

February 2026

Path to Sustainability

Harnessing Hydrogen

Recent developments

Curated and summarized - Industry and Patent news

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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

- ❑ TECNALIA's expansion of H2TESTLAB strengthens Europe's hydrogen value chain by adding high-reliability testing and validation capacity, accelerating certification cycles and de-risking product development. This advancement boosts industry confidence, supports faster market entry for electrolyser, storage, and safety technologies.
- ❑ The Toshiba–Airbus breakthrough in lightweight superconducting megawatt-class propulsion accelerates the viability of hydrogen-electric aircraft. It lowers technology risk and opens new value streams across aerospace and hydrogen mobility. This milestone further strengthens the commercial pathway for zero-emission aviation and positions hydrogen as a core enabler of future clean mobility systems.
- ❑ VINNSEN securing global type approvals for its marine fuel-cell module is a major step toward mainstream hydrogen adoption in shipping. Certification from leading registries de-risks deployment, unlocks vessel-integration pathways, and positions fuel-cell propulsion as a commercially viable route for decarbonizing maritime fleets.
- ❑ The breakthrough in manganese-based catalysts delivers a low-cost, abundant alternative to precious-metal, lowering green-hydrogen production costs and strengthening supply-chain resilience. This shift enables more scalable, affordable electrochemical processes and opens new pathways for sustainable hydrogen-based fuels and chemicals.
- ❑ Many inventions published last month revolved around two major themes:
 - Innovations in hydrogen refueling are strengthening the ecosystem by enhancing safety, accuracy, and engine performance across storage, dispensing, and injection systems. Improved sealing designs, smarter tank-size identification, and uniform hydrogen injection reduce risks, enable faster and more reliable fueling, and support smoother combustion, removing key barriers to scaling hydrogen mobility.
 - Catalyst-layer innovations use graded ionomer structures to improve oxygen transport and prevent flooding. This boosts catalyst utilization and delivers more efficient, stable fuel-cell performance.



◀ Industry News

Advanced Hydrogen Testing

New capabilities for testing and validation of renewable hydrogen technologies

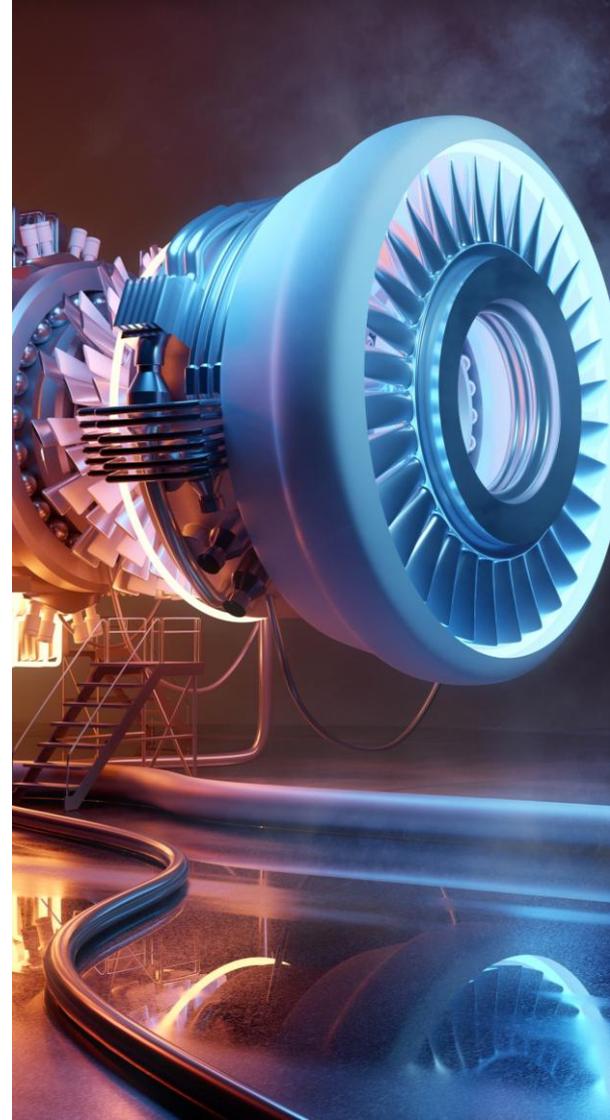
TECNALIA has expanded its hydrogen laboratory with H2TESTLAB, a specialised facility for testing materials and components used in renewable-hydrogen production, distribution and end-use. The lab supports work on next-generation electrolysers, material durability, storage, safety and industrial hydrogen systems, and includes advanced tools such as AEM electrolyser benches, membrane-degradation rigs, embrittlement benches, hydrogen-sensor validation systems and enhanced safety infrastructure. With this upgrade, TECNALIA strengthens its position as a leading centre for hydrogen-technology testing in Spain. The project is supported under Programme 1 of the PERTE ERHA (Spain's Strategic Project) initiative by IDAE (Institute for the Diversification and Saving of Energy) to advance capabilities and demonstrators in Spain's renewable-hydrogen ecosystem.



