



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C09J 153/02, A61F 13/00, C09J 153/00	A1	(11) International Publication Number: WO 98/58035 (43) International Publication Date: 23 December 1998 (23.12.98)
(21) International Application Number: PCT/US98/12520 (22) International Filing Date: 15 June 1998 (15.06.98) (30) Priority Data: 97109865.2 17 June 1997 (17.06.97) EP <i>(34) Countries for which the regional or international application was filed:</i> AT et al. (71) Applicant: H.B. FULLER LICENSING & FINANCING, INC. [US/US]; 1200 Willow Lake Boulevard, St. Paul, MN 55110-5101 (US). (72) Inventors: JANSSEN, Annegret; 1200 Willow Lake Boulevard, St. Paul, MN 55110-5101 (US). ENDRISS, Gerhard; 1200 Willow Lake Boulevard, St. Paul, MN 55110-5101 (US). (74) Agents: FISCHER, Carolyn, A.; 1200 Willow Lake Boulevard, St. Paul, MN 55110-5101 (US) et al.		(81) Designated States: CA, CN, JP, KR, MX, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: HOT MELT ADHESIVE COMPOSITIONS FOR ADHERENCE TO SKIN AND ARTICLES CONSTRUCTED THEREFROM		
(57) Abstract The present invention relates to a hot melt adhesive composition useful for articles such as plasters, bandages and tapes which are adhesively adhered to skin. The adhesive may be a coated continuously and preferably, discontinuously onto a substrate. More preferably, the hot melt adhesive composition is pattern-coated. The adhesive is permanently adhered to at least one substrate of the article and removably or releasably attachable to skin. The adhesive advantageously does not cause skin irritation nor transfers adhesive to the skin upon removal.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

HOT MELT ADHESIVE COMPOSITIONS FOR ADHERENCE TO SKIN AND ARTICLES CONSTRUCTED THEREFROM

5

Field of the Invention

The present invention relates to a hot melt adhesive composition useful for
10 articles such as plasters, bandages and tapes which are adhesively adhered to skin. The
adhesive may be coated continuously and preferably, discontinuously onto a substrate.
More preferably, the hot melt adhesive composition is pattern-coated. The adhesive is
permanently adhered to at least one substrate of the article and removably or releasably
attachable to skin. The adhesive advantageously does not cause skin irritation nor
15 transfers adhesive to the skin upon removal

Background of the Invention

Hot melt adhesives have been used to bond a variety of materials to many
substrates. James P. Szymanski et al., U.S. Pat. No. 5,204,390, discloses pressure-
20 sensitive hot melt adhesives comprising substantially saturated block copolymers,
tackifying resin, and polybutene. This hot melt composition exhibits adhesive stability
when exposed to ultra-violet light and is stable when contacted with plasticized surfaces.

Removable or releasable hot melt pressure-sensitive adhesives (PSA's) for articles
such as feminine napkins, adult incontinent pads and the like are described as "garment
25 attachment" or "positioning" adhesives. During manufacture of such articles, the hot
melt PSA is typically slot-coated directly or transfer coated onto a polyolefin film
substrate and then covered with a release liner. There are a multitude of patents
pertaining to adhesive compositions for tapes, labels, adhesive bandages and the like.
Collins et al., US Patent 4,136,699 specifically relates to hot melt PSA positioning
30 adhesive compositions comprising substantially saturated block copolymers for feminine
napkins.

In recent years, manufacturers have attempted to replace the continuous slot-coat method with various discontinuous methods, particularly by spray application methods, such as spiral spray and melt blown techniques or by pattern coating methods, otherwise referred to as screen-printing. There are several advantages in using a pattern coating technique, including aesthetic advantages due to the variety of screen designs as well as the ability to strategically place adhesive in precise locations. The primary advantage pattern coating offered is the ability to vastly reduce adhesive consumption, since the surface area per mass of adhesive is greatly increased.

However, hot melt PSAs employed for slot-coat applications tend to exhibit hot melt adhesive transfer to the surface it is removed from when coated discontinuously onto a substrate. Further, the hot melt adhesives known from the prior art have the drawback that they cause skin irritation when in contact with skin for a period of time. To counteract such skin irritation, the adhesive compositions of the prior art necessitate the addition of zinc oxide. Moreover, articles constructed from these hot melt adhesives often do not adhere properly to skin and thus can easily shift and become unattached. Finally, the hot melt adhesive compositions known from the prior art can separate from the substrate permanently adhered to due to mechanical influence.

Hence, industry would find advantage in a hot melt adhesive composition wherein the adhesive is permanently adhered to a substrate and is removably attachable to skin in order to secure an article for a period of time and can be subsequently removed without causing skin irritation or adhesive transfer.

