Dennemeyer
The IP Group

March 2025

Path to Sustainability

Harnessing Hydrogen

Recent developments

Curated and summarized - Industry and Patent news

Published by Dennemeyer India Private Limited
Parag Thakre (pthakre@dennemeyer.com)
Prachi Gupta (pgupta@dennemeyer.com)

Dennemeyer
The IP Group

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.

Dennemeyer
The IP Group

Key Insights this month

- Toyota and Honda are strategically positioning hydrogen as a competitive fuel by focusing on commercial vehicle applications. Their significant advances in fuel cell durability, efficiency, and cost-effectiveness indicate a long-term commitment to hydrogen in heavy-duty applications.

- Bosch's decision to concentrate on PEM (proton-exchange membrane) electrolysis stacks for hydrogen production over its SOFC (solid-oxide fuel cell), signifies a strong belief in the rapid growth of green hydrogen production and the potential for significant market share, likely due to the technology's scalability and efficiency.

- The collaboration between Clyde Hydrogen and PlusZero (for new decoupled electrolyser technology) and Hynfra and JOLT (for improving electrolyzer electrode) shows the importance of strategic partnerships to bring advanced electrolyzers technologies to market and critical need to reduce the cost of electrolyzers.

- Ricardo's multi-stack fuel cell module developed within three months is a direct result of their advanced, in-house virtual engineering toolchain, demonstrating how such specialized tools significantly accelerate fuel cell development and deployment.

- Many inventions that were published last month had major themes as below:

    - Electrolyzer technology is advancing through improvements in electrode performance and durability, and through innovative cell designs that can handle water with impurities, reducing the need for extensive pre-cleaning.
    - Integrating electrolyzers with the renewable energy sources such as solar and wind for on-site hydrogen production and thus eliminating the energy losses associated with the long-distance electricity transmission.

Dennemeyer
The IP Group

Industry News

Decoupled Electrolyser

Clyde Hydrogen agrees maiden partnership to demonstrate groundbreaking technology

Clyde Hydrogen Systems and PlusZero have signed an MoU to demonstrate Clyde Hydrogen's new decoupled electrolyser technology. This technology represents a major step forward in producing high-pressure green hydrogen in a safe, scalable, and economical manner. It addresses the challenge of matching renewable energy supply with hydrogen production, a key hurdle in the industry. PlusZero will host Clyde Hydrogen's commercial demonstrator electrolyser at its upcoming green hydrogen production facility in Stornoway, supporting its operation and testing for at least six months, with an option to purchase 10 MW of electrolyser capacity. This collaboration signifies a major step towards commercializing Clyde Hydrogen's breakthrough, which recently achieved a technical milestone, aiming for better cost and flexibility.