Next-Gen Flight Motor

From Dream to Reality: Toshiba and Airbus drive the future of hydrogen-powered flight with superconducting motors

Toshiba and Airbus are advancing zero-emission aviation through a partnership focused on developing Toshiba's superconducting motor, a compact and ultra-lightweight system delivering 2MW-class output at less than one-tenth the size and weight of conventional motors. First introduced in 2022, the technology is now being co-developed with Airbus to integrate into future hydrogen-powered electric aircraft, leveraging superconductivity and cryogenic cooling from liquefied hydrogen to achieve high efficiency and reduced weight. This collaboration aligns with aviation's push for net-zero CO₂ emissions by 2050 and represents a major step toward practical hydrogen-electric propulsion. Beyond aviation, Toshiba envisions the motor's lightweight, high-output design supporting sustainable mobility applications including clean maritime transport and space propulsion.



Hydrogen Station Expansion

Hyliko renews its confidence in Lhyfe and increases renewable hydrogen supply volumes for its two stations in the Paris region

Lhyfe has renewed and expanded its partnership with Hyliko to supply more than 200 tonnes of RFNBO (Renewable Fuels of Non-Biological Origin)-certified renewable hydrogen to Hyliko's two hydrogen refuelling stations in Villabé and Tremblay-en-France, supporting the decarbonisation of heavy-duty transport in the Paris region. The Villabé station has already demonstrated strong demand, enabled over 342,000 km of truck operations and avoided 234 tonnes of CO₂. Lhyfe is the first French producer of RFNBO hydrogen, which will qualify for the TIRUERT scheme. When the decree is published, Hyliko can issue certificates that may cut hydrogen prices by four to six euros per kilo. The renewed contract reinforces both companies' long-term strategy to secure green hydrogen supply, expand station networks, and prepare for future regulatory requirements in zero-emission freight transport.

