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(54) Title: METHOD OF FORMING POLYMERIC FOAM AND RELATED FOAM ARTICLES

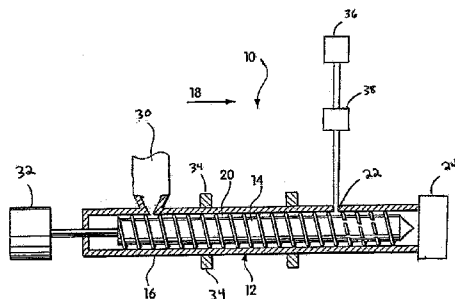


Fig. 1

(57) Abstract: Methods of forming polymeric foams are provided. The methods may involve co-extruding a foam layer along with one or more skin layers. In some embodiments, the skin layer(s) may be removed (e.g., in a peeling operation); while, in other embodiments, the skin layer(s) may form part of the final article. The methods are particularly well suited for producing polymeric foams from polymeric materials that are considered to be difficult to foam by those of skill in the art.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/034112

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - C08J 9/228 (2013.01) USPC - 521/79 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - B29C 47/00, 47/06, 47/14; C08J 9/00, 9/12, 9/22, 9/228 (2013.01) USPC - 264/41, 51; 521/50, 79 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - B29C 47/00, 47/06, 47/14; C08J 9/00, 9/12, 9/122, 9/22, 9/228 (2013.01) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patent, Google Scholar		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0068187 A1 (KRUEGER et al) 30 March 2006 (30.03.2006) entire document	54, 58-62, 68
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Y		17, 22, 55-57, 63-67
Y	US 2005/0159496 A1 (BAMBARA et al) 21 July 2005 (21.07.2005) entire document	1-24, 55-57, 63
Y	US 6,071,580 A (BLAND et al) 06 June 2000 (06.06.2000) entire document	1-24, 64
Y	US 6,103,149 A (STANKIEWICZ) 15 August 2000 (15.08.2000) entire document	6, 65
Y	US 2001/0018121 A1 (OKAMOTO et al) 30 August 2001 (30.08.2001) entire document	10-13
Y	JP 8-142156 A (KAMIEBISU et al) 04 June 1996 (04.06.1996) entire document	13
Y	US 5,000,992 A (KELCH) 19 March 1991 (19.03.1991) entire document	18, 19, 66, 67
Y	US 6,696,504 B1 (HAYASHI et al) 24 February 2004 (24.02.2004) entire document	21
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 application or patent 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 11 July 2013		Date of mailing of the international search report <b>01 AUG 2013</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/034112

**Box No. 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 No. 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 Extra 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 additional fees, this Authority did not invite payment of additional fees.
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.:  
1-24, 54-68

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/US2013/034112

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-24 and 54-68, are drawn to a method of forming a polymeric foam.

Group II, claims 25-53, are drawn to a foam of non-crosslinked polymer materials.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of the Group I, a method of forming a polymeric foam comprising: extruding a first stream and at least a second stream to form an extrudate, wherein the first stream comprises a polymeric material and a blowing agent and the second stream comprises a polymeric material, and the extrudate includes a polymeric foam layer and a polymeric skin layer; separating the polymeric foam layer from the polymeric skin layer; and collecting the polymeric foam layer, are not present in Group II; and the special technical features of the Group II, a foam comprising a non-crosslinked polymeric material, the polymeric material selected from the group consisting of polyamides, fluoropolymers, PLA (poly(lactic acid)), aliphatic polyester (PHA), polysulfones, polyurethanes, and co-polymers and blends thereof, wherein the foam has a water vapor transmission, are not present in Group I.

Groups I and II share the technical features of a polymeric foam of a non-crosslinked polyether block amide polymeric material from an extrusion process. However, these technical features do not represent a contribution over the prior art. Specifically, US 2009/0215916 A1 to Krohnke et al. discloses a polymeric foam (Abstract and Para. [0029] ...foamable polymer preparation of the present invention...; see also claim 1) of a non-crosslinked (Para. [0042] blend can be a crosslinked or non-crosslinked blend of two or more polymers) polyether block amide polymeric material (Paras. [0033] through [0036] regarding incorporation of polyamides that can be selected; Paras. [0038] and [0039] regarding polyethers; see also Paras. [0044] and [0045] the term "copolymer" as used herein means random (statistical) copolymer, block copolymer...) from an extrusion process (Para. [0092] ...mixing apparatus can be an extruder; Para. [0093]).

Since none of the special technical features of the Groups I and II inventions are found in more than one of the inventions, unity of invention is lacking.