Summary of the Invention

The present invention is a hot melt adhesive composition comprising a block copolymer, a tackifying resin, an extending agent and optionally additives, wherein all the ingredients employed are substantially saturated. Preferably, the block copolymer has styrenic end block(s) and a midblock comprising ethylene/butylene, ethylene propylene, and mixtures thereof. Most preferred block copolymers have a solution viscosity of at least 50 cPs or greater, more preferably about 100 cPs, and most preferably about 200 cPs up to about 2000 for a 25 wt-% solution of the polymer in toluene at 25°C and a diblock content of greater than about 35 wt-%, more preferably greater than about 50 wt-%, and most preferably ranging from about 70 wt-% to about

100 wt-% diblock.

The adhesive exhibits a combination of properties which are amenable to hot melt PSA pattern coating. The adhesive composition exhibits a ring and ball softening point of up to 125°C, a viscosity at 175°C of from about 500 to about 20,000 mPa.s, a tensile strength of 0.10 to 0.80 N/mm², an elongation at break from 500% to 1500%, and a needle penetration of 3 to 12 mm.

Detailed Description of the Invention

The hot melt adhesive composition according to the present invention comprises:

- 10 a) from 5 to 50 wt-%, preferably 15 to 40 wt-%, more preferably 15 to 35 wt-% and most preferably 20 to 30 wt-% of a substantially saturated block copolymer;
- b) 30 to 80 wt-%, preferably 35 to 65 wt-%, more preferably 40 to 60 wt-%, and most preferably 40 to 45 wt-% of at least one substantially saturated tackifying resin;
- 15 c) 5 to 55 wt-%, preferably 13 to 35 wt-% and more preferably 20 to 30 wt-% of at least one substantially saturated plasticizer; and
- d) 0 to 50 wt-%, preferably 0.1 to 10 wt-% and more preferably 0.1 to 5.0 wt-% of additive(s).

20 Hence, all the ingredients employed are substantially saturated. The term "saturated" as used herein means that the ingredient is substantially free of double bonds which are easily susceptible to oxidation. Accordingly, substantially saturated also refers to substantially fully hydrogenated. The Applicants surmise that the avoidance of unsaturated components contributes to the lack of skin irritation. Further, this use of substantially saturated ingredients also results in excellent melt stability and ultra-violet light stability.

The hot melt adhesive of the present invention comprises at least one substantially saturated block copolymer present in an amount ranging from 5 to about 50 wt-%, preferably from about 15 to about 40 wt-%, more preferably from about 15 to about 35 wt-% and most preferably from about 20 to about 30 wt-%. At concentrations below 5 wt-% the adhesive lacks sufficient tensile strength and tends to exhibit adhesive transfer upon removal from the surface it is intended to be removably adhered to.

Alternatively, at higher polymer concentrations, the adhesive is not sufficiently deformable to adhere adequately and exhibits too high of a viscosity to be pattern coated at low application temperatures.

The preferred block copolymers have non-elastomeric end blocks comprising
5 styrene and rubbery midblocks comprising ethylene/propylene, ethylene/butylene, and mixtures thereof. Such polymers are commercially available from Shell Chemical Company under the tradename Kraton® G series as well as from Kurraray.

In order to achieve the preferred viscosity and ring and ball softening point, preferably the block copolymer has a melt index (Condition G) of greater than about 10
10 g/10 min, more preferably greater than about 20 g/10 min, even more preferably greater than about 30 g/10 min., and most preferably ranging from about 50 g/10 min. to 200 g/10 min. Additionally, in order to achieve the required softness or deformability, higher diblock containing polymer are preferred alone or in combination with a predominantly triblock, 100% coupled, block copolymer structure. Diblock refers to the molecules
15 having an A-B structure wherein A is a nonelastomer such as polystyrene and B is the rubbery block. Diblock differs from triblock in that it does not have a nonelastomeric styrene or vinyl blocks on both ends. Preferably, the diblock content of the block copolymer(s) is greater than about 35 wt-% with respect to the total weight of the block copolymers, more preferably about 50 wt-% and greater, and more preferably about 70
20 wt-% to about 100 wt-% diblock. Further, preferred block-copolymers have an endblock to midblock ratio of 10/90 (10% styrene end block) to 40/60 wt-% and more preferably ranging from about 25 wt-% to about 40 wt-% endblock (styrene).