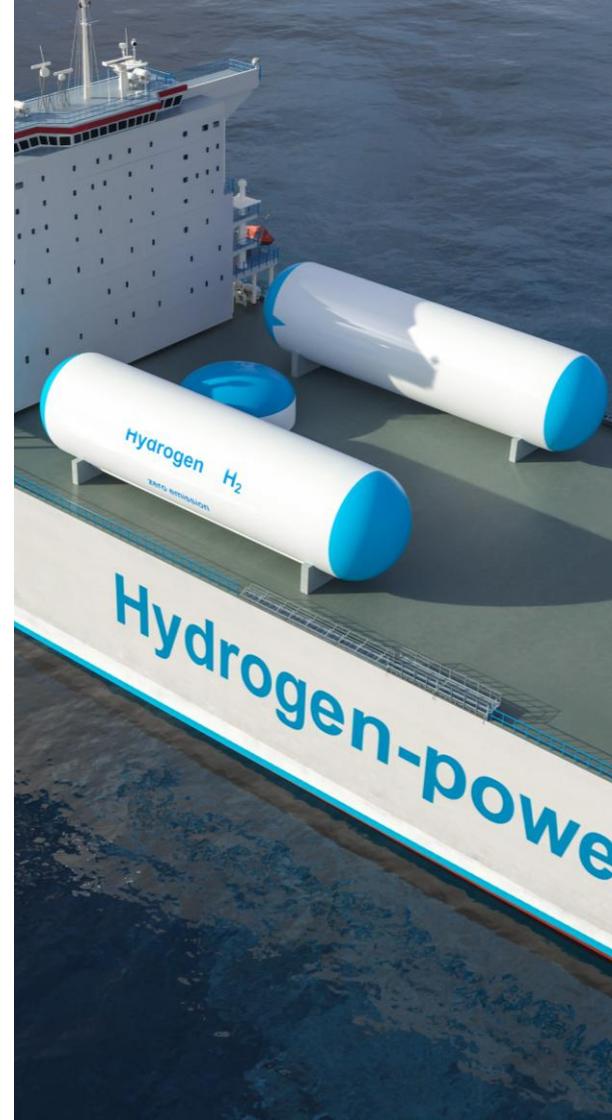
Source: [Lhyfe](#)



Marine Fuel Cell

VINSEN secures type approval from KR and ABS for 150kw marine fuel cell module

VINSEN has received Type Approval from the Korean Register (KR) and the American Bureau of Shipping (ABS) for its 150kW marine fuel cell module. The proton exchange membrane (PEMFC) module meets international design, safety and performance standards through rigorous Project Design Assessment and Manufacturing Assessment processes. Scalable to 250kW and megawatt-class systems, the module can serve as either an onboard power generator or main propulsion source for vessels ranging from small craft to large commercial ships. It has also secured project approval from the Korea Maritime Transportation Safety Authority (KOMSA), confirming compliance with IMO-aligned safety rules. This milestone strengthens VINSEN's position in developing high-power, modular hydrogen propulsion solutions for zero-emission maritime applications.



Manganese Catalyst Innovation

Manganese gets its moment as a potential fuel cell catalyst

A new study from Yale and the University of Missouri shows that manganese-based catalysts can turn carbon dioxide into formate in a more sustainable way. The team made these catalysts last longer and work better by adding an extra donor atom to the ligand, allowing them to perform better than many precious-metal catalysts. Since industrial formate production currently relies on fossil fuels, this method offers a more sustainable route by transforming atmospheric CO₂ into a valuable chemical used in industry and as a hydrogen source. The team notes that their catalyst-design strategy could extend to other important chemical transformations, marking a broader advance in sustainable catalysis. This work shows how abundant metals can replace costly precious metals in key processes. It also brings researchers closer to practical solutions for clean hydrogen production.



