

October 2025

Path to Sustainability

Harnessing Hydrogen

Recent developments

Curated and summarized - Industry and Patent news

Published by Denne Meyer India Private Limited

Parag Thakre (pthakre@denne Meyer.com)

Prachi Gupta (pgupta@denne Meyer.com)

This report is subject to copyrights and may only be reproduced, with permission of Denne Meyer.

Subscribe now



Scan the QR code to receive this monthly report
via email in your inbox.

Preface

There is a major transformation taking place in the global energy landscape as countries try to reduce carbon emissions and mitigate the impact of climate change. Hydrogen, a clean and versatile energy carrier, is emerging as a promising solution for a sustainable future. Its applications are diverse, ranging from powering vehicles and generating electricity to fueling industrial processes. The hydrogen ecosystem is rapidly evolving, with innovations emerging across the entire value chain.

This monthly report is focused on **“Hydrogen as a fuel”** including applications in transportation, manufacturing industries and energy sector. This report is a free resource for anyone working in this domain including technologists, innovators, Intellectual Property (IP) managers, strategy makers, environmental enthusiasts, etc. The report contains curated insights and summaries of the latest news and key patents published in the last one month, including the latest products, business updates, collaborations, new innovations, and more.

Key Insights this month

- ❑ Natural hydrogen is emerging as a low-carbon alternative to conventional hydrogen production, with the potential to significantly reduce costs and environmental impact. MAX Power is actively exploring this opportunity, aiming to unlock scalable hydrogen resources and accelerate commercialization across North America.
- ❑ Biomass-to-hydrogen is gaining traction as a decentralized, CO₂-neutral alternative with strong commercial potential. A.H.T. Syngas Technology's patented process offers a strategic opportunity for utilities and industrial players to secure hydrogen supply, support regional energy security, and contribute to Europe's decarbonization goals.
- ❑ Regenerative fuel cells provide zero-emission energy for lunar and terrestrial use, including off-grid and disaster-resilient systems. The collaboration between Honda and Astrobotic highlights this dual-use innovation and its commercialization potential in aerospace and clean tech.
- ❑ Research institutes like James Cropper & NPL and Kumamoto University are advancing PEM electrolyser and fuel cell technologies through innovations in platinum coatings and clay-based (flexible membrane of monolayer silicate nanosheets) electrolytes. These developments reduce costs, improve durability, and accelerate commercialization across industrial hydrogen and clean mobility sectors.
- ❑ Many inventions published last month revolved around two major themes:
 - Reducing platinum (Pt) usage in electrolysers and fuel cells through innovations like patterned catalyst layers aligned with flow field plates and Pt/Ni foam structures with uniformly dispersed low-content Pt nanoparticles. These approaches aim to lower costs while maintaining catalytic efficiency.
 - Optimizing fuel cell operation via intelligent energy management systems for heavy-duty vehicles to efficiently handle surplus energy, and control strategies in multi-fuel cell setups that shift load away from deteriorated cells to balance power demand and extend system life.

◀ Industry News

Natural Hydrogen Well

Max power confirms lead target for Canada's first dedicated natural hydrogen well

MAX Power Mining Corp. has identified a drill-ready Natural Hydrogen target, "Lawson," in the heart of the 200-km-long Genesis Trend in southern Saskatchewan, marking Canada's first deep well specifically targeting Natural Hydrogen. Extensive data confirms that Lawson hosts all five critical geological elements source, migration, reservoir, seal, and trap, while its position against the Prairie Evaporite 'Salt Barrier' provides a key sealing advantage. The well, located in a highly accessible area near the Regina–Moose Jaw Industrial Corridor, will be drilled in Q4 2025 following imminent well licensing. Success at Lawson could de-risk at least 20 similar prospects and unlock a scalable, low-cost, low-carbon hydrogen resource. MAX Power holds ~3 million permitted acres and is executing a multi-well program to validate its geological model and advance Natural Hydrogen commercialization in North America.