Source: Clyde Hydrogen

Dennemeyer
The IP Group

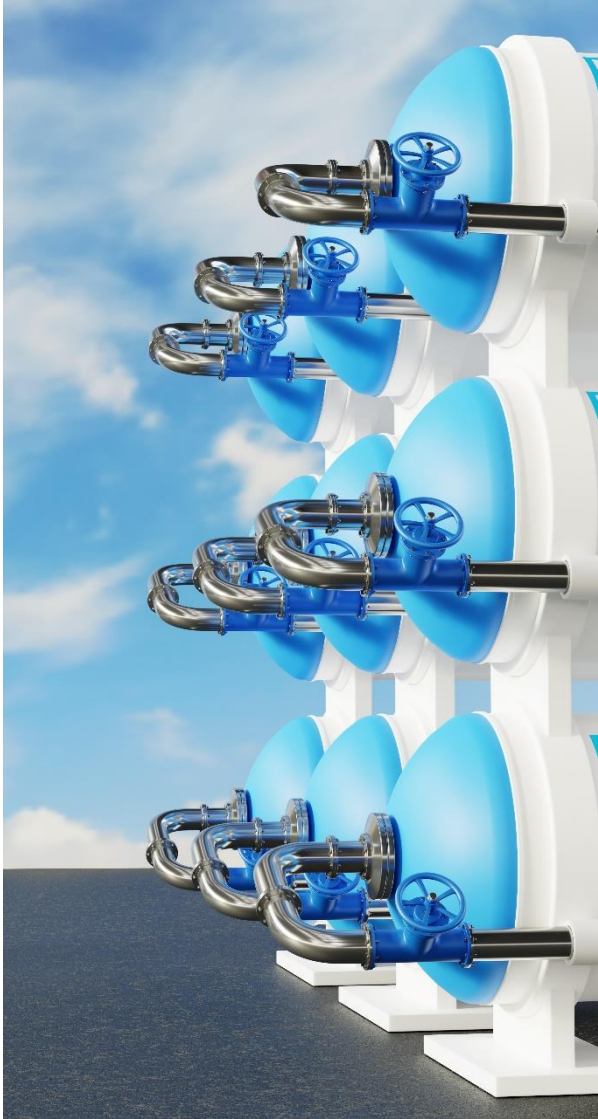
Industry News

Ricardo‘s Fuel Cell Tech

Ricardo’s Hydrogen fuel cell module successfully reaches full power

Ricardo has achieved a significant milestone by developing a high-powered, multi-stack hydrogen fuel cell module that reached 393kW of net electrical power within three months development. This achievement is enabled by their advanced virtual engineering toolchain. Ricardo's innovation allows for containerized solutions that can scale up to 3MW per container, and even 6MW in a dual-container setup, demonstrating the potential to power large vessels like cruise ships. Integrating multiple fuel cell stacks enables the high-power density and scalability, meeting diverse energy needs in maritime, stationary power, rail, and off-highway applications. This breakthrough highlights the efficiency and rapid development capabilities of Ricardo's in-house fuel cell engineering, accelerating the adoption of hydrogen as a clean energy source.

Source: Ricardo



Dennemeyer
The IP Group

Industry News

Toyota‘s 3rd Gen Fuel Cell

Toyota develops new fuel cell system

Toyota has unveiled its third-generation fuel cell (FC) system, designed to accelerate the realization of a hydrogen society, with a focus on commercial applications. This new system boasts significant improvements over its predecessor, including doubled durability, now comparable to diesel engines, and a 20% increase in fuel efficiency, extending cruising range. A key feature is the substantial cost reduction achieved through advancements in cell design and manufacturing. Aimed for deployment in heavy-duty commercial vehicles and passenger cars across key markets like Japan, Europe, North America, and China after 2026, this shows Toyota's commitment to hydrogen as a vital carbon-neutral fuel. The 3rd Gen FC System, to be showcased at the H2 & FC EXPO (International Hydrogen & Fuel Cell Expo) in Tokyo, Japan.

Source: Toyota

Dennemeyer
The IP Group

Industry News

Bosch's H2 Strategy

In stationary H2 technologies, Bosch is to focus on electrolysis – hydrogen to remain a strategic business area

Bosch is shifting its focus within hydrogen technologies, prioritizing PEM (proton-exchange membrane) electrolysis stacks for hydrogen production over its SOFC (solid-oxide fuel cell) development for decentralized power. Due to slower than expected market growth and challenging economic conditions for SOFC, Bosch will discontinue its industrialization, while continuing SOFC research in its corporate unit. Bosch sees greater potential in the rapidly growing electrolysis market, anticipating significant sales revenue by 2030, and will concentrate on developing and supplying high-performance PEM electrolysis stacks to capitalize on the increasing global demand for green hydrogen production.

Source: Bosch

Dennemeyer
The IP Group

Industry News

Fuel Cell Advancements

Honda reveals specification for its next-generation fuel cell module

Honda has unveiled its next-generation fuel cell technology, featuring significant advancements in performance and practicality. The new fuel cell module, slated for mass production in 2027, boasts a 150-kW rated output, double the durability, and half the production cost compared to its predecessor. Its volumetric power density has tripled, resulting in a much more compact design and greater installation flexibility. In addition, the Honda Fuel Cell Power Generator, launching in 2026, offers a stationary power solution for large facilities, utilizing the same fuel cell technology found in the CR-V e:FCEV (Fuel Cell Electric Vehicle). This generator is designed for high responsiveness, providing backup power within 10 seconds of startup, and features a compact design for adaptable installation.

