4  $\mu\text{m}$  to 8  $\mu\text{m}$ .

A process and an apparatus for making a flexible release sheet material according to the present invention is schematically illustrated, in a simplified way, in Figure 6; the apparatus shown can relate to the extrusion of a single layer film 55, as that illustrated in Figure 3, as well as to the co-extrusion of a multi layer flexible sheet material, for example a two or three layer as shown in Figures 4 and 5, being appropriately adaptable as known in the art. An apparatus 60 for extrusion or co-extrusion is fed through reservoirs 62, 64, 66 of the selected polyolefin material, of the selected fatty acid amide or amides, and of the selected compatibilizer compound, respectively. The different materials can be mixed together as appropriate with known means, not shown, and provide the selected feed or feeds to the extrusion die 68 in order to form a single layer film 55 or a multilayer film 54, 154 having the desired structure, i.e. comprising for example two or three layers with specific compositions as explained above. The film can be moved through e.g. a conveyor belt 70 to further manufacturing steps, or wound in a roll 72 for storage and subsequent use.

The flexible release sheet material according to the present invention comprising an extruded or co-extruded film can be produced with a simpler and cost effective process, typically consisting of a single manufacturing step. The flexible release sheet material of the present invention can also comprise further components, such for example inks, dyes, opacifiers, in order to modify the appearance, e.g. providing a colour, of the finished film; such components can be typically added

for example directly to the appropriate feed of the extrusion apparatus, for example they can be comprised in the release composition of the present invention.

5 The flexible release sheet materials according to the present invention are also more stable and resistant, particularly those comprising co-extruded multilayer structures, which are less prone to e.g. delamination when subjected to subsequent mechanical treatments, such as for example embossing.

10 The invention will be illustrated by the following examples, where by PE/EBS masterbatch it is meant a homogeneous blend of polyethylene and 5% by weight ethylene bis-stearamide, for example available as RAC-0500 masterbatch from Polyfil Corp. (Rockaway, NJ). All percentages are by weight, unless otherwise stated.

#### Example 1

15 A flexible release sheet material according to the invention was prepared by extruding a single layer film 25  $\mu\text{m}$  thick comprising 60% PE/EBS masterbatch, 28.8% of a polyolefin blend of 4 parts LLDPE and 1 part LDPE and 11.2% of a polydimethylsiloxane-polyamide compatibilizer compound sold by Dow Corning under the code DC 2-8179.

20

#### Example 2

25 A flexible release sheet material according to the invention was prepared by extruding a single layer film 25  $\mu\text{m}$  thick comprising 30% PE/EBS masterbatch, 65% of a polyolefin blend of 4 parts LLDPE and 1 part LDPE and 5% of a polydimethylsiloxane-polyamide compatibilizer compound sold by Dow Corning under the code DC 2-8179.

#### Example 3

30 A flexible release sheet material according to the invention was prepared by extruding a single layer film 25  $\mu\text{m}$  thick comprising 30% PE/EBS masterbatch, 60% of a polyolefin blend of 4 parts LLDPE and 1 part LDPE, 5% of a polydimethylsiloxane-polyamide compatibilizer

compound sold by Dow Corning under the code DC 2-8179 and 5% of an ethylene - acrylic ester - maleic anhydride terpolymer compatibilizer compound sold by Arkema as Lotader<sup>®</sup> 4403.

#### Comparative example

5

A sheet material was prepared by extruding a layer film 25 µm thick comprising 50% PE/EBS masterbatch and 50% of a polyolefin blend of 4 parts LLDPE and 1 part LDPE.

#### Reference

10

As a reference, a commercial release sheet material sold by Nordenia under the code NOR<sup>®</sup> Pouch RPW PE NDG V5 was also provided, consisting of a LDPE film which has received a UV cured silicone coating according to the known technology.

