US008480853B2

(12) **United States Patent**
Ban

(10) **Patent No.: US 8,480,853 B2**
(45) **Date of Patent: Jul. 9, 2013**

(54) **PAPERMAKING AND PRODUCTS MADE THEREBY WITH IONIC CROSSLINKED POLYMERIC MICROPARTICLE**

(75) Inventor: **Weiping Ban**, Memphis, TN (US)

(73) Assignee: **Buckman Laboratories International, Inc.**, Memphis, TN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/281,597**

(22) Filed: **Oct. 26, 2011**

(65) **Prior Publication Data**

US 2012/0103549 A1 May 3, 2012

Related U.S. Application Data

(66) Substitute for application No. 61/408,262, filed on Oct. 29, 2010.

(51) **Int. Cl.**

D21H 17/38	(2006.01)
D21H 17/37	(2006.01)
D21H 17/28	(2006.01)
D21H 17/52	(2006.01)

(52) **U.S. Cl.**

USPC **162/168.1**; 162/158; 162/164.1; 162/164.3; 162/168.3; 162/175; 162/177; 162/178; 162/183

(58) **Field of Classification Search**

USPC .. 162/158, 164.1, 164.3, 164.6, 168.1–168.3, 162/175, 177, 178, 183

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,647,763	A		3/1972	Stockmann et al.
3,872,039	A		3/1975	Vaughn et al.
4,191,799	A		3/1980	Gruber
4,195,008	A		3/1980	Gruber
4,270,977	A	*	6/1981	Herman et al. 162/168.7
4,295,987	A	*	10/1981	Parks 252/194
4,305,781	A		12/1981	Langley et al.
4,465,555	A		8/1984	Linhart et al.
4,480,078	A		10/1984	Gujarathi
4,753,710	A		6/1988	Langley et al.
4,780,500	A		10/1988	Sinka et al.
4,913,775	A		4/1990	Langley et al.
4,969,976	A		11/1990	Reed
5,008,133	A		4/1991	Herbet et al.
5,021,529	A		6/1991	Garrett
5,032,227	A		7/1991	Derrick et al.
5,064,692	A		11/1991	Hofmann et al.
5,152,925	A		10/1992	Furman
5,167,766	A		12/1992	Honig et al.
5,171,808	A		12/1992	Ryles et al.
5,185,061	A		2/1993	Lowry et al.
5,221,435	A		6/1993	Smith, Jr.
5,266,162	A	*	11/1993	Richard et al. 162/135
5,274,055	A	*	12/1993	Honig et al. 524/47
5,318,669	A		6/1994	Dasgupta
5,328,510	A		7/1994	Hofmann et al.
5,336,318	A		8/1994	Attard et al.
5,338,407	A		8/1994	Dasgupta
5,418,057	A		5/1995	Tokiyoshi et al.
5,443,899	A		8/1995	Barcus et al.
5,458,905	A		10/1995	Heagle
5,473,033	A		12/1995	Kuo et al.
5,571,380	A		11/1996	Fallon
5,630,907	A		5/1997	Nilz et al.
5,681,912	A		10/1997	Kuo et al.
5,700,893	A		12/1997	Kuo et al.
5,718,827	A		2/1998	Rydell et al.
5,721,302	A		2/1998	Wood et al.
5,763,100	A		6/1998	Quick et al.
5,865,951	A		2/1999	Kawakami et al.
6,007,679	A		12/1999	Nagarajan et al.
6,042,732	A		3/2000	Jankowski et al.
6,063,240	A		5/2000	Eriksson et al.
6,083,348	A		7/2000	Auhorn et al.
6,083,404	A		7/2000	Sommese et al.
6,168,686	B1		1/2001	Sutman et al.
6,183,650	B1		2/2001	Drummond
6,184,258	B1		2/2001	Drummond
6,273,998	B1		8/2001	Kuo et al.
6,310,157	B1		10/2001	Heard et al.
6,331,229	B1		12/2001	Wong Shing et al.
6,352,766	B1		3/2002	Crandall et al.
6,359,040	B1		3/2002	Burdick
6,432,271	B1		8/2002	Wong Shing et al.
6,451,169	B1		9/2002	Ward et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CA	1111210	10/1981
CA	2122956 A1	5/1994

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion issued in corresponding International Patent Application No. PCT/US2011/057798 dated Apr. 12, 2012 (9 pages).

Polverari, et al., "New micropolymer technologies for increased drainage and retention for both wood and non-wood containing furnishes," 41st Pulp and Paper International Congress and Exhibition, San Paulo, Brazil, Oct. 13-16, 2008 (Abstract only) (1 page).

McNeal, et al., "The effect of polymer conformation on microparticle efficiency in drainage and retention (includes slides)," 2006 TAPPI Papermakers Conference, Atlanta, Georgia, Apr. 24-28, 2006, Session 24 (Abstract only) (1 page).

Yan, et al., "The applications of cationic polymeric microparticles in papermaking," Proceedings of the International Symposium on Emerging Technologies of Pulping and Papermaking, 2nd, Guangzhou, China, Oct. 9-11, 2002 (Abstract only) (1 page).

Honig, et al, "Design and development of the micro-polymer system: an "organic microparticle" retention/drainage system," Nordic Pulp and Paper Research Journal, vol. 15, No. 5, 2000 (Abstract only) (1 page).

(Continued)

Primary Examiner — Jose A Fortuna

(74) *Attorney, Agent, or Firm* — Kilyk & Bowersox, P.L.L.C.

(57) **ABSTRACT**

Enhancement of papermaking drainage and retention properties of aqueous cellulosic suspensions used for production of paper or paper board with a retention/drainage additive system including ionic crosslinked acrylic acid-acrylate copolymer microparticles is described. Paper and paperboard products made with these copolymer microparticles are also described.

23 Claims, 2 Drawing Sheets