Commercially available block copolymers useful for the invention include
KRATON G 1650, a 29% styrene, 8000 solution viscosity (25 wt-% polymer), 100%
25 triblock styrene-ethylene/butylene-styrene (S-EB-S) block copolymer; KRATON G 1652, a 29% styrene, 1350 solution viscosity (25 wt-% polymer), 100% triblock S-EB-S block copolymer; KRATON G 1657, a 4200 solution viscosity (25 wt-% polymer), 35% diblock S-EB-S block copolymer; all available from the Shell Chemical Company. The preferred block copolymers are of the styrene-ethylene/propylene (S-EP) types and are
30 commercially available under the tradenames KRATON G 1726, a 28% styrene, 200 solution viscosity (25 wt-% polymer), 70% diblock S-EB-S block copolymer; KRATON G-1701X a 37% styrene, >50,000 solution viscosity, 100% diblock S-EP block

copolymer; and KRATON G-1702X, a 28% styrene, >50,000 solution viscosity, 100% diblock S-EP block copolymer also available from the Shell Chemical Company.

The adhesive of the present invention comprises at least one substantially saturated tackifying resin present in an amount ranging from about 30 wt-% to about 80 wt-%, preferably from about 35 wt-% to about 65 wt-%, more preferably from about 40 wt-% to about 60 wt-%, and most preferably from about 40 wt-% to about 45 wt-%. However, higher tackifying resin concentrations may be employed if the tackifying resin is a liquid at ambient temperature (25°C).

The tackifying resins useful to the present invention are also substantially saturated and included dicyclopentadiene based resins, substantially fully hydrogenated aliphatic C5 and C9 resins, and substantially saturated aromatic monomer based resins such as α -methylstyrene based resins. The preferred tackifying resins are water white in appearance, indicative of their lack of impurities. Commercially available saturated tackifying resins suitable for use in the present invention include Arkon P 90, Arkon P 125, Arkon P 140, fully saturated alicyclic hydrocarbon resins from the Arakawa Chemicals Industries Ltd.; ESCOREZ 5300, ESCOREZ 5320, ESCOREZ 5340 and ESCOREZ 5380, dicyclopentadiene resins from Exxon Chemical Company; Regalrez 1018, a liquid resin ($T_g = -20^\circ\text{C}$) based on hydrogenated polymerized styrenic based monomers; as well as KRISTALEX F85 and KRISTALEX F100, α -methyl styrene resins from Hercules GmbH. Tackifying resins which are not water white yet are nearly fully hydrogenated are also surmised to be useful such as the ESCOREZ 5400 series as well as Hercules REGALITE R-type resins.

The hot melt adhesive of the present invention comprises a plasticizer or extending agent present in an amount ranging from about 5 wt-% to about 55 wt-%, preferably from about 15 wt-% to about 35 wt-% and most preferably from about 20 wt-% to about 30 wt-%. However, in embodiments wherein high concentrations of liquid tackifiers are employed, the adhesive composition may be comprised entirely of block copolymer and tackifying resin. A minimal amount of liquid ingredient beneficially softens the block copolymer and solid tackifying resin as well as increases the compliance, elongation and needle penetration properties in addition to reducing the viscosity of the adhesive composition. The plasticizer is also substantially saturated and is typically a liquid at ambient temperature. Suitable plasticizing diluents include

predominantly paraffinic oils having minor amounts of naphthenic and minor amounts of aromatic components as well as liquid polymers such as low softening point alphaolefins, particularly polyisobutylene and liquid copolymers such as LSVI-101. Preferably, the plasticizing diluent is an oil which comprises a paraffinic content of 50 wt-
5 % to 90 wt-%, a naphthenic content of 10 wt-% to 40 wt-% and an aromatic content of no more than about 10 wt-% such as white mineral oils. Such oils are commercially available under the trademarks CATENEX, e.g., CATENEX P941 of the Shell Company or Shell Oil 4142 FU, as well as Kaydol Oil of the Witco Company.

Optionally, the hot melt adhesive compositions may further comprise an additive,
10 such as an inorganic filling agent, pigments, anti-oxidant, ultraviolet or other light protecting agents, and the like. Since the adhesive hot melt formulation according to the present invention causes practically no skin irritation, it is not necessary to add zinc oxide to the adhesive formulation. However, the addition of a small amount of zinc oxide can be beneficial. Further, various medicinal components may be added for trans-
15 dermal drug delivery applications. As is known in the art, various other components can be added to modify the tack, colour, odour, etc. of a hot melt adhesive. It is generally preferred that the other components or ingredients should be relatively inert and have negligible effects on the properties contributed by the block copolymer, tackifying agent, and extending agents.