Biomass Innovation

AHT receives patent for hydrogen production from solid biomass – milestone for future contracting projects

A.H.T. Syngas Technology N.V., together with partners Bionon UG and Bioenergy Concept GmbH, has been granted a patent for producing hydrogen via thermal gasification of solid biomass in a fixed-bed reactor, marking a major technological breakthrough. The partners, supported by extensive due diligence, have validated the technical feasibility and strong economic prospects projecting profit margins of 13–19% on a €54 million investment, and now plan to expand through contracting. They plan to establish the first hydrogen production site in northern Germany by 2026, with commercial operations starting in 2028. This innovation supports the growth of Germany and Europe's hydrogen economy by enabling decentralized, CO₂-neutral hydrogen production from sustainable biomass, which is vital for decarbonizing key sectors and enhancing regional energy security.

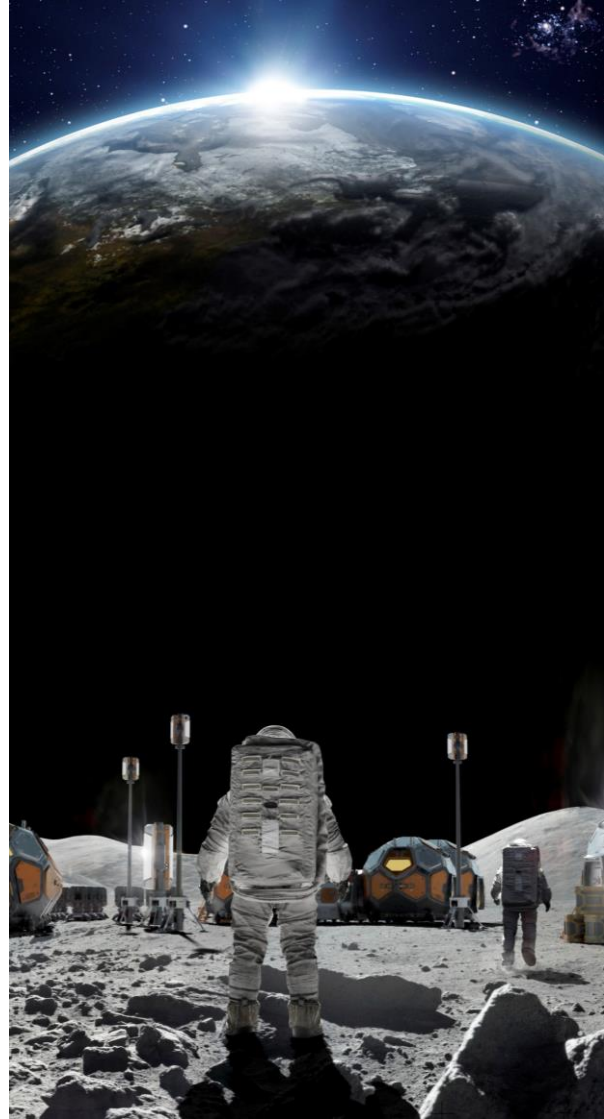


Fueling Space

Honda and Astrobotic establish joint development agreement to explore scalable lunar power solutions

Honda and Astrobotic have entered a joint development agreement to explore integrating Honda's regenerative fuel cell (RFC) system with Astrobotic's Vertical Solar Array Technology (VSAT) and LunaGrid power infrastructure to support sustained lunar missions. The RFC system, which creates a closed-loop cycle by storing solar energy as hydrogen during the lunar day and generating electricity at night, offers continuous power critical for long-duration lunar operations. The feasibility study will evaluate illumination conditions, system scalability, and integration requirements. This collaboration aims to provide reliable, zero-emission energy on the Moon, enabling extended mission durations, supporting human presence, and advancing lunar infrastructure, while also benefiting clean energy solutions on Earth.