#### 15 Release Force Test

The release force of the sheet materials was tested according to the FINAT Test Method no. 10, from the FINAT Technical Handbook 6<sup>th</sup> edition, 2001, using a pressure sensitive adhesive tape tesa<sup>®</sup> 4154 available from Tesa Tape Inc., Charlotte, N.J., USA. The test measures the force in  
20 Newton necessary to detach the standard pressure sensitive adhesive tape which has been adhered to the release sheet material. The test method has been slightly modified as for the Test Conditions. Accelerated ageing is selected for the test strips, but they are kept for 20 hours in an air circulating oven at 40°C ± 3°C, instead of 70°C ± 5°C as prescribed in the test method.

#### 25 Adhesive Contamination Test

The adhesive contamination is expressed in terms of the amount of fatty acid amide, namely ethylene bis-stearamide in the Examples described above, migrated into the adhesive tape after it has been detached from the release layer in the test for the release force. This can be suitably  
30 qualitatively evaluated by means of Fourier Transform Infra Red Spectroscopy (FTIR). The tape strips are taken from the Release Force Test and immediately after subjected to FTIR spectroscopy on the adhesive side; the area of the tape strips actually examined is in the centre of



each tape strip, namely the centre of the area of the adhesive previously adhered to the release sheet. The samples are analyzed using a Perkin Elmer Spectrum One FTIR spectrometer equipped with the Universal Diamond ATR (Attenuated Total Reflectance) accessory. Spectra are made up of 16 scans with a resolution of  $4\text{ cm}^{-1}$  ranged between  $4000\text{ cm}^{-1}$  and  $650\text{ cm}^{-1}$ ; to verify the changes in the spectra, the N-H stretching of the amide at about  $3300\text{ cm}^{-1}$  is used; the wavelength range actually considered is from  $3500\text{ cm}^{-1}$  to  $3100\text{ cm}^{-1}$ . The amount of amide migrated into the adhesive, in turn representative of the adhesive contamination, is proportional to the peak height of the amide, expressed in units of “relative absorbance”, and directly obtainable from the instrument software. As known with FTIR results, the values of peak height reported in the table do not represent as such any actual amount of amide within the adhesive; they are instead proportional to the amount of amide migrated into the adhesive, and can be used to make comparisons among the different examples. Any other suitable method and equipment for FTIR can be also used in order to qualitatively evaluate the presence of the fatty acid amide in the adhesive material of the adhesive tape, since the comparison of the results from the different samples has to be taken into account, while the actual values obtained typically do not correspond to any specific amount for the fatty acid amide which has migrated.

The results are summarized in the table below.

Example	Layer Thickness ( $\mu\text{m}$ )	Composition of film in wt. %				Release force (N)	Adhesive contamination (relative absorbance)
		PE/EBS masterbatch	PDMS-PA	Lotader <sup>®</sup> 4403	LDPE/LLDPE		
1	25	60	11.2	-	28.8	0.1	0
2	25	30	5	-	65	0.6	0
3	25	30	5	5	60	1	0.0030
Comp.	25	50	-	-	50	2.4	0.0043
Ref.	25	n/a	n/a	n/a	n/a	0.2	0

The results in the table show that the comparative example not only provides a rather high release force, typically not acceptable in the context of a releasable wrapper for an individually packaged absorbent article, as evidenced by the comparison with the Reference, but also causes contamination of the adhesive, which in use translates in a reduced adhesive capacity of the adhesive material after contact with the release material for a given time. In the field of individually packaged disposable absorbent articles, this corresponds to a reduced capacity of the

absorbent article of adhering to the user's undergarment after being detached from the wrapper material.

5 The examples of release sheet material made according to the invention instead combine a low release force, slightly higher than that of the Reference material for Examples 2 and 3, but still acceptable, and even lower for Example 1, moreover virtually eliminating contamination of the adhesive, as shown by the negligible presence of ethylene bis-stearamide found within the adhesive; no contamination at all is actually shown for Examples 1 and 2. Also, the flexible release sheet material according to the present invention is made according to a simple and cost  
10 effective process in a single manufacturing step, moreover using cheaper raw materials if compared to e.g. the Reference material, constituted by a polyolefin film provided with a UV cured silicone based release coating.

