

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
07 July 2022 (07.07.2022)



(10) International Publication Number
WO 2022/147475 A3

(51) International Patent Classification:
C10G 53/06 (2006.01) C10G 21/00 (2006.01)

(21) International Application Number:
PCT/US2021/073198

(22) International Filing Date:
30 December 2021 (30.12.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/132,750 31 December 2020 (31.12.2020) US

(71) Applicant: UOP LLC [US/US]; 25 East Algonquin Road,
P.O. Box 5017, Des Plaines, Illinois 60017-5017 (US).

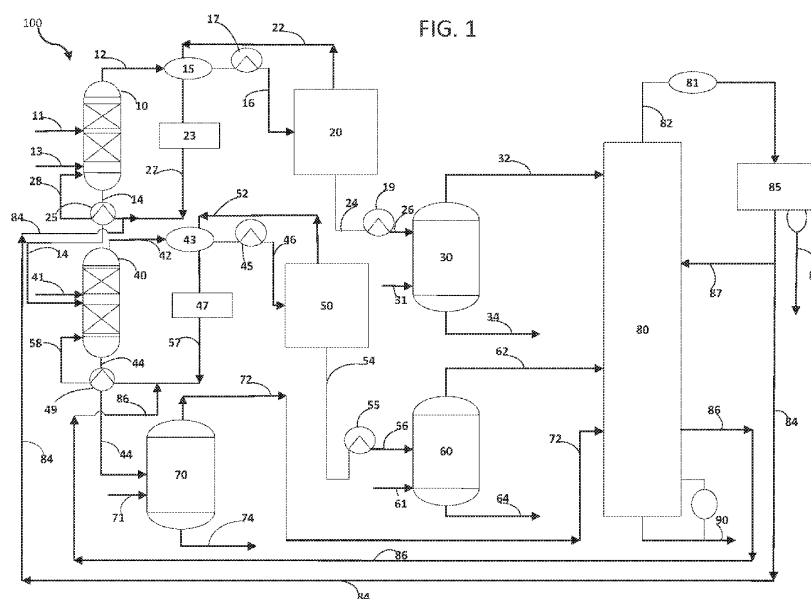
(72) Inventors: VAN WEES, Mark; HONEYWELL INTER-
NATIONAL INC., Intellectual Property Services Group,

855 S. Mint Street, Charlotte, North Carolina 28202 (US).
MCGEHEE, James F.; HONEYWELL INTERNATIONAL
INC., Intellectual Property Services Group, 855 S. Mint
Street, Charlotte, North Carolina 28202 (US). **BAUER,
Lorenz**; HONEYWELL INTERNATIONAL INC., Intel-
lectual Property Services Group, 855 S. Mint Street, Char-
lotte, North Carolina 28202 (US).

(74) Agent: **BENINATI, John F.**; HONEYWELL INTER-
NATIONAL INC., Intellectual Property Services Group,
300 S. Tryon Street, Suite 600, Charlotte, North Carolina
28202 (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, 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,

(54) Title: MULTI-STAGE SOLVENT EXTRACTION PROCESS AND APPARATUS



(57) Abstract: Process and apparatus for two-stage solvent extraction of hydrocarbon products is disclosed. The process comprises passing a heavy hydrocarbon feed stream and a first fresh solvent to a first extraction column to generate a first overhead stream and a first bottom stream. The first overhead stream is passed to a first stripping column to generate a first product stream and a first stripped solvent stream. The first bottom stream is passed to a second extraction column to generate a second overhead stream and a second bottom stream. A second fresh solvent stream is passed to a second extraction column. The second overhead stream is passed to a second stripping column to generate a second product stream and a second stripped solvent stream. Passing the first stripped solvent stream and the second stripped solvent stream to a solvent recovery column and passing the second bottom stream to a pitch stripper.

[Continued on next page]

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.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:

04 August 2022 (04.08.2022)