Source: [Astrobotic](#)



Electrolyser Durability

James Cropper and National Physical Laboratory collaborate to advance corrosion resistance research for PEM electrolyzers

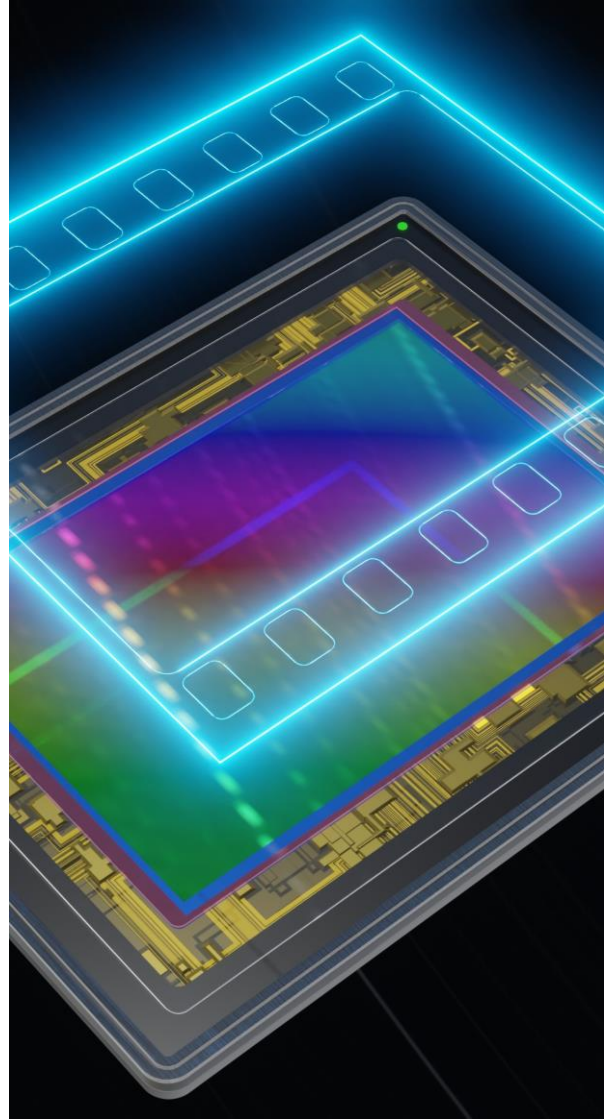
James Cropper Advanced Materials is collaborating with the National Physical Laboratory (NPL) on corrosion resistance research. The focus is on platinum-coated titanium components used in proton exchange membrane water electrolyzers (PEMWE), a key technology for green hydrogen production. The project, “Corrosion Resistance Mapping of Coated Titanium Components for PEM Water Electrolysers (TiCORR),” focuses on how microscopic flaws and variations in platinum coatings affect corrosion resistance at the micro and nanoscale. Using techniques like scanning electrochemical microscopy (SECM), SEM, and 3D optical microscopy, the team aims to map localised corrosion behaviour and improve coating uniformity. This research will enhance the durability, efficiency, and lifespan of PEM electrolyzers while reducing costs.



Clay Membrane

Flexible solid electrolyte unlocks high-performance fuel cells across extreme temperatures

Researchers at Kumamoto University have developed a groundbreaking solid electrolyte made from natural montmorillonite clay that could transform fuel cell technology. Led by Assistant Professor Kazuto Hatakeyama and Professor Shintaro Ida, the team created a flexible membrane of monolayer silicate nanosheets with high proton conductivity and exceptional hydrogen gas barrier properties over 100 times better than Nafion. Achieving stable fuel cell operation across -10°C to 140°C and delivering strong performance metrics (1080 mA/cm^2 current density, 264 mW/cm^2 power output), the material enables efficient, safe, and low-cost fuel cells. Its use of abundant, eco-friendly clay minerals offers a promising path for scalable, sustainable energy applications.



