HYBRID WING DEVICE AND METHOD OF ACTUATION

IITM Technology Available for Licensing

Problem Statement

- Current aircraft rely on rigid wings and control surfaces, leading to suboptimal aerodynamics and increased fuel consumption.
- There's a need for adaptable monolithic wings, but efficient actuation mechanisms are crucial for achieving this.
- Smart materials like MFCs and SMAs have been explored for actuation, but they have limitations such as poor actuation authority and slow response time.
- Electro Active Polymers (EAPs) are still in early development and not practical for aerospace applications yet, leaving a gap in suitable actuator options for morphing wings

Technology Category/ Market

Category - Aerodynamics
Applications - Aircraft, Minimizing aerodynamic or hydrodynamic drag
Industry - Aerospace, Wind Energy
Market- The global aerodynamic market is anticipated to reach US$ 32.44 billion by 2028 and is predicted to register a **CAGR of 4.8%** during 2023-2028.

TRL (Technology Readiness Level)

TRL - 3: Proof of concept stage.

Key Features / Value Proposition

- The structure may be used in the wings of any aerial vehicle such as UAVs, and helicopters, or any aerodynamic or hydrodynamic structure such as a wind turbine, hydrofoil etc. for controlling lift.
- The device **minimizes minimizing aerodynamic or hydrodynamic drag** and provision of effective control action via optimized actuation of control surfaces.
- The device provides **enhanced aerodynamic efficiency** by having a hinge-less design and reduces energy loss.

Intellectual Property

- IITM IDF Ref**. 1736**
- **IN 381604 - Patent Granted**

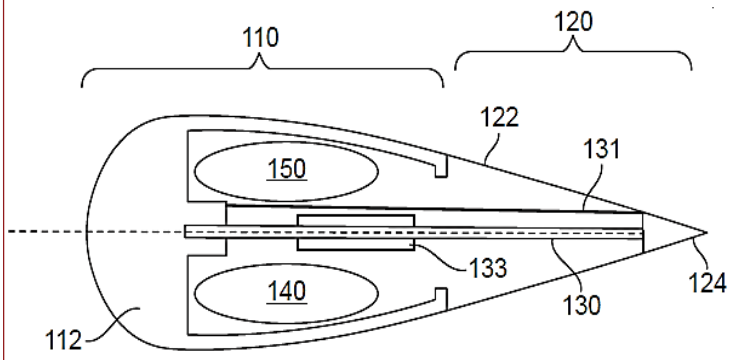

FIG.1. illustrates a schematic of the hybrid wing device.

Technology

The invention discloses **a compliant aerofoil device configured to change its profile in flight using shape memory alloy (SMA)** and piezoelectric composite elements in response to control inputs.

Device

1. **The device is formed of a rigid leading edge part (110) including a D-spar and a compliant trailing edge part(120), connected by an elastically deformable membrane(130).**
2. **The Trailing edge part (120) includes a flexible shell(122) and a rigid tail tip portion (124).**
3. **The invention discloses a method of controlling an aerodynamic or hydrodynamic structure by providing at least one tensile element along with one or more bending elements.**

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