Source: Honda

Dennemeyer
The IP Group

Industry News

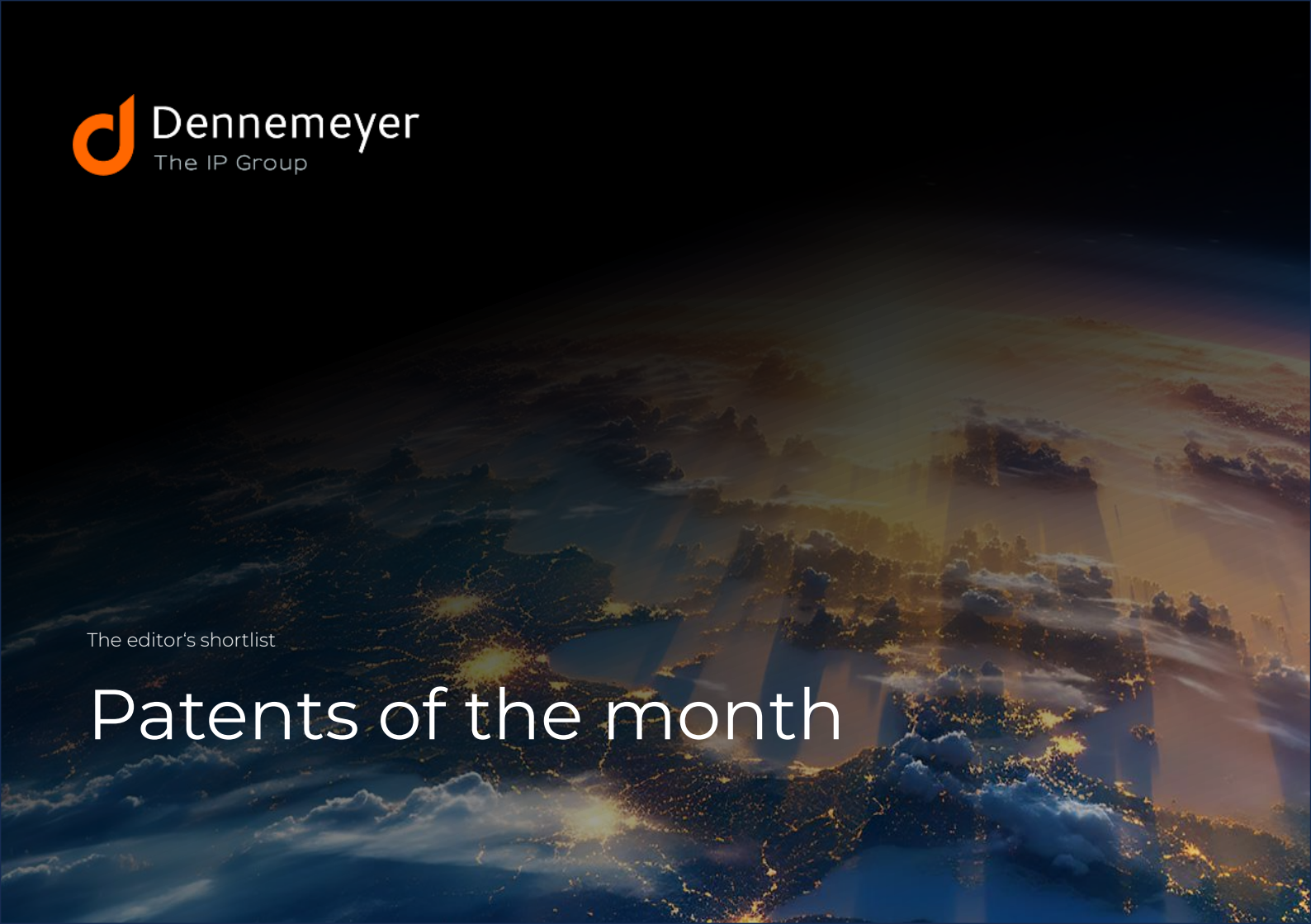
Hydrogen Electrode Tech

Polish Hynfra and Spanish deep-tech company JOLT sign LoI to cooperate on electrolyzers efficiency

Hynfra and JOLT have formed a strategic partnership to tackle the critical challenge of improving electrolyzer electrode performance and durability, essential for cost-effective renewable hydrogen production. Currently, electrode costs can reach up to 25% of an electrolyzer's total expense, and their restricted lifespan and effectiveness contribute to higher operational costs, thus increasing hydrogen production's overall price. By combining Hynfra's expertise in large-scale hydrogen projects with JOLT's advanced Sparkfuze™ electrode coating technology, they aim to significantly reduce electrode costs, extend lifespans, and enhance electrolyzer efficiency. The partnership will move forward with technical evaluations, feasibility studies, and collaborative research to deploy these advancements in real-world applications.

Source: Jolt Hynfra Deal

Dennemeyer
The IP Group



The editor's shortlist

Patents of the month

Green **Green patent indicator** powered by Octimine Dennemeyer IP Group

Patents of the month

Published in February 2025

Shortlisted and summarized by our analyst

- US12224463B2 - Installation and method for supplying a fuel cell with hydrogen Green
  Assignee: Air Liquide SA (France)
- US2025070201A1 - Method for diagnosing fault in pressure gauge of hydrogen charging system, and method for calibrating pressure gauge of hydrogen charging system Green
  Assignee: Eneos Corp (Japan)
- US12237551B2 - Method and system employing fuel cell stack power model in controlling fuel cell system Green
  Assignee: Ford Global Technology LLC (US)
- US2025059658A1 - A wind turbine with an up-tower electrolysis system and a method for controlling the system Green
  Assignee: Vestas Wind System (Denmark)
- CN114765264B – Fuel cell system Green
  Assignee: Honda Motor Co Ltd (Japan)
- DE102023207318A1 - Contaminant scavenger in an electrolysis cell Green
  Assignee: Robert Bosch GMBH (Germany)
- JP7630274B2 - Liquid hydrogen storage device for locomotive and hydrogen supply method Green
  Assignee: Kawasaki Heavy Ind Ltd (Japan)
- WO2025037300A1 - Substrates, oxygen electrodes and electrochemical devices Green
  Assignee: Hydrolite Ltd (Israel)
- GB2604595B - Systems and methods for controlling air flow at a fuel cell Green
  Assignee: Intelligent Energy Ltd (UK)
- IN202521009675A - Novel Solar-Hydrogen hybrid system for continuous power generation
  Assignee: Bharati Vidyapeeth College Of Engineering Navi Mumbai (India)

