METHOD A FUNCTIONALITY FOCUSED HYBRID DESIGN OF AN OBSERVATION CLASS BIO-INSPIRED UNDERWATER REMOTELY OPERATED VEHICLE

IITM Technology Available for Licensing

Problem Statement

- **Inefficient Propulsion:** Conventional ROVs use rotary propellers that consume more power for required maneuverability, leading to lower propulsive efficiency.
- **Complex Control Systems:** Bio-inspired underwater vehicle designs offer higher efficiency but suffer from complex control system designs.
- **Limited Battery Life:** Efficient propulsion and maneuverability are crucial for autonomous underwater observation vehicles with limited battery capacity.

Intellectual Property

- IITM IDF Ref. **1323**
- **IN 538228 - Patent Granted**
- **PCT/IN2016/000272**

Technology Category/ Market

Category - Advanced Underwater Robotics, Robotics & Automation.
Applications - Scientific Exploration, Subsea Oil and Gas Observation
Industry - Marine Robotics, Oil and Gas

Market - Global underwater robotics market is projected to touch USD 553.71 Million by 2032, exhibiting a **CAGR of 6.8%.**
- **Advancements in Autonomous Navigation and Sensing Technology** to Accelerate Market Growth.

TRL (Technology Readiness Level)

TRL - 5, validation in relevant environment.

Research Lab

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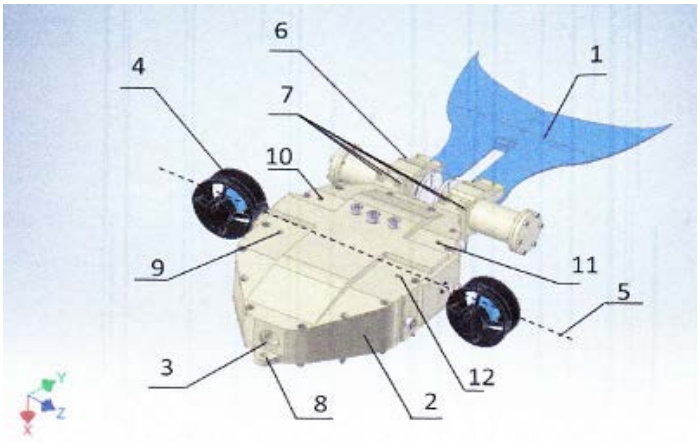

FIG.1. Illustration of the current invention showing the key components of the system.

Technology

The present invention relates to a **functionality-focused hybrid design of a bio-inspired underwater remotely operated vehicle.**

1. Integrated Hybrid Propulsion System:

- **The invention combines a bio-inspired caudal fin propulsion system with conventional rotary thrusters to achieve high efficiency for long-distance navigation and improved maneuverability for complex operations.**

2. Simplified Control and Stability:

- **The design minimizes control system complexity while enhancing stability and maneuverability by optimizing the placement and orientation of propulsion systems, hull shape, and weight distribution.**

3. Modular and Adaptable Design:

- **The vehicle's modular design allows for easy replacement and customization of components, making it suitable for various underwater missions and applications with minimal modifications.**

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Key Features / Value Proposition

The main features of the invention are:

1. Shape of the hull is streamlined and such that the vehicle has natural pitching for the vehicle to lean towards the direction of heaving.

2. The flapping axis orientation and weight distribution is such that the amplitude of body oscillations while flapping is minimal.

3. The bio-inspired flapping mechanism has a slotted lever and flexible fin, with the flexibility of the fin chosen such that the heave leads the pitch by about 90 degrees.

4. The design is capable of moving straight long distances propelled by the efficient bio-inspired fin and maneuvering with rotary thrusters. This gives better overall efficiency for a given mission.

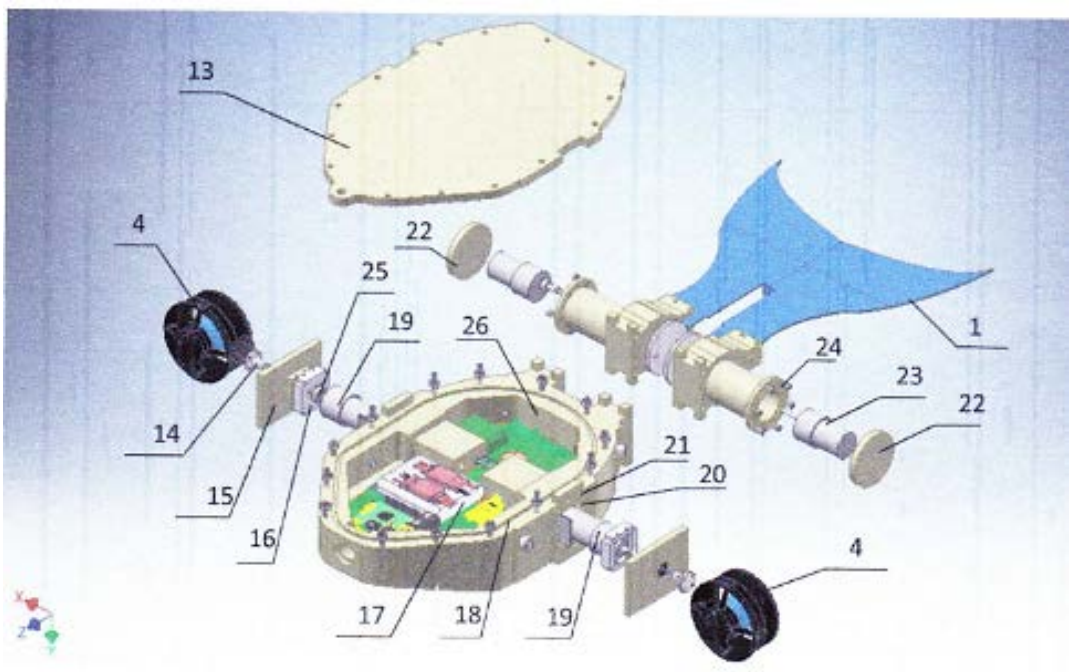

FIG. 2. Exploded view of the vehicle assembly to show some of the key components of the vehicle.

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