The editor's shortlist

◀ Patents of the month



Patents of the month

Published in Sep 2025

Shortlisted and summarized by our analyst

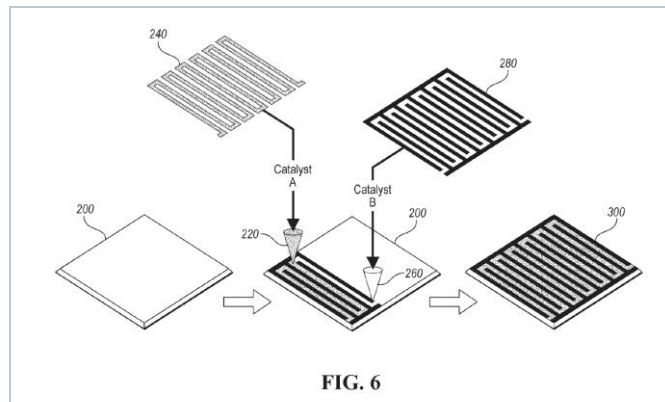
- [US2025279441A1](#) - Patterned catalyst layers in fuel cells
Assignee: Robert Bosch GMBH (Germany)
- [US12431521B2](#) - Method for controlling multiple fuel cells of fuel cell vehicle
Assignee: Hyundai Motor Company, Kia Corp (Korea)
- [US12405594B2](#) - Pumping of liquid cryogen from a storage tank
Assignee: Air Liquide (France)
- [US2025297707A1](#) - Hydrogen pressurizing rig
Assignee: Logan Energy Ltd (UK)
- [US2025251088A1](#) - Method for detecting a fault in a tank system, computer program product, tank system and fuel cell electric vehicle
Assignee: AVL List GMBH (Austria)
- [EP4612088A2](#) - Energy generating devices, systems, and methods of use thereof
Assignee: Found Energy Co (USA)
- [EP4242038B1](#) - A system, a method of controlling a system, and a vehicle comprising a system
Assignee: Volvo Truck Corp (Sweden)
- [EP4265897B1](#) - Hydrogen fuel system for aircraft
Assignee: Eaton Intelligent Power Ltd (Ireland)
- [IN202541076872A](#) - A system and a method for charging a battery unit of an electric vehicle
Assignee: Daimler Truck AG (Germany)
- [CN115558956B](#) - Preparation and application of three-dimensional self-supporting electrochemical catalyst material Pt/Ni Foam
Assignee: Nanjing University (China)



US2025279441A1

Green

Patterned catalyst layers in fuel cells



The disclosed invention relates to advanced catalyst layer designs in fuel cells aimed at improving performance and reducing cost. It introduces a patterned catalyst layer structure where distinct regions of the catalyst layer are aligned with the channels and lands of the flow field plate. The catalyst layer is divided into a first region (aligned with flow channels) and a second region (aligned with lands), each containing differing catalyst or ionomer compositions and carbon materials with unique carbon-to-catalyst (or ionomer) ratios. This spatial variation addresses issues like nanoparticle growth and material degradation under operational stress, enabling better durability and reduced use of costly materials like platinum.

Company name Robert Bosch GMBH (Germany)

Inventors Cheng Lei,
Metzger Michael,
Kuppan Saravanan,
Johnston Christina

Priority date 19-Jun-2020

Publication date 04-Sep-2025





US12431521B2

Green

Method for controlling multiple fuel cells of fuel cell vehicle

Company name Hyundai Motor Company, Kia Corp (Korea)

Inventors Jang Sang Pil

Priority date 17-May-2022

Publication date 30-Sep-2025



Summarized by Denemeyer

FIG. 3A

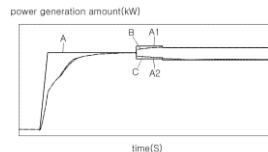
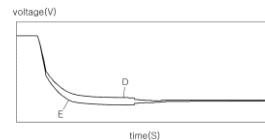