The editor's shortlist

◀ Patents of the month



Patents of the month

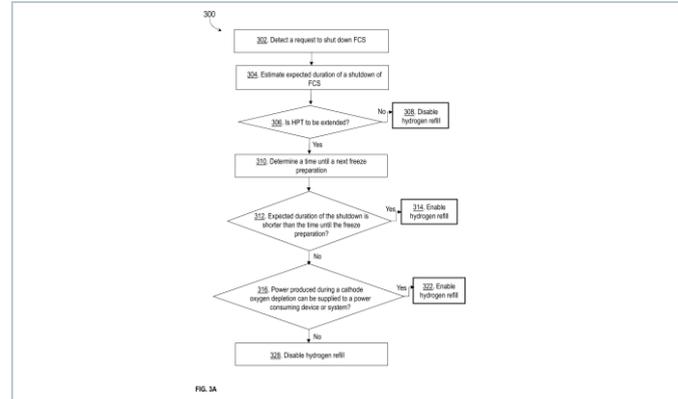
Published in Jan 2026

Shortlisted and summarized by our analyst

- [US12523340B2](#) - Receptacle for hydrogen charging of fuel cell vehicle
Assignee: Hyundai Motor Co (KR), Kia Corp (KR)
- [US2026031375A1](#) - Managing operation of a fuel cell system in a fuel cell vehicle
Assignee: Volvo Truck Corp (Sweden)
- [US2026008672A1](#) - Apparatus and method for simultaneous hydrogen production and emission control
Assignee: Barber Michael D (USA)
- [EP4677142A1](#) - Electrochemical cell stack
Assignee: Schaeffler Technology AG & CO KG (Germany)
- [EP4673987A1](#) - Balance-of-plant for electro-synthetic or electro-energy liquid-gas cells or cell stacks
Assignee: HYSATA PL (Australia)
- [EP4674669A1](#) - Improved safety system for a fuel cell vehicle
Assignee: IVECO SPA (Italy)
- [EP4677256A1](#) - Method for determining a variable of a tank
Assignee: Linde GMBH (Germany)
- [JP2026000755A](#) - Catalyst layer for electrochemical device, membrane electrode assembly for electrochemical device, and electrochemical device
Assignee: Panasonic Intellectual Property Management Co Ltd (Japan)
- [IN202541040872A](#) - Method for hydrogen leak detection and media substitution in hydrogen cylinders
Assignee: Ashok Leyland Ltd (India)
- [CN121296340A](#) - Nozzle structure of hydrogen injector, internal combustion engine and vehicle
Assignee: Shenzhen Yinghe Automobile Co Ltd (China)

US2026031375A1

Managing operation of a fuel cell system in a fuel cell vehicle



The invention presents a control strategy for fuel cell vehicles that prevents degradation from air-to-air starts during shutdown, a condition occurring when air remains on both anode and cathode sides at restart. It manages hydrogen refills by estimating shutdown duration, checking the next freeze-prep timing, and ensuring oxygen-depletion power can be absorbed by loads such as the ESS (Energy Storage Systems), grid, brake resistor or auxiliary devices. A refill is enabled only when shutdown time is shorter than the freeze-prep interval and excess power can be safely consumed; otherwise, it is disabled to avoid hydrogen waste and harmful open-circuit voltage conditions. By aligning hydrogen protection with freeze-prep timing and system capacity, the approach cuts air-to-air starts, prevents voltage damage and improves fuel cell durability.

Company name Volvo Truck Corp (Sweden)

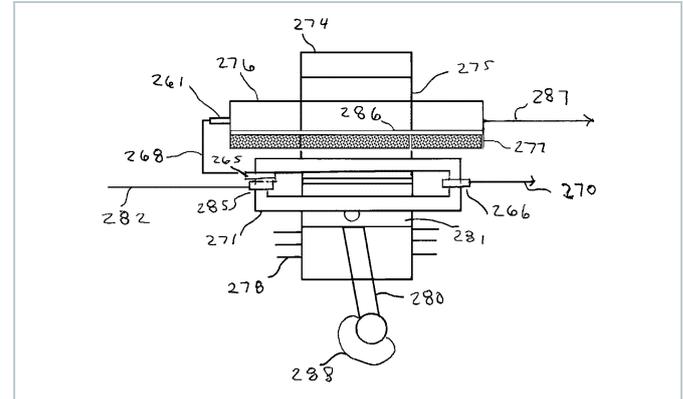
Inventors Arya Pranav,
Blanc Ricard

Priority date 25-Jul-2024

Publication date 29-Jan-2026

◀ [US2026008672A1](#) 🌱 Green

Apparatus and method for simultaneous hydrogen production and emission control



This invention introduces a design that cools an engine while producing hydrogen by capturing heat normally wasted in internal combustion engines. Instead of letting heat dissipate through fins, coolant, or the catalytic converter, it injects water onto hot cylinder walls to create steam, which is collected and routed around a reaction chamber. The steam heats the chamber walls and is then injected inside, where it reacts with hot iron or other oxidizable materials to generate hydrogen through the steam-over-hot-iron process. The reaction is reversible, allowing iron oxide to be restored to iron using hydrogen and steam. Additional steam is produced using catalytic-converter heat, which also lowers emissions. Using engine and exhaust heat for hydrogen production increases efficiency, supports cooling, and provides hydrogen as supplemental fuel.