Each dimension for which a value is defined herein is a technical dimension, which, in the  
15 context of the present invention is not to be understood literal. Hence, all embodiments having dimensions functionally equivalent to the dimensions stated herein are intended to be covered by the scope of the invention, e.g. a dimension of "40 mm" has to be understood as meaning "about 40 mm".

## CLAIMS

What is claimed is:

1. A release composition comprising:  
a polyolefin or blend of polyolefins,  
from 1% to 5% by weight, preferably from 1.5% to 4% by weight, more preferably from 2% to 3% by weight of a fatty acid amide or blend of fatty acid amides, from 1% to 20% by weight, preferably from 2% to 15% by weight, more preferably from 4% to 13% by weight, of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane – polyamide copolymers, and mixtures thereof.
2. A release composition according to claim 1, wherein said fatty acid amide or blend of fatty acid amides is selected among amides of a saturated or unsaturated carboxylic acid, and alkylene bis-amides of a saturated or unsaturated monocarboxylic acid.
3. A release composition according to any preceding claim, wherein said fatty acid amide or blend of fatty acid amides is selected among methylene bis-stearamide, ethylene bis-stearamide, and propylene bis-stearamide.
4. A release composition according to any preceding claim, wherein said fatty acid amide is ethylene bis-stearamide.
5. A release composition according to any preceding claim, wherein said compatibilizer compound is an ethylene - acrylic ester - maleic anhydride terpolymer or a polyorganosiloxane – polyamide copolymer.
6. A release composition according to claim 5, wherein said polyorganosiloxane – polyamide copolymer is a polydialkylsiloxane-polyamide copolymer.
7. A release composition according to any preceding claim, wherein said compatibilizer compound is a polydimethylsiloxane – polyamide (PDMS-PA) copolymer.

8. A release composition according to any preceding claim, wherein said polyolefin is polyethylene.
9. A flexible release sheet material comprising an extruded or co-extruded film comprising at least a first layer comprising the release composition of claims 1 to 8.
10. A flexible release sheet material according to claim 9, wherein said material is a co-extruded film and further comprises a second layer comprising a polyolefin or blend of polyolefins.
11. A flexible release sheet material according to claim 10, wherein said second layer further comprises a polyamide or polyethylene terephthalate, said sheet material further comprising a third layer comprised between said first layer and said second layer, said third layer constituted of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and mixtures thereof.
12. A flexible release sheet material according to claim 10 or 11, wherein said second layer is constituted by polyethylene.
13. A flexible release sheet material according to any of claims 9 to 12, wherein said material has a thickness of 8  $\mu\text{m}$  to 80  $\mu\text{m}$ , preferably of 10  $\mu\text{m}$  to 40  $\mu\text{m}$ , more preferably of 15  $\mu\text{m}$  to 30  $\mu\text{m}$ .
14. A flexible release sheet material according to any of claims 9 to 13, wherein said first layer has a thickness of 0.5  $\mu\text{m}$  to 5  $\mu\text{m}$ , preferably of 1  $\mu\text{m}$  to 3  $\mu\text{m}$ .
15. A flexible release sheet material according to any of claims 10 to 14, wherein said second layer has a thickness of 5  $\mu\text{m}$  to 30  $\mu\text{m}$ , preferably of 8  $\mu\text{m}$  to 20  $\mu\text{m}$ , more preferably of 10  $\mu\text{m}$  to 15  $\mu\text{m}$ .

16. A flexible release sheet material according to any of claims 11 to 15, wherein said third layer has a thickness of 1  $\mu\text{m}$  to 10  $\mu\text{m}$ , preferably of 4  $\mu\text{m}$  to 8  $\mu\text{m}$ .
17. A releasable wrapper for an individually packaged absorbent article, said releasable wrapper comprising a flexible release sheet material according to any of claims 9 to 16.
18. An individually packaged absorbent article comprising an absorbent article having a body facing side, a garment facing side, two longitudinal sides and two transverse ends, said absorbent article having an adhesive element on said garment facing side, a releasable wrapper overlaying said garment facing side of said article and releasably affixed to said adhesive element, said absorbent article and said wrapper being folded as a unit about at least one fold-axis to define a package comprising said absorbent article, wherein said releasable wrapper is according to claim 17.
19. A process for making a flexible release sheet material according to any of claims 9 to 16, comprising the steps of:

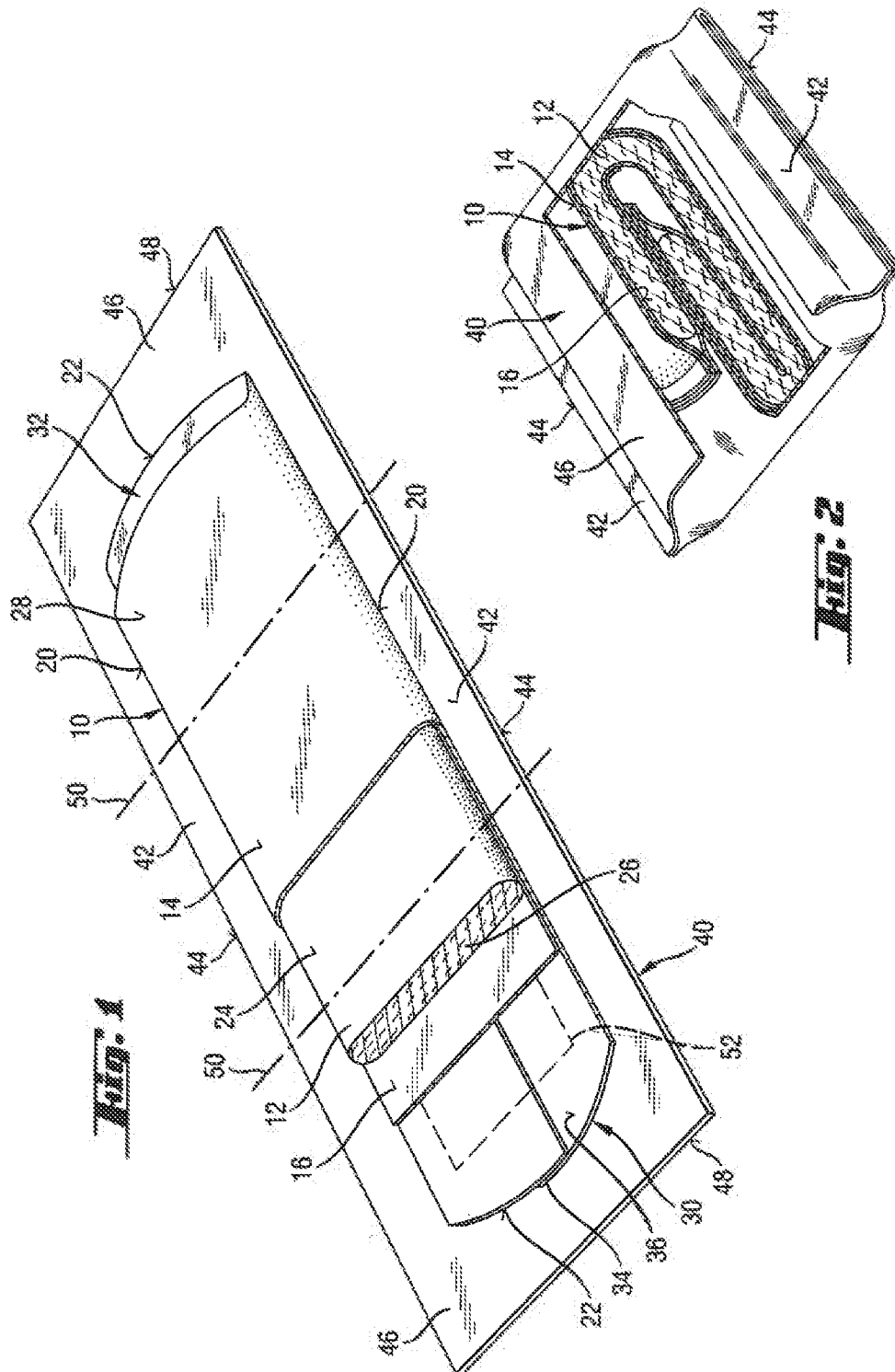
providing at least a first feed of a first material comprising a polyolefin or blend of polyolefins, from 1% to 5% by weight, preferably from 1.5% to 4% by weight, more preferably from 2% to 3% by weight of a fatty acid amide or blend of fatty acid amides, and from 1% to 20% by weight, preferably from 2% to 15% by weight, more preferably from 4% to 13% by weight, of a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and polyorganosiloxane - polyamide copolymer, and mixtures thereof;

optionally providing a second feed of a second material comprising a polyolefin or blend of polyolefins;