Dennemeyer
The IP Group

Latest patents

US12224463B2 Green

Installation and method for supplying a fuel cell with hydrogen

Company name	Air Liquide SA (France)
Inventors	Allidieres Laurent
Priority date	25-Mar-2020
Publication date	11-Feb-2025

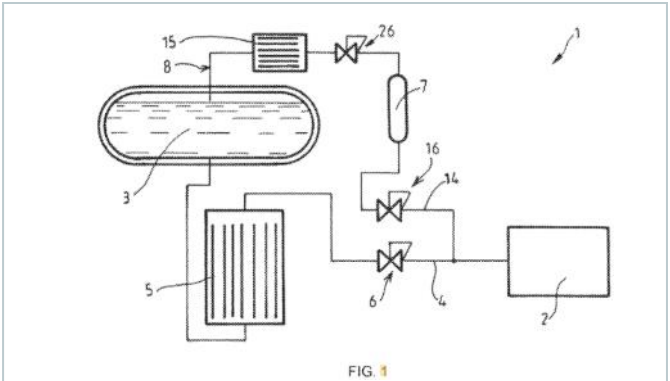


FIG. 1

The invention addresses the challenge of efficiently supplying hydrogen to fuel cells from low-pressure liquid hydrogen storage facilities, particularly when manufacturers specify higher operating pressures. The invention provides a solution by incorporating a buffer tank within the supply circuit. This tank accumulates heated hydrogen from the storage facility, creating a high-pressure reserve (4-100 bar) for safe cell shutdown, while allowing the main storage to operate at lower, more efficient pressures (1.5-4.5 bar). This eliminates the need for complex intermediate tanks and ensures a reliable hydrogen supply, addressing the mismatch between low-pressure storage and higher fuel cell operating pressure requirements.

Summarized by Dennemeyer

Dennemeyer
The IP Group

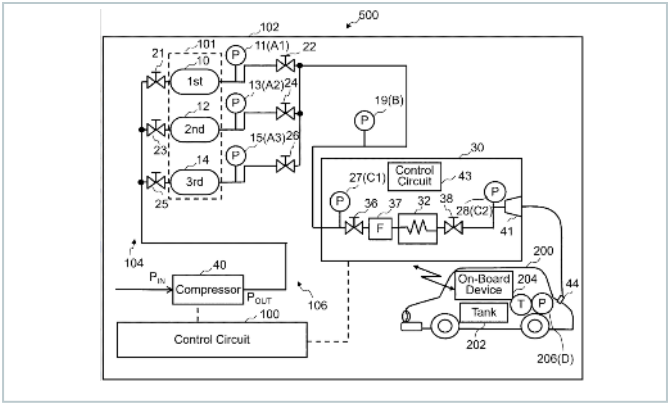
Latest patents

US2025070201A1 Green

Method for diagnosing fault in pressure gauge of hydrogen charging system, and method for calibrating pressure gauge of hydrogen charging system

Company name	Eneos Corp (Japan)
Inventors	Fukunaga Akihiko
Priority date	26-Mar-2018
Publication date	27-Feb-2025

Summarized by Dennemeyer



This invention addresses the problem of efficiently and accurately diagnosing and calibrating pressure gauges used in hydrogen filling systems. Traditional methods require costly and time-consuming removal of gauges for factory calibration, leading to potential undetected failures and operational downtime. The invention provides a solution by diagnosing gauge failures and performing automatic calibration during normal filling operations, eliminating the need for gauge removal. It diagnoses faulty gauges by analyzing and comparing pressure readings from multiple sensors during specific filling stages, such as near-end, peak pressure, or valve closure. It performs real-time diagnostics by checking if pressure deviations stay within limits, without service interruptions.