20 Techniques for manufacturing articles comprising the hot melt adhesive of the present invention include continuous coating methods, such as slot-coating as well as various discontinuous methods, particularly spray application methods, such as spiral spray and melt-blown techniques, and by pattern coating methods, otherwise referred to as screen-printing. The hot melt adhesive composition of the present invention is
25 particularly preferred for pattern coating which involves extruding the molten adhesive through a rotating screen which in turn deposits the adhesive directly onto the substrate to be coated. Alternatively, the hot melt adhesive composition may be first deposited onto release paper and then transfer coated onto the intended substrate. The screens typically used in this process range from about 15 mesh to about 195 mesh, preferably
30 from about 30 to about 60 mesh, and more preferably from about 30 to about 40 mesh. A 30 to 60 mesh screen results in individual hot melt adhesive deposits ranging in mass from as little as about 5×10^{-5} g per hot melt adhesive deposit to about 0.05 g per

adhesive deposit. The number of individual hot melt adhesive deposits per area of substrate ranges from as little as 1 per cm^2 to as many as about 100 per cm^2 . The total mass of adhesive per area ranges from as little as about 5 g/m^2 to about 500 g/m^2 , preferably from about 15 g/m^2 to about 300 g/m^2 , more preferably from about 60 g/m^2 to about 170 g/m^2 , and most preferably from about 85 g/m^2 to about 150 g/m^2 for some applications. For other applications total mass of adhesive per areas is as little as possible, ranging from about 5 g/cm^2 to about 50 g/m^2 , since amounts greater than 50 g/m^2 exceed the coating weights currently used for most slot-coat applications. However, lower or higher amounts may be useful for some applications to alter the level of adhesion.

As previously mentioned, discontinuous coating methods, such as spray and pattern coating, are particularly preferred over slot coating, due to the possibility of greatly increasing the surface area per mass of adhesive and enhancing the level of adhesion. This increase in surface area provides sufficient adhesion, comparable to adhesion levels of slot-coat applications, at greatly reduced adhesive consumption levels. Moreover, pattern coating offers the advantage that small amounts of adhesive hot melt formulation can be strategically placed in precise locations. This aspect is particularly important for applying the hot melt adhesive composition onto nonwoven or woven stretchable bandages or breathable substrates, such as gauze, for better fit.

Preferably, the hot melt adhesive composition is pattern-coated directly onto the substrate for better anchorage of the individual adhesive deposits. The particular shape of the adhesive deposits may vary. Since screens are typically manufactured having square-shaped voids, the resulting adhesive deposit is typically a four-sided pyramid having a square base. However, triangular, circular, elliptical, etc. voids are also contemplated. Hemispherical adhesive deposits are anticipated to be preferred.

The Applicants have found that certain physical properties are predictive as to whether the adhesive has the proper balance of properties to be permanently adhered to the intended substrate of the article, yet removably adhere to a surface such as fabric or skin without adhesive transfer. Further, the Applicants have found that by employing substantially saturated ingredients the adhesive does not cause skin irritation.

The hot melt adhesive composition according to the present invention possesses a low viscosity in comparison to hot melt adhesive compositions commonly employed for

slot-coating applications. The adhesive of the present invention exhibits a viscosity of less than 20000 mPa.s at 175°C, preferably 500 to 12000 mPa.s, more preferably 800 to 5000 mPa.s, most preferably 825 to 3000 mPa.s. At a viscosity of greater than about 20000 mPa.s the adhesive is not easily processed, particularly in the case of
5 discontinuous application methods such as pattern-coating. At a viscosity of less than 500 mPa.s the adhesive transfers when removed.

The hot melt adhesive composition according to the present invention has a ring and ball softening point up to 125°C, preferably of 80°C to 110°C, more preferably of 90°C to 105°C and most preferably of 95°C to 103°C. The relatively low ring and ball
10 softening point and low viscosity are of particular importance for direct coating of the hot melt adhesive composition onto heat sensitive substrate such as polyolefin films and nonwoven. Due to these combination of properties that adhesive may be applied at temperatures of less than about 160°C, preferably at temperatures of less than about 150°C, and most preferably at temperatures of less than about 140°C.

15 The hot melt adhesive composition according to the present invention has a needle penetration value at 25°C of 3 to 12 mm, preferably 4 to 11 mm, more preferably 5 to 10 mm, and most preferably above 7 mm. Additionally, the adhesive composition has a tensile strength of up to 1 N/mm², preferably 0.10 to 0.80 N/mm², more preferably 0.30 to 0.70 N/mm² and an elongation at break from 500% to 1500%, preferably 600% to
20 1300%, more preferably 800% to 1200% and most preferably 830% to 1150%.

