

Industrial Consultancy & Sponsored Research (IC&SR)

Compact and Minimalist Observation Class Bio Inspired Robotic Vehicle for Septic Tank and Sewer Line Inspection IITM Technology Available for Licensing

PROBLEM STATEMENT

- Generally, manual scavenging of septic tanks is **most dangerous practice** which has taken **many lives** during operation.
- Based on technical survey, the prior art used sphere of robotics trying to replace the manual scavenging.
- Said prior art robotic system has an issue like **limitations** to **pipeline crawlers**.
- Further the prior art robotics system includes other issues, related to **unable to swim** through water in case of **higher sewage volume, failure of propulsion**.
- Hence, there is a need to address above issues and present invention provides solution in efficient manner.

INTELLECTUAL PROPERTY

IITM IDF Ref. 1733; IN Patent No: 411893

TECHNOLOGY CATEGORY/ MARKET

Technology:; Inspection system;

Industry: Infrastructure, Waste Management;

Applications: Waste management;

Market: The global **inspection robots** market is projected to grow at a **CAGR of 20%** during **2024-2032**.

TRL (TECHNOLOGY READINESS LEVEL)

TRL-4, Proof of Concept ready, tested in lab.

TECHNOLOGY

- The present invention describes an **inspection system** having hull designed in a preselected shape and a motor casing positioned outside the hull for holding motors. (Refer Figures)
- Said inspection system further comprises **sensors** for inspecting a **predefined area** and at least **two fins** for **enabling** a movement of the **inspection system** in the **predefined area**.
- In this instance, the **first fin** is provided at a **front side** and a **second fin** provided at a **rear side**.

- The **two fins** are actuated through **motors**.
- **Cameras** are **connected** at different positions over the hull and said cameras are **controlled** through **motors** and the control system for **controlling navigation** of the **inspecting system** inside the predefined area.
- The inspection system is implemented as a **robotic septic tank inspection system** (robotic vehicle).

Fig. 1A:

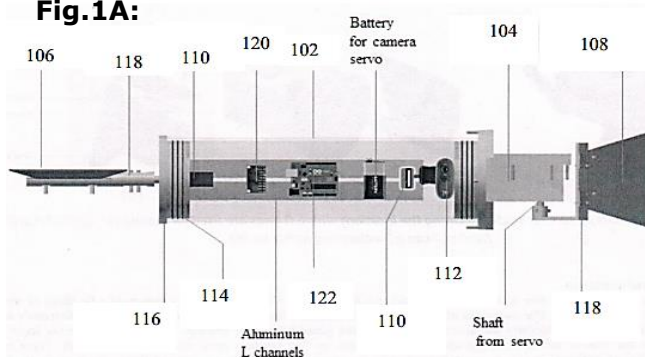


Fig. 1B:

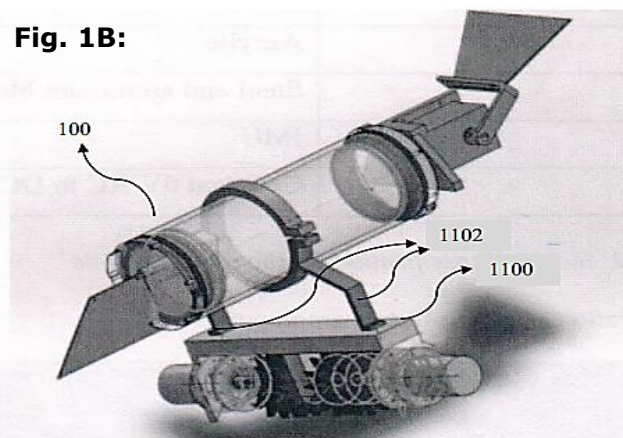


Fig.1A & 1B: Illustrates schematic views of the inspection system (robotic vehicle)

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KEY FEATURES / VALUE PROPOSITION

❖ Technical Perspective:

- The shape of the hull of inspection system is **cylindrical shape**.
- The **inspection system** includes a **bio inspired propulsion**, with minimum use of actuators with high degree of maneuverability, **compact in size**.
- The inspection system also comprises **cleaning sub-modules** for enabling a **cleaning functionality of the predefined area**.
- The predefined area comprises an area inside a **water body** comprises a **water tank, or a sewer line**.
- **The actuation** of each of the front and rear fin enables **station keeping** despite the vehicle being slightly positively buoyant. (**Four degrees of freedom** are achieved by this **ROV-heave** (up/down), **pitch, yaw and surge** (forward/backward).
- The **navigation** of the **inspection system** is controlled by using a **control system**.
- The **front view** of inspection area is captured by **endoscope camera** configured outside the inspection system & **side view** of inspection area is captured by **webcam** configured onto the servo motor (**full 360 degrees side view**).
- The **short circuit problem** (due to tethers damage) can be tackled by utilizing **onboard battery packs** configured in the transmitter module of the inspection system.

❖ Industrial Perspective:

- Easily applicable in alien **septic/sewer tanks** and further applicable as disaster management tool, and other septic/sewer environments.
- **Cost-effective Robotic vehicle** effectively **minimize human intervention**.

Reference Nos Mentioned Inspection System (Fig. 1)

100	Inspection System
102	Hull
104	Motor casting
106,108	Fins
110	Motors
112	Cameras
118	Shaft
114	O-rings & etc.

Experimental Image

Fig.2A

Fig.2B



Figs. 2A & 2B: Illustrates picture of the inspection system in septic tank mockup during surge and surge heavy.

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