

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
19 May 2023 (19.05.2023)



(10) International Publication Number
WO 2023/083423 A1

(51) International Patent Classification:
F26B 3/12 (2006.01) *F26B 23/00* (2006.01)
F26B 21/06 (2006.01)

(21) International Application Number:
PCT/DK2021/050332

(22) International Filing Date:
12 November 2021 (12.11.2021)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **GEA PROCESS ENGINEERING A/S**
[DK/DK]; Gladsaxevej 305, 2860 Soborg (DK).

(72) Inventors: **BELLEMO, Lorenzo**; c/o GEA Process Engineering A/S, 2860 Soborg (DK). **BERGAMINI, Riccardo**; c/o GEA Process Engineering A/S, 2860 Soborg (DK).

(74) Agent: **AWA DENMARK A/S**; Strandgade 56, 1401 Copenhagen K (DK).

(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.

(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,

(54) Title: AN EFFICIENT HEAT PUMP-BASED HEATING SYSTEM WITH HEAT RECOVERY

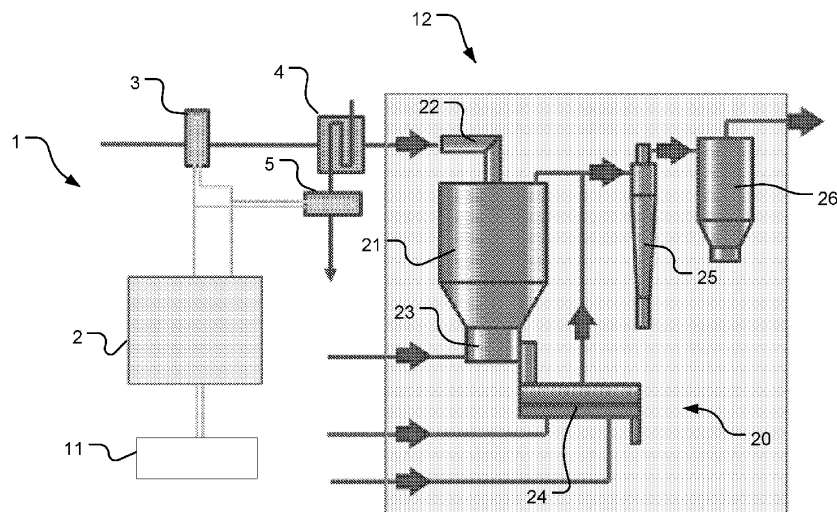


Fig. 2

(57) Abstract: The invention relates to a heating system comprising a heat pump system. The heat pump system comprises a heat pump, operating with a primary fluid, and a secondary fluid. The heat pump system further comprises a first sink heater. The heat pump is connected to the first sink heater, and the first sink heater is configured to preheat a process medium. The heating system further comprises a second sink heater configured to transfer heat to a second process medium. The heat pump system further comprises a heat exchanger that is connected to the second sink heater and is configured to transfer heat from an exhaust medium of the second sink heater to the secondary fluid used to provide heating to the process medium. The heat pump is connected to the heat exchanger in a parallel configuration. Furthermore, a method for integrating a heating system into a drying plant, the heating system comprising a heat pump system, is provided.

[Continued on next page]

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))