(54) Title: SOFT IONOMER COMPOSITIONS AND BLENDS THEREOF FOR GOLF BALL COVERS

(57) Abstract: Novel, soft, low modulus ethylene copolymer ionomer compositions containing an acrylate softening monomer, neutralized with magnesium or lithium ions possess a higher level of resilience at a given level of PGA Compressibility than known ionomers. The advantage is maintained in certain blend compositions with hard ionomers of lithium and magnesium for blends having a neat-sphere PGA Compressibility below about 155, for blends with hard sodium ionomer for blends with a neat-sphere PGA Compressibility below about 155 provided there is at least 50 % soft ionomer, and for stiffer blend compositions having 51 - 80 % hard ionomer, where the hard ionomer is sodium, potassium or zinc. The soft ionomers and blends are useful for golf ball cover material.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7  C08L23/08  A63B37/12

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  A63B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>X</td>
<td>WO 98 47957 A (WILSON SPORTING GOODS ;DU PONT (US)) 29 October 1998 (1998-10-29) claims; figure 1; tables 1,2</td>
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<td>WO 97 02317 A (DU PONT) 23 January 1997 (1997-01-23) claims; figures; tables 1,2</td>
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<td>WO 97 02318 A (DU PONT) 23 January 1997 (1997-01-23) claims; figures 1,2; examples; tables 1,2</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

"X" Special categories of cited documents:

"X" 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 novel or 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.

"S" document member of the same patent family

Date of the actual completion of the international search: 6 October 2000

Date of mailing of the international search report: 10.01.2001

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 epp nl, Fax (+31-70) 340-3016

Authorized officer: Clemente Garcia, R
INTERNATIONAL SEARCH REPORT

Box I  Observations where certain claims were found unsearchable (Continuation of item 1 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 II  Observations where unity of invention is lacking (Continuation of item 2 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.:

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.:

1-3, 10-14, 7 (in part)

Remark on Protest

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

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-3, 10-14, 17 (as dependent of claim 10)
   Golf ball wherein the cover consist essentially of a soft ionomer.

2. Claims: 4, 5, 9
   Golf ball comprising a cover consisting essentially of (i) at least 10 wt/% of a soft ionomer neutralised with Mg or Li and (ii) a hard ionomer neutralised with Li or Mg ions.

3. Claims: Claims 6, 15, 17 (as dependent of claim 15)
   Golf ball cover, wherein the cover consists essentially of (i) at least 50 wt/% of a soft ionomer and (ii) less than 50 wt/% of a hard ionomer neutralised with Na ions.

4. Claims: Claims 7, 8, 16 and 17 (as dependent of claim 16)
   Golf ball comprising a cover comprising: (i) 20-49 wt/% soft ionomer neutralised with Li or Mg and (ii) 51-80 wt/% of a hard ionomer neutralised with Na, Zn or K ions.
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