(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 January 2012 (05.01.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/003407 A3

(51) International Patent Classification:
B04B 1/20 (2006.01)

(21) International Application Number:
PCT/US2011/042718

(22) International Filing Date:
30 June 2011 (30.06.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/360,723 1 July 2010 (01.07.2010) US

(72) Inventors; and
(71) Applicants : **KOPPER, Michael** [US/US]; 40609 Cornell Street, Beach Park, IL 60099 (US). **HAVRIN, Robert** [US/US]; 205 East Scranton Avenue, Lake Bluff, IL 60044 (US).

(74) Agent: **BRANNEN, Nicholas, A.**; 104 South Main Street, Suite 506, Fond du Lac, WI 54935 (US).

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

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:
27 March 2014

(54) Title: CENTRIFUGAL LIQUID SEPARATION MACHINE TO EFFICIENTLY FLOW MULTI-PHASE SOLIDS FROM A HEAVY PHASE DISCHARGE STREAM

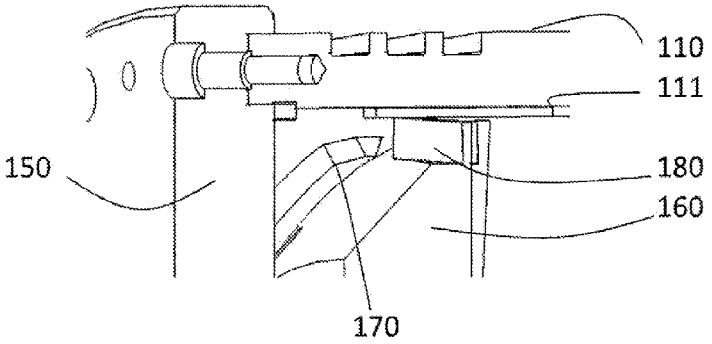

FIG. 9

(57) Abstract: The present invention relates to a centrifugal liquid separation machine and in particular to a screw type centrifugal liquid separation machine that lifts grit and other solids from the bowl wall in a radially inward manner and resuspends the grit and other solids into the heavy phase discharge flow. According to one embodiment of the present invention, the machine has an outer bowl and a conveyor. The bowl and conveyor are coaxial, and a back drive assembly causes these components to rotate at different speeds to allow the conveyor to mechanically sweep heavy phase materials within a separation region of the machine. Grit is conveyed radially inward along a plow and tumbled into the heavy phase discharge flow, wherein it is resuspended and exits the machine with that flow. Wipers can also be provided for preventing blockage of heavy phase flow under the solids baffle.

WO 2012/003407 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/042718

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B04B 1/20 (2011.01)
USPC - 494/54
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(8) - B01D 33/06, 33/11; B04B 1/00, 1/20, 11/00, 11/02, 15/12; B65G33/26 (2011.01)
USPC - 494/52, 53, 54, 55, 56, 57, 58, 59, 66, 67

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 practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,335,846 A (SHAPIRO) 22 June 1982 (22.06.1982) entire document	1-4, 6-8
Y		5, 9-20
Y	US 3,428,248 A (ANDRESEN et al) 18 February 1969 (18.02.1969) entire document	5, 10, 13, 14, 17-20
Y	US 5,261,869 A (CALDWELL et al) 16 November 1993 (16.11.1993) entire document	9-16
Y	US 5,429,581 A (MICHAUD et al) 04 July 1995 (04.07.1995) entire document	12
Y	US 4,818,296 A (HEJMAN et al) 04 April 1989 (04.04.1989) entire document	12
A	US 1,572,612 A (LAUGHLIN) 09 February 1926 (09.02.1926) entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐

* 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	Date of mailing of the international search report
22 November 2011	02 DEC 2011
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