Dennemeyer
The IP Group

Latest patents

US12237551B2 Green

Method and system employing fuel cell stack power model in controlling fuel cell system

Company name	Ford Global Technology LLC (US)
Inventors	Lowstedt Carl, Rahm Fredrik, Hrustic Adnan, Gona Bala Narasimha Reddy
Priority date	11-Feb-2022
Publication date	25-Feb-2025

Summarized by Dennemeyer

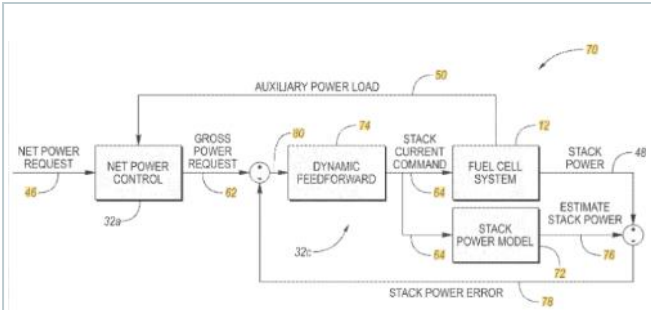


FIG. 4

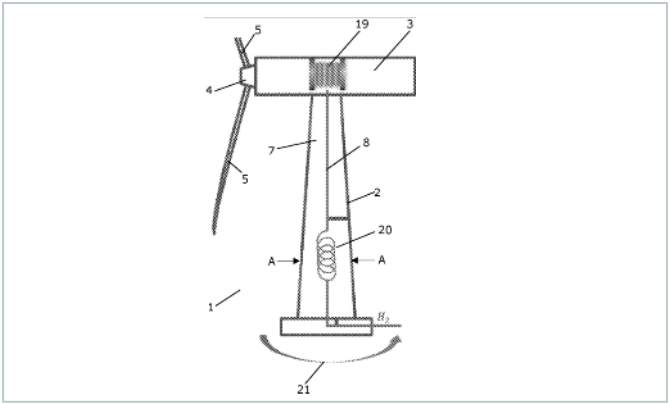
This invention focuses on improving the control of fuel cell systems, particularly in vehicles, by using a smart controller that adjusts the fuel cell's electrical current to meet power demands. The controller uses a "power model" to predict how the fuel cell will respond to changes, ensuring accurate and timely power delivery. It compares the requested power with the actual output, making adjustments as needed. The system also accounts for the fuel cell's own power consumption (auxiliary power) alongside the power needed for propulsion. By dynamically adjusting the current based on real-time driver demands and using predictive modeling, the invention enables the fuel cell to quickly and efficiently provide the required power, optimizing performance and responsiveness.

Dennemeyer
The IP Group

Latest patents

US2025059658A1 Green

A wind turbine with an up-tower electrolysis system and a method for controlling the system



Company name	Vestas Wind System (Denmark)
Inventors	Hansen Jesper Rømer, Reumert Alexander, Baun Torben Ladegaard
Priority date	21-Dec-2021
Publication date	20-Feb-2025

This patent describes a wind turbine with an integrated electrolysis system for on-site hydrogen production. The key innovations include placing the electrolysis system in the up-tower part of the turbine (nacelle or nearby), thereby minimizing energy losses associated with long-distance electricity transmission and eliminate the need for a grid-side converter. A hydrogen transport line, protected within the tower, carries the produced hydrogen down to a lower outlet. Safety is enhanced through hydrogen sensors within the tower, blast panels to mitigate explosion risks, controllable valves to isolate the hydrogen flow, and an emergency hydrogen exit channel for venting. Additional features such as double-walled pipes, venting blowers, and flexible transport lines further enhance safety and efficiency for reliable hydrogen production.

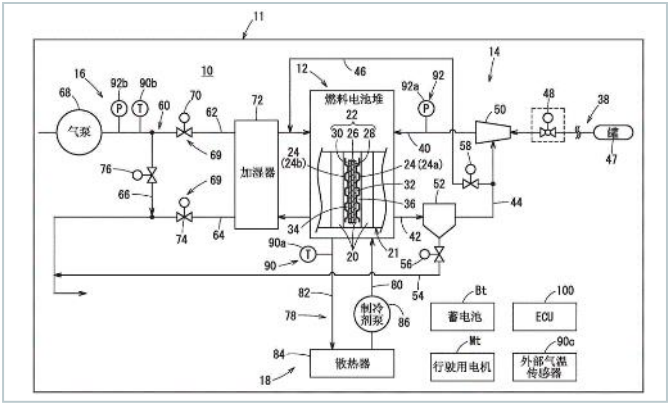
Summarized by Dennemeyer

Dennemeyer
The IP Group

Latest patents

CN114765264B Green

Fuel cell system



Company name	Honda Motor Co Ltd (Japan)
Inventors	Sakai Ryoji, Nakagawa Takuto, Akabori Sho, Inoue Tomoyuki
Priority date	14-Jan-2021
Publication date	07-Feb-2025

This patent tackles the problem of maintaining the longevity and reliability of fuel cell systems in mobile applications that experience frequent power generation shutdowns. It introduces a system with a bypass line and intelligent control that adapts to the fuel cell's temperature. When warm, it circulates air through the bypass line to prevent membrane degradation. When cold, it initiates minimal power generation to prevent valve freezing. By intelligently managing gas flow and power generation based on temperature, this system effectively prevents both membrane degradation and valve freezing, significantly improving the overall durability and reliability of fuel cell systems in mobile units.