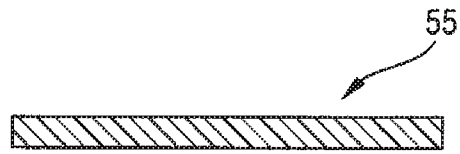
optionally providing a third feed of a third material comprising a compatibilizer compound selected from ethylene - acrylic ester - maleic anhydride terpolymers, ethylene - acrylic acid copolymers, ethylene - vinyl acetate copolymers, and mixtures thereof;

extruding or co-extruding said first material, optionally said second material and optionally said third material into a single layer or multi layer film, wherein said first material provides a first layer, said optional second material provides an optional second layer, and said optional third material provides a further optional third layer comprised between said first layer and said optional second layer.

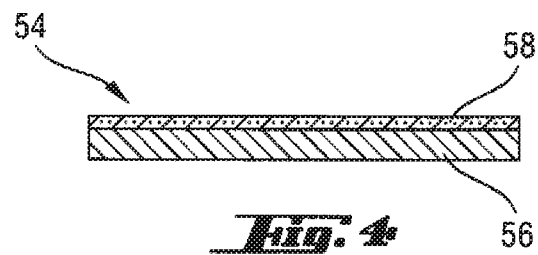
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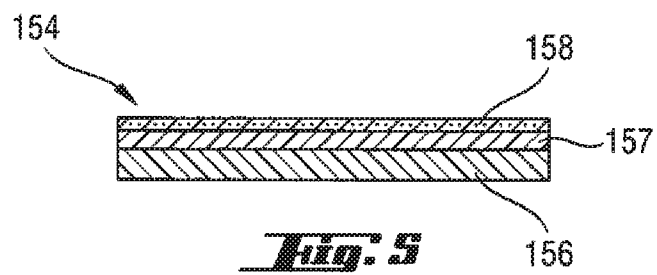
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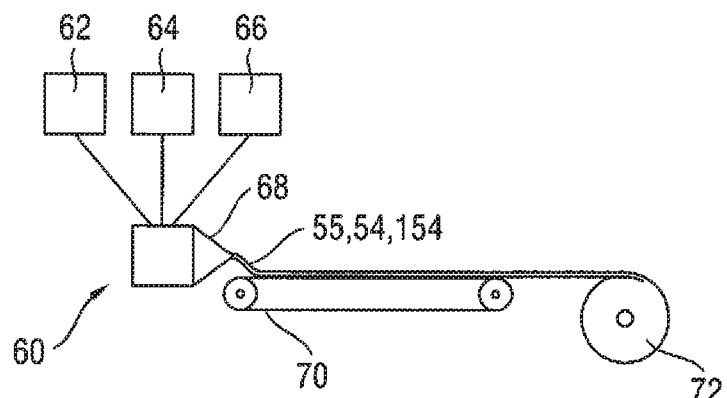
**Fig. 3**



**Fig. 4**



**Fig. 5**



**Fig. 6**



## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2011/025026

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	C08L23/02 C08G77/455	C08L23/06 C08K5/20
	C08L23/08	A61K8/89
		A61K8/891
ADD.		
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)		
C08L A61K C08G C08K		
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, PAJ, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/027234 A1 (SIGWORTH WILLIAM D [US] ET AL) 1 February 2007 (2007-02-01) abstract; claims 1,3,8,10,12 -----	1-4,9
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "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) "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 "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 "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		
Date of the actual completion of the international search		Date of mailing of the international search report
6 July 2011		13/07/2011
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer  Bergmans, Koen

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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