The viscosity, needle penetration, tensile strength and elongation relate to the compliance, ability to deform, or softness of the adhesive. When the the viscosity, needle penetration and tensile strength are too high, the adhesive layer of the article according to the present invention is less deformable to the substrate adhered to, such as
25 skin or fabric, causing the adhesive layer to separate from the article resulting in adhesive transfer. Additionally, if these values are too high the adhesive tends to bond tenaciously, causing physical skin irritation. However, a relatively low tensile strength, needle penetration, and viscosity in combination with a high elongation at break allows the hot melt adhesive composition coating to deform to an optimum extent, improving
30 the adherence to the substrate, without adhesive transfer or skin irritation.

Articles whereon at least one substrate is continuously or discontinuously coated with the hot melt adhesive composition of the present invention include plasters,

bandages, feminine napkins, adult incontinent pads, diapers, tapes, medical devices such as eye patches, medicinal patches and electrode patches, and the like. The substrate is typically a plastic film, nonwoven, or textile material. The articles according to the present invention are particularly useful for plasters, gauze and bandages for medical purposes.

The present invention can also be exemplified by the following non-limiting examples. The present invention is not restricted or limited in scope by the exemplified hot melt adhesive composition nor articles constructed therefrom or the process of making such articles, but rather can be advantageously used for all removable hot melt adhesive applications.

Examples

Test Methods

1. The Brookfield Viscosity was determined with Brookfield models DVH, DV-II or DV-III. An appropriate spindle size and hot melt adhesive sample size was selected in accordance with the viscometer manufacturers instructions. The adhesive sample was melted in the thermocel at the temperature at which the viscosity was to be measured. The spindle was lowered into the melted adhesive sample. The motor was turned on at the lowest speed and the corresponding torque reading displayed. The speed was increased until the torque reading stabilized and the viscosity measurement recorded after 30 minutes.
2. The Ring and Ball Softening Point was determined with a Herzog MC 753 instrument. The rings were preheated to the melt temperature and then placed on release paper. The melted adhesive sample was then poured into the rings without inclusion of air bubbles. After cooling, excess adhesive was removed from the rings and two samples placed in the holder of the apparatus with a steel balls on top of each sample. The samples were lowered into a glycerin filled beaker positioned on a heating plate. The samples were lowered into the glycerin and heated at a rated of 5°C per minute. The average temperature at which the balls have fallen is recorded, the difference being not more than 1°C.

3. The Needle Penetration was measured in accordance with DIN 51579 with a load of 100 g and a rate of 5 seconds.
- 5 4. The Tensile & Elongation was measured by first preparing a 20-30 mil (0.5 - 0.7 mm) thick adhesive film free of air bubbles. Cut dogbones lengthwise from the film measuring the thickness at the gauge section (4 mm $\pm$ 1.5 mm). Condition the samples for at least 24 hours at 21°C and 23 to 50 percent relative humidity. Place each sample in the jaws of an Instron tensile tester or equivalent with a load
10 cell capable of measuring a 4 pounds (1.8 kg) force $\pm$ 1 percent. Elongate samples crosshead speed of 100 mm/minute until break. Record the "Ultimate Tensile" at yield by dividing the maximum force by the cross-section area of the sample and "percent Elongation" by dividing the displacement at break by the sample length and multiply by 100. The "Ultimate Tensile" and "percent
15 Elongation" are an average of three to five samples.
5. 180° Peels to Stainless Steel were determined using test method #PSTC-1.
6. The 180° Peels to a Textile Material was determined by first preparing hot melt
20 coated adhesive films on Mylar or polyolefin film using a suitable coating device at an appropriate application temperature. During preparation of the adhesive film, the adhesive surface is covered with release paper to facilitate handling. The coat weight is checked targeting the indicated coat weight or 40 g/m² $\pm$ 3 g/m² where not indicated otherwise. The adhesive coated films are cut into 25
25 mm wide strips which are 170 mm in length in the machine direction. Remove the release paper and place the adhesive surface of one 1 inch (2.5 cm) wide strip onto the textile* material to form a composite. Place the composite on the mechanical roll-down device (2250 g at 120 inches/min), and allow the roller two passes over the sample, one forward and one back. Cut the strips in the middle to
30 obtain two samples. The strip is placed into the mobile jaw and the fabric is placed in the stationary jaw. The procedure is repeated three times (six samples), recording the average T-peel value and noting any legging or transfer. The T-

peel values are reported in grams per linear inch. It is preferred to have T-peels in the 100-500 g range, most preferred in the 200-500 g range without adhesive transfer.