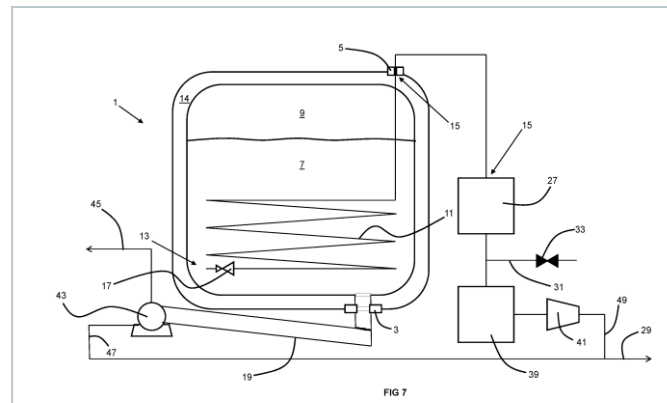
FIG. 3B



The invention is about controlling multiple fuel cells in a fuel cell vehicle by differentially adjusting their power output based on each fuel cell's degree of deterioration. Instead of conventional equal control, it uses a controller to initially equalize power generation, then monitors voltage differences to assess relative deterioration. If significant differences are detected, the controller calculates corrected power generation values, assigning less load to more deteriorated cells and more to healthier ones. This differential control balances degradation rates across the fuel cells, extending their lifespan and improving system reliability. The method includes re-evaluating the need for differential control over time, ensuring optimal operation throughout the fuel cell system's lifecycle.

US12405594B2 Green

Pumping of liquid cryogen from a storage tank



The patent addresses the challenges of efficiently storing and pumping liquid cryogens, especially liquid hydrogen (LH₂), by introducing a cryogenic storage apparatus with built-in subcooling capability. It features an insulated vessel and a hollow metal conduit that draws in liquid cryogen. A pressure reducer creates a biphasic mixture, which absorbs heat from the surrounding liquid, triggering vaporization and lowering the cryogen's heat content to subcool it. This enhances pump performance by increasing net positive suction head (NPSHA), reducing vapor formation, and minimizing boil-off. The invention also applies to hydrogen refueling stations, integrating this system with pumps, vaporizers, storage buffers, and nozzles to enable efficient, high-pressure fueling with reduced waste and less reliance on external cooling.

Company name Air Liquide (France)

Inventors Light Joshua

Priority date 02-Sep-2021

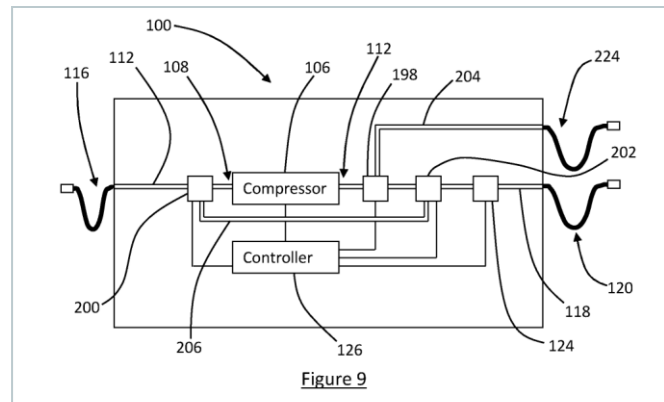
Publication date 02-Sep-2025



US2025297707A1

Green

Hydrogen pressurizing rig



The invention describes a hydrogen pressurizing rig designed to safely and efficiently pressurize storage tanks, especially in vehicles. The rig includes a compressor, pressure sensors, a controller, and configurable inlets/outlets for interfacing with hydrogen sources and storage tanks, ensuring pressurization without exceeding a set pressure ramp rate. It operates in multiple modes: pressurizing, purging (removing non-hydrogen gases via fill-purge cycles), and reclaiming hydrogen from storage tanks. The rig features adaptable valves, user controls, and connectors for various tank types, and can be made portable with wheels. A multi-stage setup allows one rig to pre-compress hydrogen before further pressurization by a second rig, enhancing flexibility, safety, and fueling efficiency.