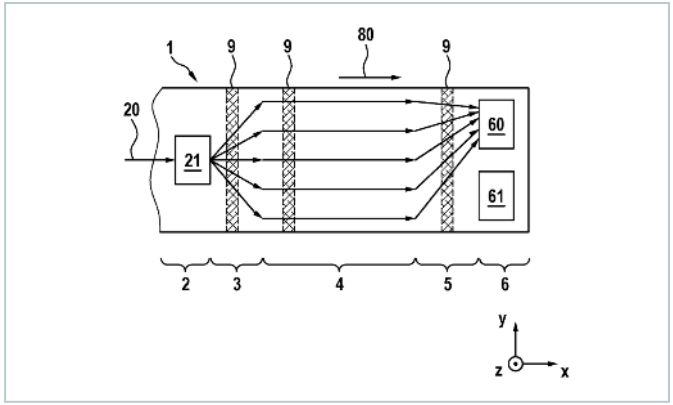
Summarized by Dennemeyer

Dennemeyer
The IP Group

Latest patents

DE102023207318A1 Green

Contaminant scavenger in an electrolysis cell



Company name	Robert Bosch GMBH (Germany)
Inventors	Brunner Matthias
Priority date	01-Aug-2023
Publication date	06-Feb-2025

This patent describes an improved electrolysis cell designed to handle water with impurities, eliminating the need for extensive pre-cleaning. The key innovation is the integration of contaminant catchers within the electrolysis cell itself, specifically in the distribution areas and/or the active area, to bind impurities through absorption, adsorption, or chemical reactions. These catchers, using binding agents like activated carbon and antioxidants, act as filters, enhancing efficiency and preventing blockages that can lead to overheating and damage. The design allows for flexible placement of these catchers, either individually or in multiple locations, to optimize contaminant removal based on temperature gradients and flow dynamics within the cell.

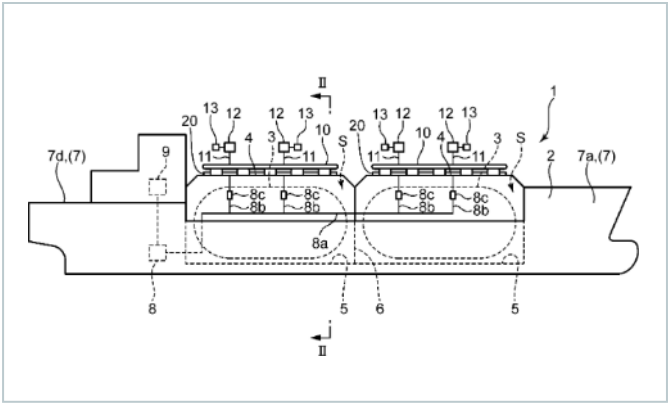
Summarized by Dennemeyer

Dennemeyer
The IP Group

Latest patents

JP7630274B2 Green

Liquid hydrogen storage device for locomotive and hydrogen supply method



Company name	Kawasaki Heavy Ind Ltd (Japan)
Inventors	Tanimoto Keisuke, Shimogaki Takashi
Priority date	28-Dec-2020
Publication date	17-Feb-2025

This patent describes a piping structure for cryogenic liquids, specifically for use on ships carrying liquids like liquefied hydrogen. The invention addresses the problem of air condensing and liquefying on the cold pipes, which can then drip onto and embrittle the ship's structural materials. To prevent this, the piping is designed as a double-walled pipe with a vacuum layer for insulation. Additionally, a "storage area partitioning member" is installed on the ship's structural material below the pipe, creating a contained area to hold an "evaporation-promoting liquid." This liquid evaporates any dripping liquefied air, preventing it from damaging the ship's structure. The ship also includes a supply device for replenishing this evaporation liquid.