5 *Test fabrics available from TestFabrics (style 460.30 cotton interlock knit
prewashed at 95°C, style 322 nylon tricot 6 prewashed at 40°C, and satin
reference 010682 prewashed at 40°C. Prewashing is done without detergent.

7. A similar procedure was employed to measure the peel adhesion to skin with the
10 exception that the adhesive coated strips were contacted to the inside forearm of
the inventor and had a roller used to apply pressure.

8. To determine skin irritation an adhesive coated strip from each example was
contacted to the forearm of an individual known to have very sensitive skin.
15 After 3 days no irritation was noted.

9. Free Hanging Loop Tack
A film of adhesive about 1 mil thick is coated onto polyester (Mylar®) film. The
film is then mated with release liner, and cut into 1 inch x 5 inch strips (2.54 cm x
20 12.7). A test sample is then inserted into a Loop Tack Tester with the adhesive
side facing out (release liner removed). The Loop Tack Tester automatically
records the tack value in Newtons/25 mm.

25 Example 1

	<u>Ingredient</u>	<u>Tradename</u>	<u>%-Weight</u>
	SEBS Block copolymer	KRATON G 1726	30
30	Tackifying resin	ARKON P125	40.7
	Oil	CATENEX P941	29
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

Example 2

	SEBS Block copolymer	KRATON G 1726	30
		KRATON G 1657	4
5	Tackifying resin	ARKON P90	13
		ARKON P125	27.7
	Oil	CATENEX P941	25
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANIC PS800	0.15

10

Example 3

	SEBS Block copolymer	KRATON G 1726	30
	Tackifying resin	ESCOREZ 5340	44.7
15	Oil	CATENEX P941	25
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

Example 4

20	SEBS Block copolymer	KRATON G 1726	30
	Tackifying resin	ARKON P125	30.7
		ARKON P140	10
	Oil	CATENEX P941	29
25	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

Example 5

30	SEBS Block copolymer	KRATON G 1726	30
	Tackifying resin	ARKON P125	35.7
		ARKON P140	5
	Oil	CATENEX P941	29
	Antioxidant	IRGANOX 1010 FF	0.15
35		IRGANOX PS800	0.15

Example 6

	SEBS Block copolymer	KRATON G 1726	25
40		KRATON G 1657	5
	Tackifying resin	ARKON P90	49.7

		KRISTALEX F85	5
	Oil	CATENEX P941	15
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

5

Example 7

	SEBS Block copolymer	KRATON G 1726	30
	Tackifying resin	ARKON P90	49.7
10		KRISTALEX F85	5
	Oil	CATENEX P941	15
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

15 Example 8

	SEBS Block copolymer	KRATON G 1657	30
	Tackifying resin	ARKON P125	40.7
	Oil	CATENEX P941	29
20	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

Example 9

25	SEBS Block copolymer	KRATON G 1726	33.00
	Tackifying resin	ARKON P125	41.70
	Oil	CATENEX P941	25
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

30

Example 10

	SEBS Block copolymer	KRATON G 1652	10
		KRATON G 1650	5.5
35	Tackifying resin	ESCOREZ 5380	54.70
	Oil	CATENEX P941	29.50
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

40

Example 11

5	SEBS Block copolymer	KRATON G 1657	20
	Tackifying resin	ARKON P125	20
		ESCOREZ 5340	32.7
	Oil	CATENEX 706	27
	Antioxidant	IRGANOX 1010 FF	0.15
10		IRGANOX PS800	0.15

Example 12

15	SEBS Block copolymer	KRATON G 1650	15
	Tackifying resin	ESCOREZ 5320	55.7
	Oil	CATENEX P941	29
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

Example 13

5	SEBS Block copolymer	KRATON G 1652	15
	Tackifying resin	ESCOREZ 5320	55.70
	Oil	CATENEX P941	29
	Antioxidant	IRGANOX 1010 FF	0.15
		IRGANOX PS800	0.15

10 Examples 1-13 were made in a vertical mixer using known hot melt adhesive blending techniques.

The viscosity of Example 1 is as follows:

	<u>Temp °C</u>	<u>Viscosity (CPs)</u>
15	110	98,000
	120	27,000
	130	10,600
	140	4,600
	150	2,450
20	160	1,575
	170	1,000
	175	825

25 The Viscosity of Examples 2-5 are as follows:

Temperature (°C)			
	125	150	175
Example 2	48,000	6,800	2,075
Example 3	21,200	3,625	1,225
Example 4	18,400	2,725	925
Example 5	16,400	2,625	862

Preparation of Coated Articles

- The mixture of the components, as described in each of the Examples 1 to 13 were melted at 150°C to 160°C in a standard melting apparatus and extruded through an extrusion nozzle or through a screen directly onto the intended substrate of the article constructed therefrom. Alternatively, the melted hot melt composition is first extruded onto release paper and then transfer coated onto the intended surface of the article constructed therefrom, such as plasters, gauze and bandages for medical purposes.

