A METHOD OF COMBUSTING A GASEOUS FUEL CONTAINING AT LEAST ONE COMBUSTIBLE GAS IN AN INTERNAL COMBUSTION ENGINE

IITM Technology Available for Licensing

Problem Statement

- **Low Calorific Value:** Biogas and similar low-calorific-value fuels are abundant in rural areas, posing challenges for efficient combustion in internal combustion engines.
- **Pressurized Injection Solutions:** Existing solutions like pressurized fuel injection (as seen in US patent no. 5522369) are effective but not cost-effective for overcoming the low calorific value problem.
- **Unaddressed Need:** None of the existing technologies address the specific challenge of efficiently combusting unpressurized fuels with low calorific value, such as biogas.

Intellectual Property

- IITM IDF Ref. **1111**
- **IN 368912 - Patent Granted**

Technology Category/ Market

Category- Internal Combustion Engine (ICE) Enhancement
Applications- Automotive, Power Generation
Industry- Internal Combustion Engine Manufacturers, Renewable Energy Companies

Market - The internal combustion (IC) engine market size is expected to reach USD 485.1 Billion by 2032 at a **CAGR of 4.7%.**

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

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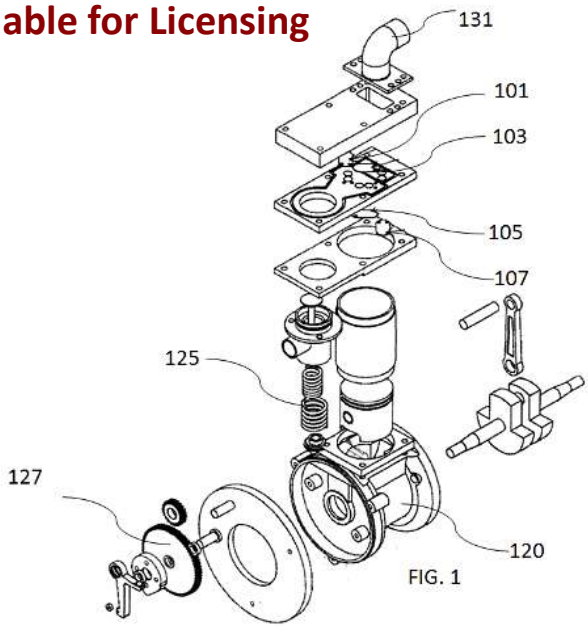

FIG 1. shows the pressurizing device having various components.

Technology

Pressurizing Device Design:

- **The system utilizes a reciprocating piston cylinder type gas pressurizing device, equipped with reed valves for gas intake and outlet, along with a poppet valve for gas injection into the engine. The device can vary the clearance volume and the number of compression cycles per engine cycle.**

Operation and Timing:

- **Gas is sucked in during the piston's movement towards Bottom Dead Center (BDC) and compressed during its movement towards Top Dead Center (TDC). Once the desired pressure is reached, the compressed gas is injected into the engine through a timed operation of the poppet valve, ensuring proper phasing with the engine.**

Load Variation and Gas Mixture:

- **The system adapts to varying loads by throttling the inlet or outlet of the device and by introducing secondary non-combustible gases like nitrogen along with the primary gas. This allows for adjustments to the chamber volume and the amount of gas injected into the engine.**

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Key Features / Value Proposition

1. Innovative Fuel Pressurization Mechanism:

- The technology employs a reciprocating piston cylinder pressurizing device, offering an innovative method to compress gaseous fuels efficiently.

2. Flexible Adaptation to Engine Load and Fuel Types:

- It allows for adjustment of compression cycles, chamber volume, and gas mixture, enabling adaptability to varying engine load conditions and different types of gaseous fuels.

3. Cost-Effective Solution for Rural Areas:

- Especially beneficial for rural areas with abundant biogas or producer gas, the technology provides a cost-effective means to utilize these low-calorific-value fuels, addressing a significant market need.

4. Precise Timing and Phasing:

- The timed operation of the poppet valve ensures optimal injection of pressurized gas into the engine, synchronized with engine phasing, enhancing engine efficiency and performance.

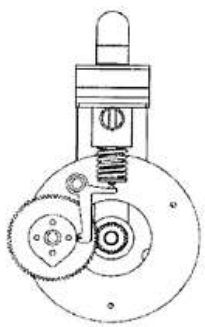

FIG. 2A

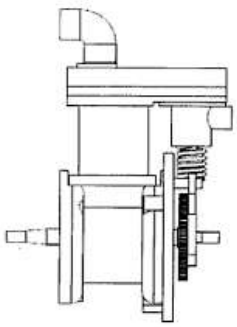

FIG. 2B

FIG 2. 2A-FIG. 2D illustrates the pressurizing device as viewed from different angles.

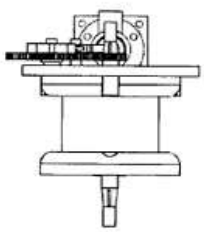

FIG. 2C

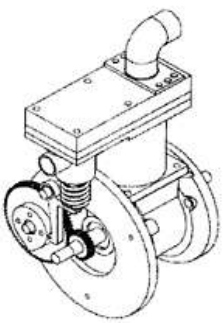

FIG. 2D

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