Dennemeyer
The IP Group

Latest patents

WO2025037300A1 Green

Substrates, oxygen electrodes and electrochemical devices

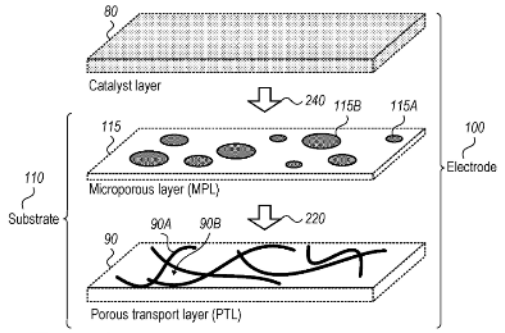


Figure 1

Company name	Hydrolite Ltd (Israel)
Inventors	Kitayev Anna, Tal-gutelmacher Ervin, Azra Charly David, Smirnova Viktoria
Priority date	15-Aug-2023
Publication date	20-Feb-2025

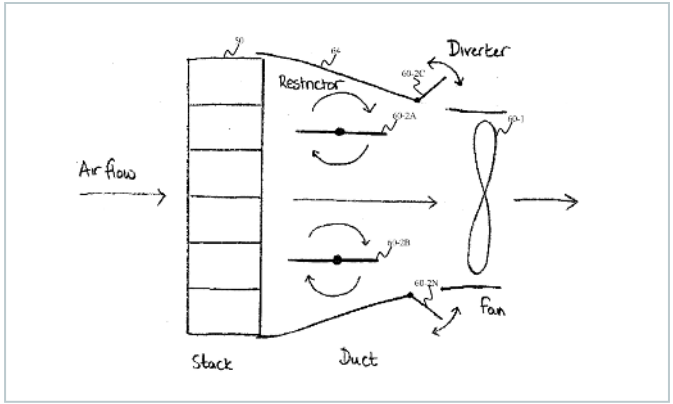
This invention focuses on improving oxygen electrodes for electrochemical devices like fuel cells and electrolyzers. It introduces a substrate for these electrodes, consisting of a porous transport layer (PTL) made of metal fibers (nickel, stainless steel, titanium, etc.) and a microporous layer (MPL) attached to PTL, of a similar metal to enhance compatibility. This combination ensures electrical conductivity and a specific pore size distribution. This design improves catalyst layer adhesion, optimizes mass transport, and reduces contact resistance, ultimately boosting the efficiency and durability of fuel cells and electrolyzers.

Dennemeyer
The IP Group

Latest patents

GB2604595B Green

Systems and methods for controlling air flow at a fuel cell



Company name	Intelligent Energy Ltd (UK)
Inventors	Christopher James Kirk, Steven Hanser
Priority date	05-Mar-2021
Publication date	26-Feb-2025

This invention focuses on improving the performance and longevity of open cathode fuel cell (FC) stacks by dynamically adjusting airflow. A controller is used to increase airflow significantly when needed, based on sensed attributes like voltage or moisture levels, or after a certain operating time. This adjustment helps prevent issues like electrode flooding and ensures proper hydration of the membrane, ultimately enhancing the FC stack's efficiency and durability. The system can be implemented using various methods, including controlling air movers, restrictors, or pressurized bellows, and is particularly useful in applications like unmanned aerial vehicles (UAVs).