Preparation of Coated Samples (see Table 1 and Table 2)

- The components were melted, as in Example 14, in a melting apparatus and then full-coated onto the textile. The adhesion of the coated textile against steel and skin was measured.

Table I - Adhesion Properties of Full Coated Samples

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Full coated on textile Coating weight - g/m ²	120	120	120	120	120	120	120
Peel adhesion against the backside of the coated textile N/25 mm	5.63	5.0	3.8	7.85	6.24	5.77	6.53
N/cm	2.25	2.0	1.52	3.14	2.49	2.31	2.61
Peel adhesion against steel N/25 mm	14.8	19.2	28.4	27.0	14.8	17.0	24.0
Free hanging loop N/25 mm	10.6	13.5	26.0	24.8	8.9	19.0	20.0
Peel adhesion against skin N/25 mm	1.25	1.5	1.6	2.6	3.4	1.2	1.1

Table II - Adhesion Properties of Full Coated Samples

	Example 8	Example 9	Example 10	Example 11	Example 12	Example 13
Full coated on textile Coating weight - g/m ²	120	120	120	120	120	120
Peel adhesion against the backside of the coated textile N/25 mm N/cm	3.75 1.50	4.75 1.9	3.5 1.4	5.85 2.34		

Table III - Physical Properties

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Viscosity measured on a Brookfield Viscosimeter, spindle 27 20 rpm at 175°C [mPa×s]	865	2080	1200	925	868	1850	1062
Ring and Ball softening point [°C]	95	100	97	103	99	94	96
Needle penetration at 25°C [mm]	9.8	7.9	8.5	9.9	11.2	6.4	7.0

Table IV - Physical Properties

	Example 8	Example 9	Example 10	Example 11	Example 12	Example 13
Viscosity measured on a Brookfield Viscosimeter, spindle 27 20 rpm at 175°C [mPa×s]	11900 (5 rpm)	1360	600	4225 (10 rpm)	1500	900
Ring and Ball softening point [°C]	90	102	80	77	104	85
Needle penetration at 25°C [mm]	5.5	7.7	8.0	7.0	7.2	7.5
Tensile strength [N/mm ²]			0.32		0.67	0.40
Elongation at break [%]			1124		985	838

What is claimed is:

1. A hot melt adhesive composition useful for adherence to skin comprising:
 - a) 5 to 50 weight-%, preferably 15 to 40 weight-%, more preferably 15 to 35 weight-% and most preferably 20 to 30 weight-% of at least one substantially saturated block copolymer;
 - b) 30 to 80 weight-%, preferably 35 to 65 weight-%, more preferably 40 to 60 weight-%, and most preferably 40 to 45 weight-% of at least one substantially saturated tackifying resin; and
 - c) 5 to 55 weight-%, preferably 13 to 35 weight-% and more preferably 20 to 30 weight-% of at least one substantially saturated plasticizer.
2. The adhesive composition of claim 1 wherein said block copolymer has styrenic end blocks and a midblock comprising ethylene/butylene, ethylene/propylene, or mixtures thereof.
3. The adhesive composition of claim 2 wherein the ratio of endblock to midblock of said block copolymer ranges from 10/90 to 40/60 weight-% with respect to the weight of the block copolymer.
4. The adhesive composition of claim 1 wherein the tackifying resin is selected from the group consisting of hydrogenated aliphatic tackifying resins, saturated aromatic resins, and mixtures thereof.
5. The adhesive composition of claim 1 wherein the plasticizer is an oil comprising a parafinic content of 50 to 90 weight-%, a naphthenic content of 10 to 40 weight-% and an aromatic content of not more than 10 weight-%.
6. The adhesive composition of any one of the preceding claims, wherein the adhesive

composition has a ring and ball softening point preferably of 80° to 110°C, more preferably of 90°C to 105°C and most preferably of 95°C to 103°C.

7. The adhesive composition according to any one of the preceding claims, wherein the adhesive composition has a viscosity of preferably 500 to 12000 mPa·s, more preferably 800 to 5000 mPa·s, most preferably 825 to 3000 mPa·s.

8. The adhesive composition according to any one of the preceding claims, wherein the adhesive composition has an tensile strength of preferably 0.10 to 0.80 N/mm², more preferably 0.30 to 0.70 N/mm².

9. The adhesive composition according to any one of the preceding claims, wherein the adhesive composition has an elongation at break from 500% to 1500%, preferably 600% to 1300%, more preferably 800% to 1200% and most preferably 830% to 1150%.