Company name Logan Energy Ltd (UK)

Inventors Ireland William

Priority date 10-May-2022

Publication date 25-Sep-2025



EP4331898B1

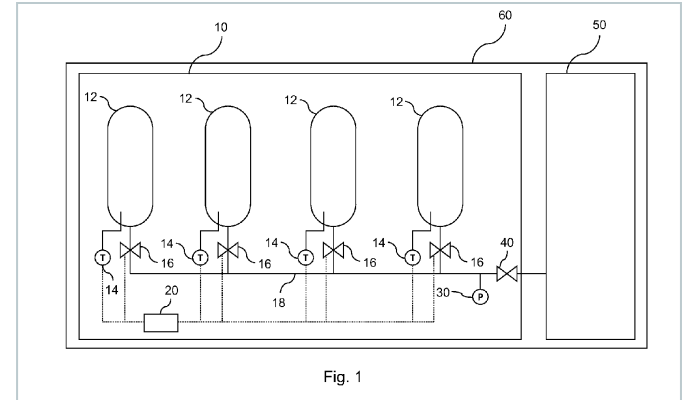
Method for detecting a fault in a tank system, computer program product, tank system and fuel cell electric vehicle

Company name AVL List GMBH (Austria)

Inventors Alzorgan Mohammad,
Harb Elias,
Al-raqqad Sharif

Priority date 29-Aug-2022

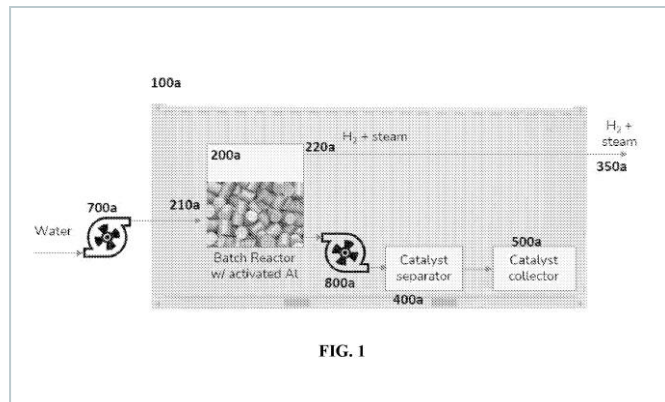
Publication date 24-Sep-2025



The patent addresses fault detection such as leaks or valve issues in hydrogen tank systems with multiple tanks connected to a shared supply line, as used in fuel cell vehicles. Unlike conventional systems that rely on a single pressure sensor and require full shutdowns, this invention uses individual temperature sensors in each tank to detect and localize faults. It analyzes temperature data, calculates statistical values like averages and deviations, and identifies tanks with abnormal readings. When a fault is detected, only the affected tank is isolated via its valve, reducing downtime and preserving system function. It offers a scalable, cost-effective solution for real-time monitoring in hydrogen-based applications.

EP4612088A2 Green

Energy generating devices, systems, and methods of use thereof



This invention introduces a novel system for safe, efficient, high-density renewable energy storage and transport using activated aluminum as a carbon-neutral fuel carrier. Leveraging aluminum's high energy density and stability, the system employs a liquid metal catalyst (e.g., gallium or indium) to drive an on-demand aluminum-water reaction that produces hydrogen and heat. Housed in modular, containerized units, it integrates reactors, circulation pumps, steam and catalyst separators, and optional hydrogen fuel cells for power generation. Scalable from kilowatts to multi-megawatts, the system supports continuous thermal or electrical output, ideal for global energy distribution, maritime shipping, and remote power applications.

Company name Found Energy Co (USA)