Summarized by Dennemeyer

Dennemeyer
The IP Group

Latest patents

IN202521009675A

Novel Solar-Hydrogen hybrid system for continuous power generation

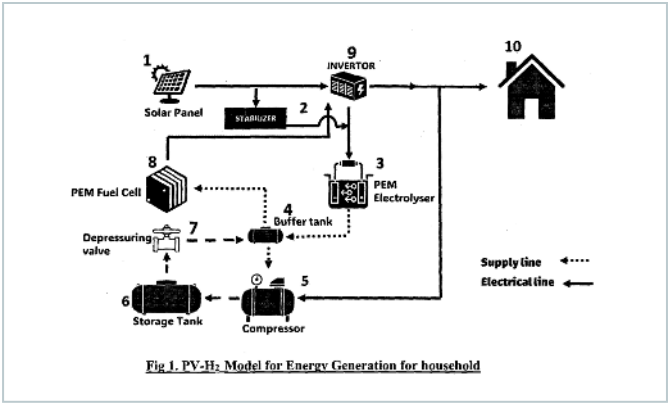
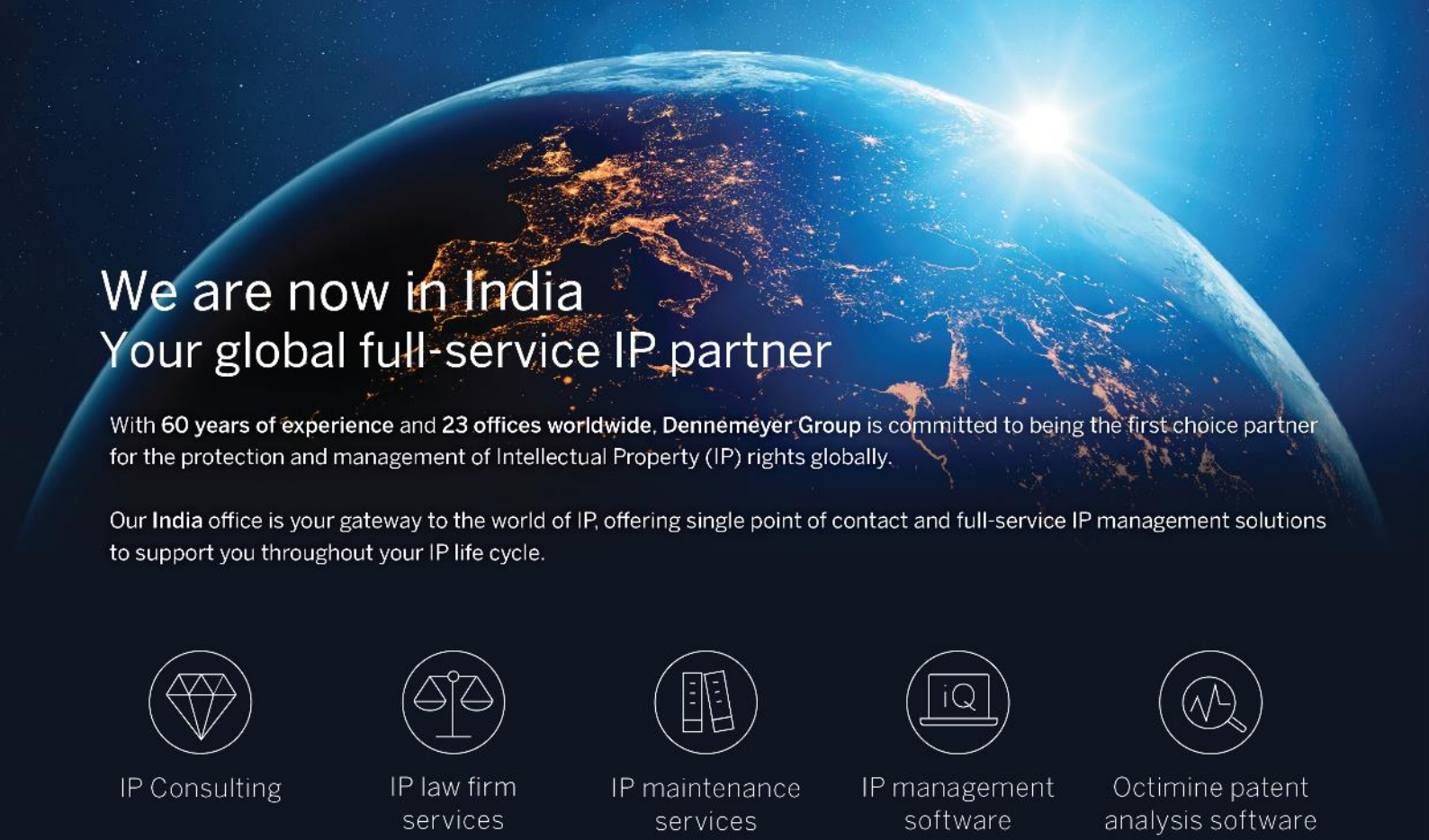


Fig 1. PV-H₂ Model for Energy Generation for household

Company name	Bharati Vidyapeeth College Of Engineering Navi Mumbai (India)
Inventors	Firdos J Khan, Yashraj N Sawant, Adeshkumar A Pandey, Yash P Patange, Sushant P Thali, Padmini K Sawant, Dr Sandhya D Jadhav, Dr Shivgond N Teli, Prathamesh D Patil, Jaydeep S Patil
Priority date	06-Feb-2025
Publication date	28-Feb-2025

This invention addresses the challenges of fossil fuel dependence and intermittent renewable energy by creating a self-sustaining residential energy system. It integrates solar PV panels, a PEM electrolyzer for hydrogen production and storage, and a PEM fuel cell for electricity generation. Excess solar energy is converted to hydrogen, stored for long periods, and then used to power the home when solar is unavailable. The system aims to demonstrate the feasibility of this integrated approach, reduce reliance on traditional energy sources, and promote household-level adoption of sustainable energy solutions. This system utilizes stabilizers to manage voltage fluctuations and prioritizes hydrogen from a buffer tank to minimize decompression losses.

Summarized by Dennemeyer



We are now in India
Your global full-service IP partner

With **60 years of experience** and **23 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 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
- Vargarda, SE
- Warsaw, PL
- Woking, UK
- Zagreb, HR

Talk to us now

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

- Patent Renewals
- Trademark Renewals
- Trademark Filing
- Recordals
- PCT Nationalization
- European Patent Validation
- DIAMS IP Management Software
- IP Analytics

Dennemeyer
The IP Group

Thank you.

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

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

North & East India
+91 98185 99822

South & West India
+91 88266 88838