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(54) ELECTROCHEMICAL REACTION DEVICE AND METHOD OF OPERATING ELECTROCHEMICAL REACTION DEVICE

(57) An electrochemical reaction device includes: a structure that includes: a cathode; an anode; a diaphragm, a cathode chamber; and an anode chamber; a first to a fourth flow path through which a first to fourth fluid flows respectively; at least one controller selected from a first and a second flow rate controller, a first and a second pressure controller, a temperature controller and a power supply, the controller including the first flow rate controller; a gas/liquid separator in the middle of the fourth flow path; a first flowmeter that measures a flow rate of the third fluid; a second flowmeter that measures a flow rate of the fourth fluid; and a control device that measures the sum of the flow rates of the first, third and fourth fluids and controls the controller according to the sum to control a pressure difference between the chambers.

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 1701

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 3 795 720 A1 (TOSHIBA KK [JP]) 24 March 2021 (2021-03-24) * paragraphs [0023] - [0025], [0048], [0050]; figures *	1-9, 12-15 10,11	INV. C25B15/08 C25B1/04 C25B1/23 C25B3/03 C25B3/07 C25B3/26
X A	EP 4 151 773 A1 (TOSHIBA KK [JP]) 22 March 2023 (2023-03-22) * paragraphs [0074], [0083] - [0084]; figures *	1-9, 12-15 10,11	
A	CINTI GIOVANNI ET AL: "Integration of Solid Oxide Electrolyzer and Fischer-Tropsch: A sustainable pathway for synthetic fuel", APPLIED ENERGY, ELSEVIER SCIENCE PUBLISHERS, GB, vol. 162, 11 November 2015 (2015-11-11), pages 308-320, XP029327325, ISSN: 0306-2619, DOI: 10.1016/J.APENERGY.2015.10.053 * abstract *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

C25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 April 2025	Ulivieri, Enrico

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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01-04-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3795720 A1	24-03-2021	CN 112593258 A	02-04-2021
		EP 3795720 A1	24-03-2021
		JP 7204619 B2	16-01-2023
		JP 2021046575 A	25-03-2021
		US 2021079541 A1	18-03-2021
EP 4151773 A1	22-03-2023	CN 115807236 A	17-03-2023
		EP 4151773 A1	22-03-2023
		JP 7551585 B2	17-09-2024
		JP 2023042896 A	28-03-2023
		US 2023079481 A1	16-03-2023

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