Company name Barber Michael D (USA)

Inventors Barber Michael D

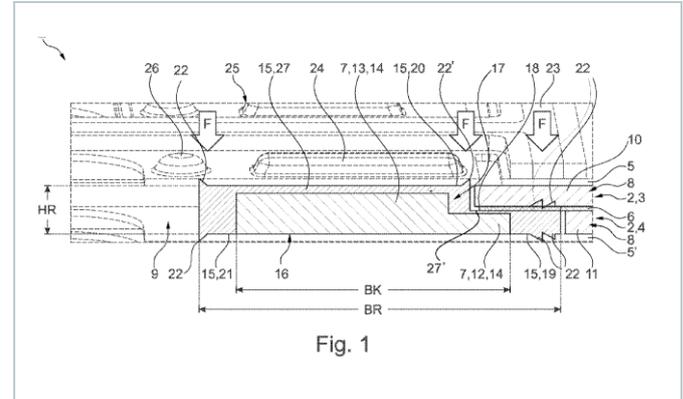
Priority date 13-Sep-2025

Publication date 08-Jan-2026



EP4677142A1 Green

Electrochemical cell stack



The invention relates to an improved electrochemical cell stack, particularly an electrolysis stack for hydrogen production. The stack uses bipolar plates separating individual cells, each formed by two half-cells around a membrane supported by a stepped support frame. The frame integrates molded sealing areas of different widths to ensure reliable sealing on both anode and cathode sides under high pressure. A porous transport layer extends into the stepped region to transmit pressure forces and support the membrane edge, preventing leaks. It also includes three sealing regions with elastomeric lips, insulating sections and optional elastic supports to reduce tolerances and part count. Overall, the design enables high-pressure electrolysis near 100 bar with improved sealing integrity, manufacturability and robustness for advanced electrolyzers.

Company name Schaeffler Technology AG & CO KG (Germany)

Inventors FRANK MATTHIAS,
YAO YUAN,
HAUCK JOSEF,
WOEHNER TIMO

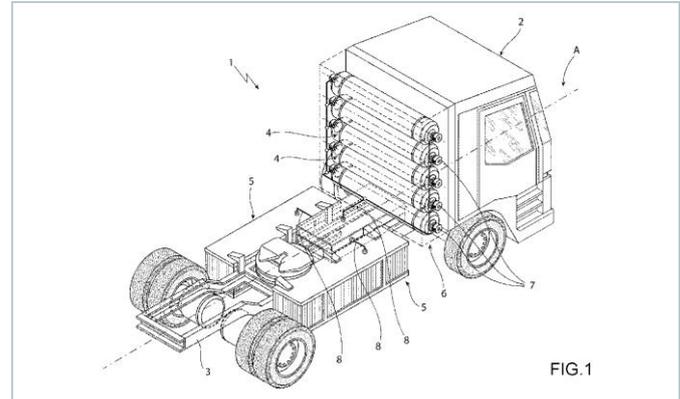
Priority date 03-Mar-2023

Publication date 14-Jan-2026



EP4674669A1

Improved safety system for a fuel cell vehicle



The patent addresses the safety risk in fuel cell vehicles where high-pressure hydrogen tanks sit close to lithium-ion battery packs that can enter thermal runaway and compromise tank integrity. To prevent catastrophic explosions, the invention uses a valve that normally keeps the tank sealed but automatically opens to vent hydrogen when excessive heat or pressure from a battery failure is detected. This actuation occurs passively through conduits or thermally conductive wires that channel the battery's hot exhaust gases or rising pressure to the valve, triggering venting before structural damage. By enabling early detection and passive actuation, the design reduces explosion risks, lowers system complexity, and improves safety of hydrogen-powered vehicles.