Inventors Godart Peter,
Ruschin Gadi,
Jackson Ariel

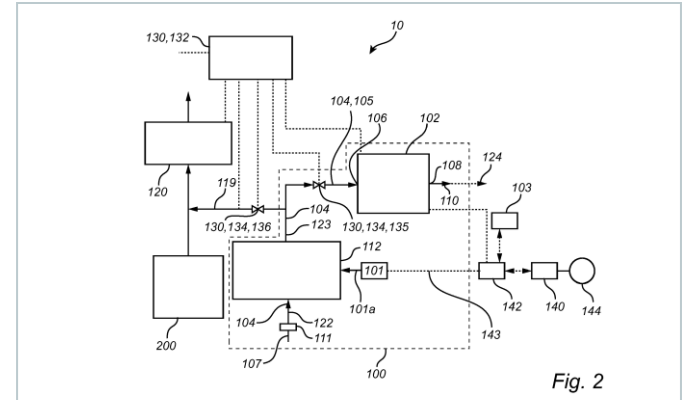
Priority date 04-Nov-2022

Publication date 10-Sep-2025



EP4242038B1 Green

A system, a method of controlling a system, and a vehicle comprising a system



The patent describes an energy management system for fuel cell electric heavy-duty vehicles that efficiently handles excess energy, such as from regenerative braking. It integrates a fuel cell, air compressor, and air-cooled brake resistor with a controllable valve and intelligent control system. When surplus energy is available, it redirects compressed air, powered by that energy, either to the fuel cell or brake resistor based on real-time conditions (e.g., braking demand, fuel cell load, battery charge). This reduces the need for large batteries or mechanical retarders, improving energy efficiency, safety, and thermal management. This smart energy redistribution system enhances overall vehicle performance while minimizing energy waste.

Company name Volvo Truck Corp (Sweden)

Inventors Audhav Tove,
Rahm Fredrik

Priority date 11-Mar-2022

Publication date 03-Sep-2025

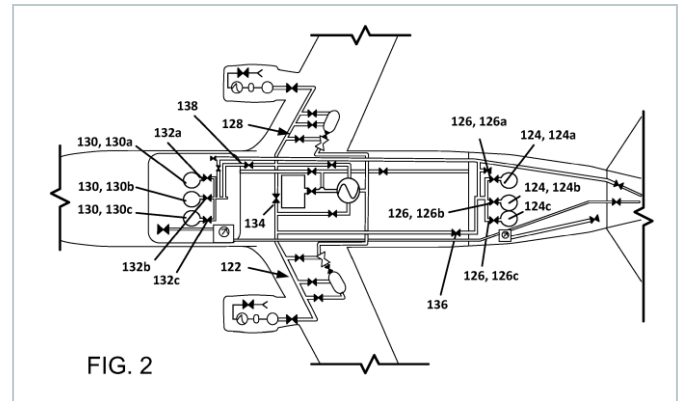




EP4265897B1



Hydrogen fuel system for aircraft



The invention relates to a hydrogen fuel system for aircraft that offers a cleaner alternative to traditional fossil fuels by using hydrogen for propulsion, onboard electricity, or both. The system is designed to safely store and manage hydrogen in liquid form during and between flights, with capabilities to handle vaporization and regulate pressure and temperature. It includes a fuel tank, boost pump, engine feeder sub-system, and fuel cell sub-system. The engine feeder heats hydrogen to a supercritical liquid state for combustion, while the fuel cell sub-system converts it to a high-pressure gas for electric power, using dedicated heat exchangers. The design supports multiple fuel tanks, which can operate independently or together, improving flexibility, safety, and redundancy using shutoff and crossfeed valves.

Company name Eaton Intelligent Power Ltd (Ireland)

Inventors Sarkar Subrata

Priority date 09-Oct-2023

Publication date 19-Sep-2025



A system and a method for charging a battery unit of an electric vehicle

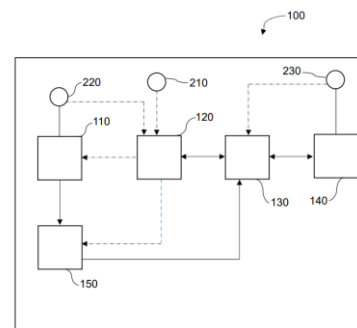
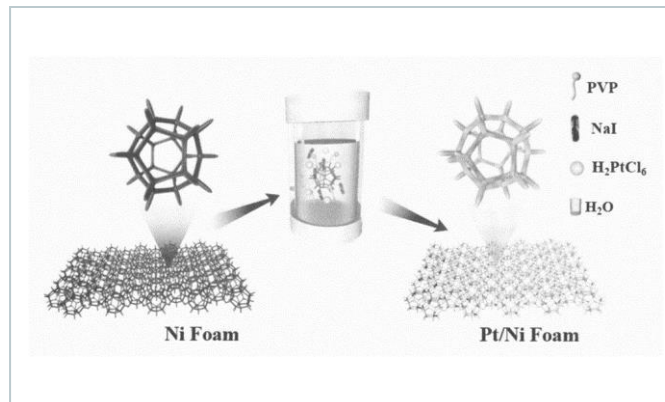
Summarized by Denneweyer

