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(54) **BLOCK COPOLYMERS AND USES THEREOF**

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(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,242,474 A 12/1980 Shinohara et al.

4,618,400 A 10/1986 Wood et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1 932 870 A1 6/2008

EP 1932870 A1 * 6/2008

(Continued)

OTHER PUBLICATIONS

A Napoli, N Tirelli, G Kilcher, JA Hubbell. "New Synthetic Methodologies for Amphiphilic Multiblock Copolymers of Ethylene Glycol and Propylene Sulfide." *Macromolecules*, vol. 34, 2001, pp. 8913-8917.*

(Continued)

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(57) **ABSTRACT**

An encoding/decoding apparatus and method using a low-density parity-check code (LDPC code) is disclosed. Basic column group information, serving as a set of information regarding positions of rows with weight 1, is extracted from a reference column in each column group of a predetermined parity-check matrix. Column group information transforms the positions of rows with weight 1 into positions whose lengths are within a required parity length. A parity-check matrix is generated according to the generated column group information. Data is encoded or decoded based on the generated parity-check matrix.

11 Claims, 29 Drawing Sheets

