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(54) Title: THERMOPLASTIC ELASTOMER RESIN COMPOSITION

(57) Abstract: A thermoplastic elastomer resin composition comprising 70% to 99% by weight of a thermoplastic elastomer (TPE) and 1% to 30% by weight of a random styrene-butadiene copolymer (SBC) for use as a soft layer in a multi component molding system, e.g. two layers, i.e. a soft layer and a hard, rigid polymer substrate for improving the fusion and/or adhesive properties of the two layers. The random SBC is formed in a reactor under free radical suspension polymerization conditions, and is comprised of 80% to 95% by weight styrene and 5% to 20% by weight butadiene. The resin composition is formed via compounding techniques, and is co-injection molded as a layer onto the rigid polymer substrate. The random SBC has a low weight average molecular weight ranging from 100,000 to 140,000, preferably 120,000 and an MDW ranging from 2.0 to 8.0, preferably 3 to 4.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C08L53/02 C08L25/06 C08L23/00 C09J153/02 B32B27/08

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C08L C09J C09D B32B

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

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

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 147 906 A (* SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B V) 22 May 1985 (1985-05-22)	1-8, 10-13,16
Y	abstract page 2, lines 17-23 page 1, lines 5-8,29-34,37-63 page 2, lines 49-55 page 1, line 18 - page 2, line 46 page 2, line 49-55 "injection moulding" page 2, lines 60,61	14,15

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[X] Further documents are listed in the continuation of box C.

[X] 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

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Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2005	21 OCT 2005

Name and mailing address of the ISA	Authorized officer
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	Hammond, A

Form PCT/ISA/210 (second sheet) (January 2004)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/15897 A (DENKI KAGAKU KOGYO KABUSHIKI KAISHA; ISHII, MASANORI; HIGANO, MASANORI) 8 March 2001 (2001-03-08) abstract page 3, line 4 - page 4, line 4 page 4, lines 12-17 page 8, lines 16-18 page 6, line 7 - page 11, line 19; examples 1-5	1-8, 10-16
X	US 3 562 204 A (ADRIAAN W. VAN BREEN) 9 February 1971 (1971-02-09) abstract; claims 1-6 examples and tables column 1, line 47 - column 3, line 49	1-8,10, 11,16
X	US 3 676 386 A (MANNIE BRENNER ET AL) 11 July 1972 (1972-07-11) abstract claim 1 column 1, lines 42-59 * examples * column 4, lines 67-71	1-3,6-8, 10,11,16
X Y	US 4 075 285 A (TABANA ET AL) 21 February 1978 (1978-02-21) abstract column 2, lines 1-66 column 3, lines 4-32 column 4, lines 30-36	1-8, 10-12,16 13-15
Y	EP 0 771 846 A (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V; KRATON POLYMERS RESEAR) 7 May 1997 (1997-05-07) abstract page 3, line 13 - page 4, line 51 examples claims 1-17; tables 1-7	14,15
Y	US 4 332 858 A (SAITOH ET AL) 1 June 1982 (1982-06-01) abstract column 2, line 1 - column 3, line 20 column 2, lines 23,31 column 3, line 61 - column 7, line 19; examples 1-5	13-15
A	EP 0 176 060 A (BASF AKTIENGESELLSCHAFT) 2 April 1986 (1986-04-02) claims 1-4 * Tables *	1-16
A	GB 2 168 362 A (* BCL LIMITED) 18 June 1986 (1986-06-18) abstract; claims 1-10	1-16

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 452 010 A (ARCO CHEMICAL TECHNOLOGY INC) 16 October 1991 (1991-10-16) abstract; claims 12,1-18 page 3, line 26 - page 6, line 37	1-16
A	US 5 002 625 A (NARITOMI ET AL) 26 March 1991 (1991-03-26) claims 1-6	10-16

INTERNATIONAL SEARCH REPORT

rnational application No.
PCT/GB2005/001481

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

partial 1-8 ; 10-16

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: partial 1-8

Thermoplastic elastomer resin composition comprising (i) 70-99 %wt. of a styrenic block copolymer thermoplastic elastomer ; 1-30 %wt. of a random styrene-butadiene copolymer.

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2. claims: partial 1-8

Thermoplastic elastomer resin composition comprising : (ii) 70-99 %wt. of a thermoplastic olefin ; 1-30 %wt. of a random styrene-butadiene copolymer.

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3. claims: partial 1-8

Thermoplastic elastomer resin composition comprising ; (iii) 70-99 %wt. of a thermoplastic polyurethane ; 1-30 %wt. of a random styrene-butadiene copolymer.

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4. claims: partial 1-8

Thermoplastic elastomer resin composition comprising ; (iv) 70-99 %wt. of thermoplastic vulcanisates ; 1-30 %wt. of a random styrene-butadiene copolymer.

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5. claims: partial 1-8

Thermoplastic elastomer resin composition comprising (v) 70-99 %wt. copolyester elastomer ; 1-30 %wt. of a random styrene-butadiene copolymer.

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6. claims: partial 1-8

Thermoplastic elastomer resin composition comprising ; (vi) 70-99 %wt. of a copolyamide elastomer ; 1-30 %wt. of a random styrene-butadiene copolymer.

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7. claims: partial 1-8 ; 9

Thermoplastic elastomer resin composition comprising : (vii) hydrogenated styrene-butadiene-styrene elastomers ; 1-30 %wt. of a random styrene-butadiene copolymer.

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8. claims: 10-16

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Various articles as described in claims 10-16 comprising at least one component comprised of the composition of any one of claims 1-9.

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9. claim: 17

A method for improving the adhesion and/or fusion properties of an article as describrd in the claim 17.

INTERNATIONAL SEARCH REPORT

...formation on patent family members

Inte ɔnal Application No
PCT/GB2005/001481

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