FIG. 1

The invention describes an intelligent approach to charging the high-voltage battery of a Fuel Cell Electric Vehicle (FCEV) using excess hydrogen from the fuel tank, particularly when the battery is low, but hydrogen remains. A control unit, connected to sensors monitoring vehicle motion, hydrogen levels, and battery charge, activates charging when the vehicle is stationary and a need is detected. It calculates the required hydrogen based on fuel cell energy output, motor demands, and a machine-learned correction factor reflecting driver behavior and conditions. If sufficient hydrogen is available, it powers the fuel cell to recharge the battery. Charging stops if hydrogen runs out, the vehicle moves, or the need ends. This system optimizes energy use, prevents battery depletion, and improves overall FCEV efficiency.

◀ **CN115558956B** Green

Preparation and application of three-dimensional self-supporting electrochemical catalyst material Pt/Ni Foam



The patent addresses the inefficiency and high cost of electrochemical catalysts for renewable energy conversion, especially hydrogen production via water electrolysis. To overcome platinum (Pt) limitations, the invention introduces a 3D self-supporting Pt/Ni Foam catalyst, where low-content Pt nanoparticles (0.1%–1%) are uniformly dispersed on commercial nickel foam. This is achieved via a simple oil bath heating method aided by halogen ions and surfactants, forming a stable Pt-Ni heterostructure. The design improves Pt utilization, electron transport, and structural stability, resulting in enhanced catalytic performance for hydrogen and oxygen evolution reactions. The material works in both acidic and alkaline water splitting systems and serves as an electrode in zinc-air batteries, showing versatility and cost-effectiveness.

Company name Nanjing University (China)

Inventors Gao Feng,
Xiong Boru,
Lu Qingyi

Priority date 29-Sep-2022

Publication date 19-Sep-2025

We are now in India

Your global full-service IP partner

With **60+ years of experience** and over **20 offices worldwide**, **Dennemeyer Group** is committed to being the first choice partner for the protection and management of Intellectual Property (IP) rights globally.

Our **India** office is your gateway to the world of IP, offering a single point of contact and full-service IP management solutions to support you throughout your IP life cycle.



IP consulting



IP law firm
services



IP maintenance
services



IP management
software



Octimine patent
analysis software

By the numbers



Founded in
1962



180
jurisdictions
covered worldwide



~2 Million
patents maintained



~1 Million
trademarks managed



>60
years
of experience in IP



>20
global offices



>900
employees and
associates

Global presence

Abu Dhabi, UAE
Beijing, CN
Bengaluru, IN
Brasov, RO
Chicago, USA
Dubai, UAE
Howald, LU
Johannesburg, ZA
Manila, PH
Melbourne, AU
Munich, DE
Paris, FR

Rio de Janeiro, BR
Rome, IT
Singapore, SG
Stockport, UK
Taipei, TW
Tokyo, JP
Turin, IT
Warsaw, PL
Woking, UK
Zagreb, HR
Zug, CH

Talk to us now

Find out how we can support you
in these services and more.

- International Patent and Trademark Renewals
- International Patent and Trademark Filings
- European Patent Validation
- PCT Nationalization
- Records
- DIAMS IP Management Software
- Patent Search & Analysis



Thank you.

You want to know more? Visit us at www.dennemeyer.com

 Dennemeyer India Private Limited
Bengaluru
info-india@denndemeyer.com

 North & East India
+91 98185 99822

South & West India
+91 88266 88838

DISCLAIMER: This report, including external links, is generated using data bases and information sources believed to be reliable. While effort has been made to employ optimal resources for research and analysis, Dennemeyer expressly disclaims all warranties regarding the accuracy, completeness or adequacy of the information provided. We do not control or endorse the content of external sites and are not responsible for their accuracy or legality. The information provided in this report should not be construed as legal advice, and users are strongly advised to consult with qualified legal professionals for specific legal guidance.