10. The adhesive composition according to any one of the preceding claims, wherein the adhesive composition has a needle penetration value at 25°C of 3 to 12 mm, preferably 4 to 12 mm, more preferably 5 to 10 mm and most preferably greater than 7 mm.

11. An article comprising a substrate coated with the hot melt adhesive composition according to claims 1 to 10.

12. The article of claim 11 wherein the adhesive composition is permanently adhered to the substrate and removably adheres to skin to secure said article for a period of time.

13. The article of claim 11 wherein the adhesive does not cause skin irritation or adhesive transfer when removed.

14. The article according to claim 11, wherein said adhesive is coated onto said substrate as a number of individual adhesive hotmelt deposits ranging in deposits per areas from 1 per cm² to 100.000 per cm².

15. The article of claim 14, wherein the total mass of adhesive ranges about 5g/m^2 to about 500g/m^2 , preferably from about 15g/m^2 to 300g/m^2 , more preferably from about 60g/m^2 to 170g/m^2 , and most preferably 85g/m^2 to 150g/m^2 .

16. The article according to one of claims 11 to 15, wherein the article is a plaster, bandage, feminine napin, adult incontinent pad, diaper, tape, medical device, eye patch, electrode patch, or the like.

17. A method for the production of an article comprising the steps of:

- a) providing a substrate;
- b) coating the adhesive composition of claims 1 to 11 onto said substrate.

18. The method of claim 17 wherein said adhesive is applied by a method selected from the group consisting of slot coating, spiral spraying, melt-blowing and pattern coating methods.

19. The method of claim 17 wherein said adhesive applied by pattern coating.

20. An adhesive composition comprising:

- a) from 5 to about 50 wt-% of a substantially saturated block copolymer having a diblock content of greater than 35 wt-% of the block copolymer;
- b) from about 5 to about 55 wt-% of a substantially saturated plasticizer;
- c) from about 30 to about 80 wt-% of at least one substantially saturated tackifying resin;

wherein the adhesive composition does not transfer.

INTERNATIONAL SEARCH REPORT

National Application No
PCT/US 98/12520

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C09J153/02 A61F13/00 C09J153/00

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C09J

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 286 077 A (D. ST. CLAIR ET AL.) 25 August 1981 * Formulations E, F* see column 4, line 18-56; claims 1,4,5,7,10,11 ---	1-5,11
X	WO 94 07967 A (SHELL INTERNATIONALE R.M.B.V.) 14 April 1994 see claim 1; example 1 ---	1,11,12
X	EP 0 616 018 A (NGUYEN VAN TAO) 21 September 1994 see claim 1 ---	1-5,11
X	US 5 001 179 A (KAUFFMAN THOMAS F ET AL) 19 March 1991 see column 1, line 55 - column 2, line 44; claims 1-4 --- -/--	1-5,11



Further documents are listed in the continuation of box C.



Patent family members are listed in 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

23 September 1998

Date of mailing of the international search report

05/10/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Meulemans, R

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 98/12520

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 559 165 A (PAUL CHARLES W) 24 September 1996 see column 2, line 11 - column 4, line 57; claims 1,5,7,15 ----	1-5,11, 12
A	WO 95 10576 A (H.B. FULLER LIC. & FIN., INC.) 20 April 1995 see page 7, line 18-23; claim 1; example 1 see page 8, line 14-19 -----	1

INTERNATIONAL SEARCH REPORT

information on patent family members

ional Application No

PCT/US 98/12520

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4286077 A	25-08-1981	CA 1148689 A	21-06-1983
WO 9407967 A	14-04-1994	US 5331038 A	19-07-1994
		AU 4819693 A	26-04-1994
		CN 1085235 A	13-04-1994
EP 0616018 A	21-09-1994	FR 2697263 A	29-04-1994
		DE 69403924 D	31-07-1997
US 5001179 A	19-03-1991	US 4822653 A	18-04-1989
		AU 2044288 A	20-04-1989
		CA 1332649 A	18-10-1994
		EP 0302394 A	08-02-1989
		JP 1051487 A	27-02-1989
		JP 7042447 B	10-05-1995
US 5559165 A	24-09-1996	AU 6190696 A	13-02-1997
		CA 2182713 A	09-02-1997
		EP 0758009 A	12-02-1997
		JP 9125035 A	13-05-1997
WO 9510576 A	20-04-1995	CA 2171542 A	20-04-1995
		EP 0723571 A	31-07-1996
		JP 9505840 T	10-06-1997
		US 5459193 A	17-10-1995