Company name IVECO SPA (Italy)

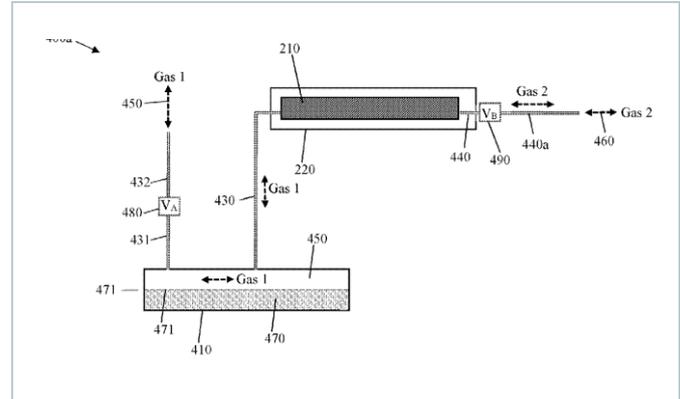
Inventors GROTTENTHALER DAVID,
FINKELSTEIN DAVID

Priority date 02-Jul-2024

Publication date 07-Jan-2026

EP4673987A1 Green

Balance-of-plant for electro-synthetic or electro-energy liquid-gas cells or cell stacks



The patent introduces an improved balance-of-plant concept for electro-synthetic and electro-energy liquid-gas cell stacks, enhancing safety, efficiency, and operation under variable renewable power. It uses infra-mounted pressure-equalisation tanks, precise dual-stage gas-pressure control, and gas recirculation with de-contamination units to manage purity and prevent hazardous gas crossover. Liquid circulation is stabilised through ejectors, pumps, and partially filled tanks that also support pressure management, while integrated cooling uses annular fluids and optional phase-change tubes. Embedded chips simplify cell monitoring, and modular pressurised stack arrays with shared manifolds support scalable, bidirectional operation for load following and grid balancing.

Company name HYSATA PL (Australia)

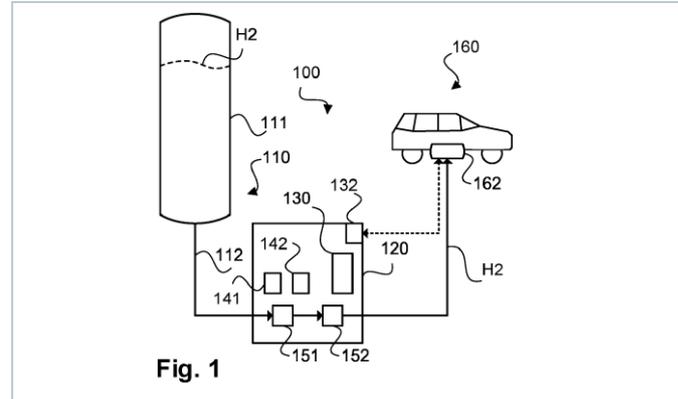
Inventors Warburton Adam,
Swiegers Gerhard Frederick,
Cox David John,
Khoo Paul Soo-hock, Rice Nick,
Allison Hugh Alexander, Tier Dominic

Priority date 13-Mar-2023

Publication date 07-Jan-2026

EP4677256A1 Green

Method for determining a variable of a tank



The patent explains determining a hydrogen tank's size during refueling by running a short test-fill and comparing several mass measurements. During this brief fill, it records supply-side conditions, mass-flow data, and when available tank-side values from the vehicle. These measurements generate several mass-difference estimates that are compared with predefined reference ranges for small or large tank categories. The tank is then automatically assigned to the correct category, enabling safe, efficient protocol selection without relying on vehicle interfaces that may lack SIL-2 (Safety Integrity Level 2) safety reliability. Redundant sensors and mass-flow limit checks further enhance accuracy and prevent overfilling or overheating, improving overall refueling safety and efficiency at hydrogen stations.

