Method of retrofitting and actuating variable profile cam for controlling lift and timing of engine valves

IITM Technology Available for Licensing

Problem Statement

- Generally, it is noted that the changing the opening & closing times and lifts of the valves at various operating speeds could enhance the fuel efficiency & reduced emission.
- Based on prior arts discussion, several means of controlling the timing and lift of valves have been proposed, however the IC engines are very limited due to **difficulties in manufacturing, assembly, size constraints & cost**.
- Further, said prior art actuation mechanism are **limited** to a **complete replacement of cam shaft and /or other components** in the engine including **external or active means**.
- Hence, there is a need to mitigate above challenges & provide **efficient solution.**
- **This invention** has addressed above issues in efficient manner.

Technology Category/ Market

Technology: Operating variable profile cam for controlling lift and timing in IC engine;
Industry: Automotive; **Applications:** Fuel Injection Testing; ;
Market: The global Internal combustion engine market size is projected at a **CAGR** of **9.3%** during period of 2022-**2030.**

Intellectual Property

IITM IDF Ref.:1153 Patent No. 349242
PCT Application No. PCT/IN2015/000212

TRL (Technology Readiness Level)

TRL- 4, Proof of Concept, tested & validated

Research Lab

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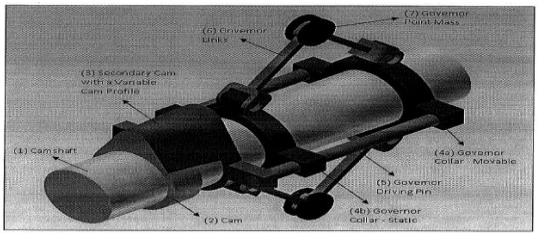
Technology

- Present invention describes a method of **operating a variable valve lift and timing in IC engine.**
- The method comprising a few steps as mentioned in the smart chart hereinbelow:

1. **mounting a secondary moveable cam along the cam shaft of the conventional cam, such that the outer profile of the primary cam & inner profile of the secondary cam are matching, & the outer profile of the secondary cam is optimized such that the sliding secondary cam surface presents a different cam profile to the follower;**
2. **operating the secondary cam with a rotary mechanical assembly governor to move the secondary cam slidably axially along the cam shaft on the basis of engine speed,**
3. **mounting a movable collar on the governor with a governor driving pin operatively connecting the movable cam to the governor;**

- The axial location of the sliding secondary cam surface presents a different cam profile to the follower, such that the **changing profile** of the secondary cam results in a **variable timing & lift** of the valves at various operating speed of the engine. (**Refer Fig.1**)



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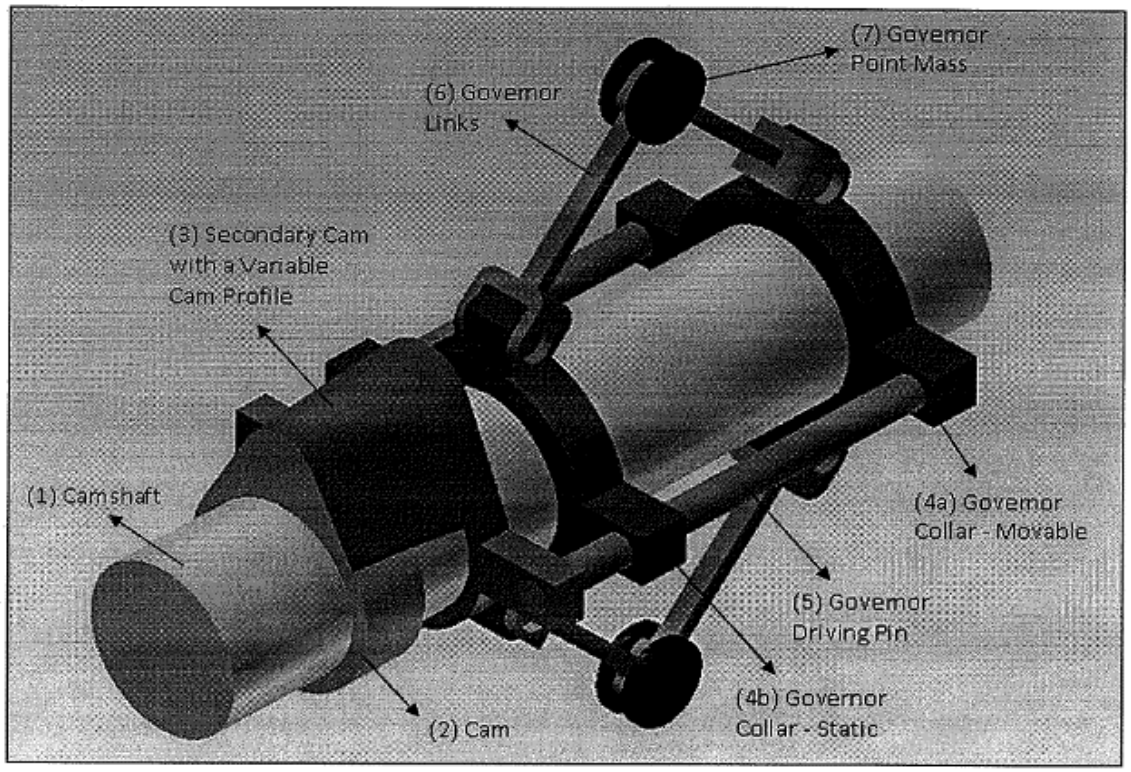
Layout of proposed Concept

Fig.1



Key Features / Value Proposition

❖ *Technical Perspective:*

- Facilitates a **variable profile movable cam** which can be retrofitted to the existing cam & a means of sliding the cam by mechanical governor fitted onto the camshaft which provides **speed dependent linear motion**.
- The claimed Patent includes the **governor assembly** which consists **of spring**, which is **in compressed state** when engine speed is below a predetermined value, & **in uncompressed state** when engine speed is above a predetermined value.
- Further, the secondary cam rests on the conventional cam continuously at all times and with the inner profile of the two cams matching and outer profile of secondary cam optimized, wherein the follower of the rocker follows the outer profile of the secondary cam resulting **in variable valve lifting and timing on the basis of engine speed**.

❖ *Industrial Perspective:*

- Facilitates the claimed technology to be used in **lower segment vehicles** like two-wheeler in particular.
- **Increased efficiency** of the **engines**, thereby **improved** the fuel economy.

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