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(54) **Title:** SELF-HEALING ADHESIVE COMPOSITION

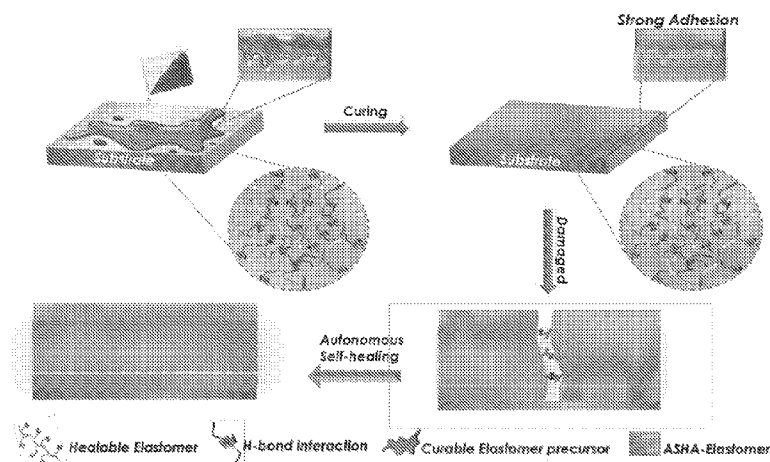


FIG. 1

(57) **Abstract:** A self-healing adhesive composition comprising a homogeneous mixture of: (i) a self-healing polymer containing hydrogen bonding groups or long-chain alkyl groups, wherein said hydrogen bonding groups comprise hydrogen bond donating groups and hydrogen bond accepting groups, and wherein said long-chain alkyl groups contain at least four carbon atoms; and (ii) an extrudable adhesive polymer base having a curable property and no self-healable property; wherein component (i) is present in the self-healing adhesive composition in an amount of at least 10 wt% and up to 70 wt% of the total of components (i) and (ii). Also described herein is a method of sealing a space (e.g., crack, gap, or pores) in a substrate material by at least partially filling the space with the self-healing adhesive composition described above and permitting the self-healing adhesive composition to harden over time without applying an external stimulus to induce hardening.

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(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US20/64243

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.: 11-13, 17-18, 25-27
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:

- 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.:

- 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

International application No.

PCT/US20/64243

A. CLASSIFICATION OF SUBJECT MATTER

IPC - C08L 101/14; C08F 2/44; C08F 265/06; C09J 133/04; C09J 133/24 (2021.01)

CPC - C08F 265/06; C08L 101/14; C08F 2/44; C09J 133/04; C09J 133/24

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)

See Search History document

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

See Search History document

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	JP 2016199647 A (OTSUKA CHEM CO LTD.) 20 November 2019, machine translation; page 2, tenth paragraph, translation; page 3, third, fourth, seventh and eighth paragraphs, translation; page 9, seventh paragraph, translation; figure 1, original	1-7, 10, 14-15, 16/14-15, 19-21, 24 --- 8-9, 22-23
Y	WO 2015/061070 A1 (THE PROCTER and GAMBLE COMPANY) 30 April 2015; page 1, lines 20-25; page 46, lines 33-34; page 47, lines 30-31	1-7, 10, 14, 16/14, 19-21, 24
Y	WO 2008/057488 A2 ; (NATIONAL STARCH AND CHEMICAL INVESTMENT HOLDING CORPORATION) 15 May 2008; abstract; paragraph [0025]; claim 10; figure 1	1-7, 10, 14-15, 16/14-15, 19-21, 24
Y	EP 2351892 B1 (VISSMANN WERKE GMBH AND CO KG) 6 June 2018, machine translation; abstract, translation; page 7, ninth paragraph, translation	15, 16/15
A	JP 2013071947 A (NIPPON CATALYTIC CHEM IND CO LTD) 22 April 2013, machine translation; page 2, fourteenth paragraph	8-9, 22-23
A	EP 3225228 A1 (IVOCLAR VIVADENT AG) 4 October 2017; paragraph [0018]	8-9, 22-23

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"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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