Company name Linde GMBH (Germany)

Inventors Bleile Thomas,
Breitbach Thomas

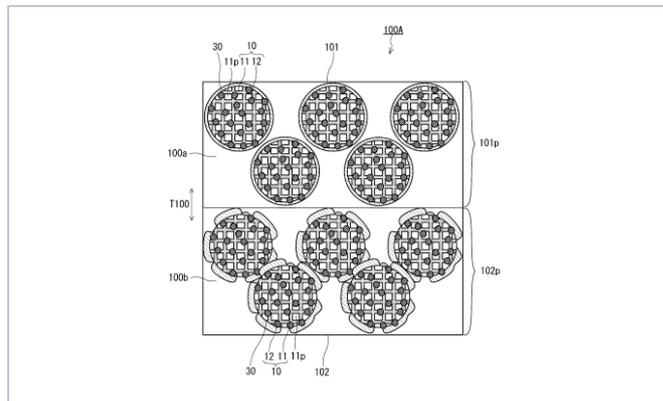
Priority date 03-Mar-2023

Publication date 14-Jan-2026



◀ JP2026000755A

Catalyst layer for electrochemical device, membrane electrode assembly for electrochemical device, and electrochemical device



This patent introduces a catalyst-layer design for electrochemical devices, such as fuel cells, aimed at improving catalyst utilization by overcoming oxygen-diffusion losses near the membrane. Increasing ionomer content near the membrane can trap water in the porous support, reducing oxygen transport and reaction efficiency. The invention avoids this by designing the porous-material/ionomer interface, so the gas-diffusion side has greater ionomer contact or higher electric double-layer capacitance than the membrane side. This gradient, achieved through layered structures or controlled hydrophobicity, prevents pore flooding, maintains oxygen diffusibility, and supports effective proton conduction. As a result, catalyst particles are used more efficiently, water retention decreases, and overall catalyst-layer performance improves.

Company name Panasonic IP Management Co Ltd (Japan)

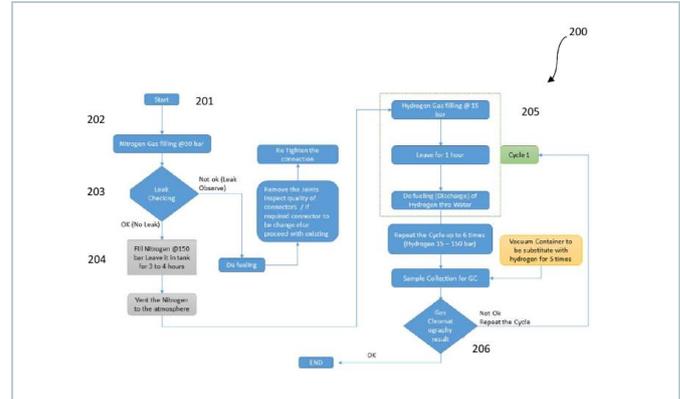
Inventors Takumi Hikiji,
Kazuhiko Sugimoto,
Miho Genban,
Kensaku Kinokawa,

Priority date 18-Jun-2024

Publication date 06-Jan-2026

IN202541040872A

Method for hydrogen leak detection and media substitution in hydrogen cylinders



This patent describes a hydrogen-leak detection and safety approach for Fuel Cell Vehicles (FCVs) and H2-Internal Combustion Engine (ICE) vehicles used in high-risk confined spaces. It employs micro-level detection tools like chromatography paper, optical and thermochromic sensors, along with pressure, partial-pressure and temperature monitoring to identify tiny leaks. The approach integrates inert-gas purging with repeated nitrogen/argon-hydrogen substitution cycles and staged high-pressure leak checks, while embedded sensors enable real-time alarms and fire-protection responses. Pressure and temperature variations help indicate micro-ignition events, and safeguards such as chamber leak tests, controlled purging and routine inspections ensure precise detection and safer operation in confined environments.

Company name Ashok Leyland Ltd (India)

Inventors Senthilraja V, Ravishankar D, Dr Vijay Bhooshan Kumar, Balakrishnan D

Priority date 28-Apr-2025

Publication date 09-Jan-2026

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