TWIN-INJECTOR SYSTEM FOR TWO-STROKE SPARK IGNITION ENGINES AND USES

IITM Technology Available for Licensing

Problem Statement

- High HC emissions and poor fuel economy in conventional 2-stroke spark-ignition engines due to short-circuiting of fuel-air mixture during scavenging.
- Limited benefits of electronic fuel injection in conventional 2-stroke engines due to primary mixture preparation in the crankcase.
- **Challenges with injector durability, lubrication, and cooling in high-pressure direct injection systems for gaseous fuels in 2-stroke engines.**

Intellectual Property

- IITM IDF Ref. **1216**
- **IN 364625 - Patent Granted**

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

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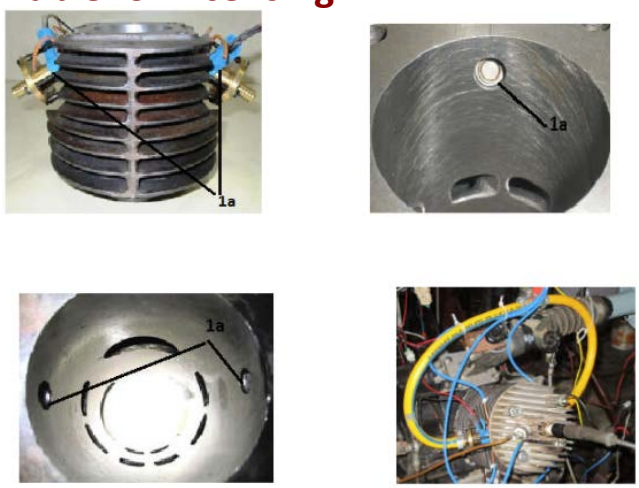

FIG. 1. Depicts the test set up and cylinder barrel with injectors of the injection system showing injectors (1a).

Technology Category/ Market

Category - Advanced Fuel Injection Systems
Applications- High-Performance Racing Engines, Small Engine Equipment (e.g., Chainsaws, Leaf Blowers), Two-Stroke Power Tools & Lawn Equipment
Industry- Automotive, Power Equipment

Market - The fuel injection systems market size will grow from $81.52 billion in 2023 to $91.7 billion in 2024 at a rate **CAGR of 12.5%.**

Technology

The present invention relates to **a twin injector system for automotive applications wherein the said injection system consists of two electronically controlled gas injectors.**
Twin Injectors (electronic injectors) with sprays impinging at an angle with these specific features
a.Specifically directed towards the centrally located spark plug and not directed towards the cylinder or cylinder head walls.
b.The common boundary of the sprays just touching the spark plug.
c.The plane containing the injectors being perpendicular to the plane containing the axis of the exhaust port and the axis of the cylinder (or) The plane containing the injectors being perpendicular to the plane containing the axis of symmetry of the exhaust ports (if there is more than one exhaust port) and the axis of the cylinder.
d.The injectors positioned symmetrically above the transfer ports and opposite each other. The plane containing the injectors also contains the axis of the cylinder.
e.The location of the injectors should be such that they are uncovered by the piston during expansion at an angle greater than or equal to 50 deg after TDC.

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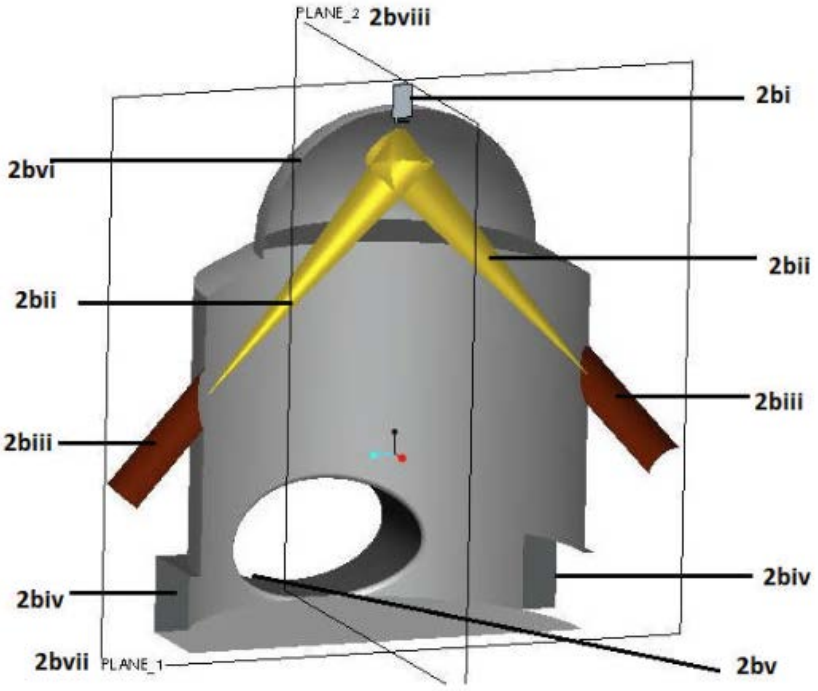

FIG. 2b. Depicts the twin injector system for direct cylinder barrel injection showing spark plug (2bi), gas jet (2bii), injector (2biii), transfer port (2biv), exhaust port (2bv), combustion chamber (2bvi), plane-1, containing both injectors, (2bvii) and its perpendicular plane -2 (2bviii).

Key Features / Value Proposition

- **a) Ability to use low pressure gaseous fuels with high thermal efficiency and low emissions in a two-stroke spark-ignition engine.**
- **b) Good durability compared to cylinder head injection even with gaseous fuels.**
- **c) Nearly homogeneous mixture preparation and low levels of short-circuiting.**
- **d) Two injectors facilitating high flow rates with short injection durations with the possibility of delayed injection to reduce short circuiting.**
- **e) Significant reduction in hydrocarbon (HC) emission compared to conventional systems.**
- **f) Significant improvement in brake thermal efficiency compared to conventional systems.**
- **g) Improved combustion as compared to conventional systems.**

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